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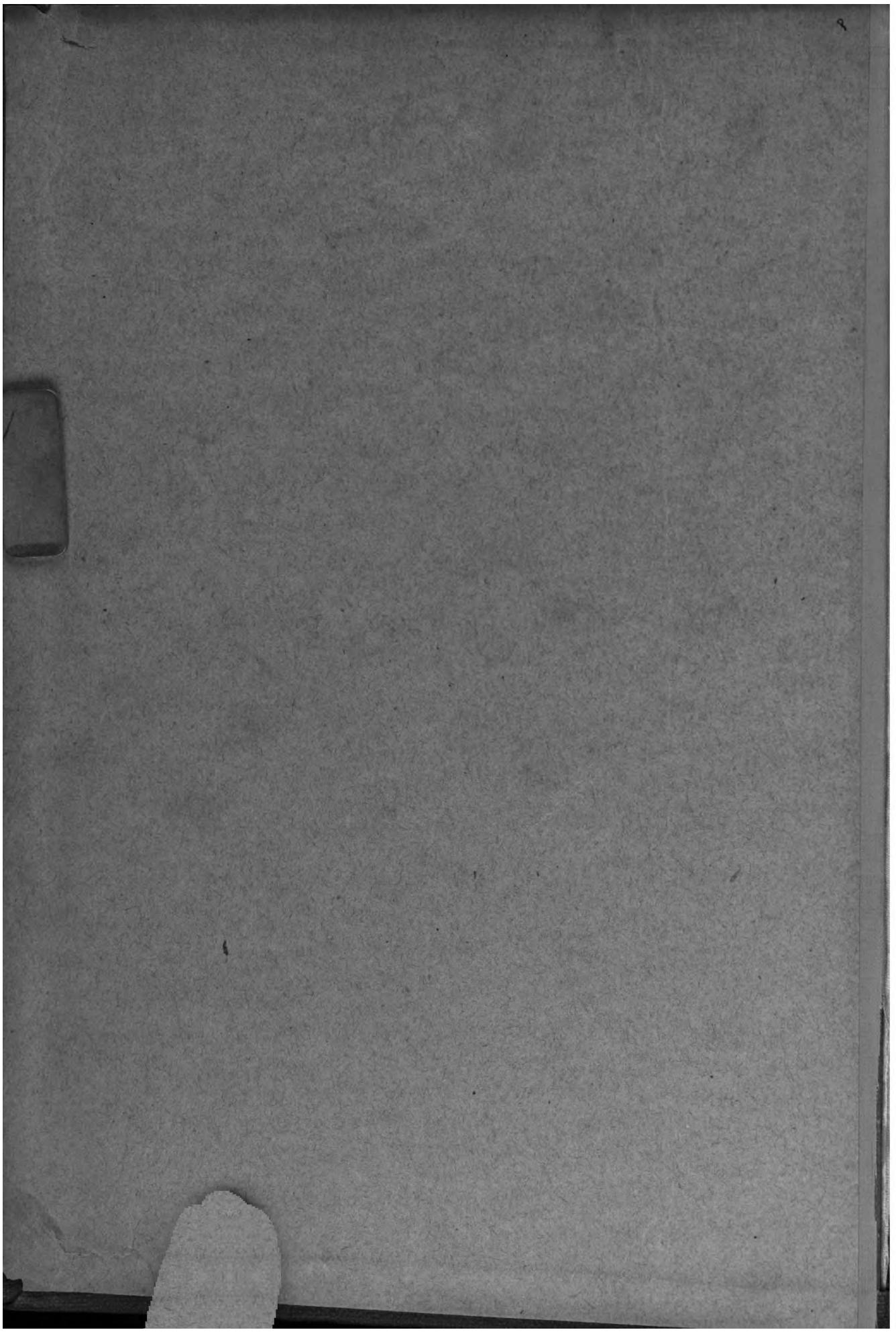
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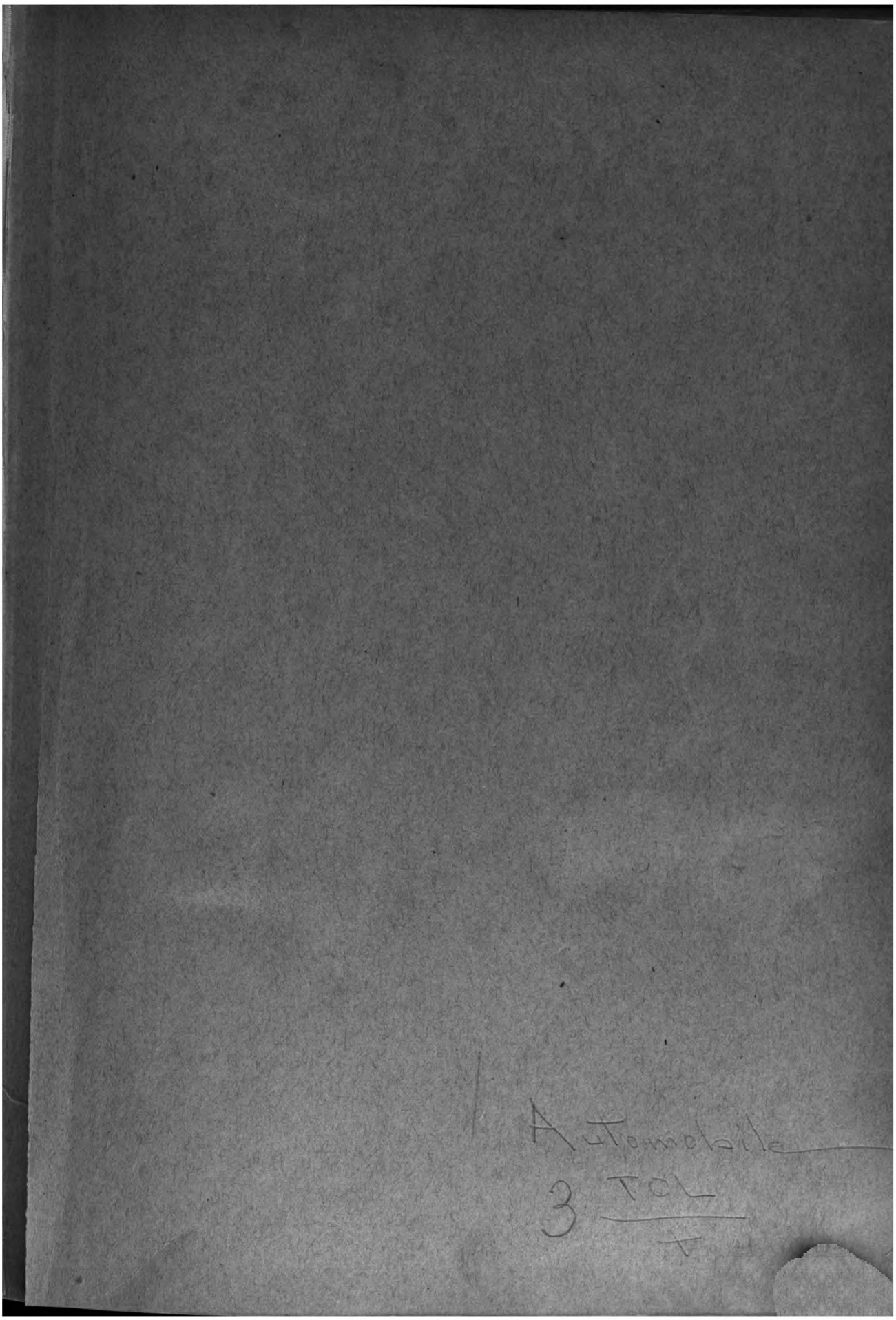
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v.23 no.1 sept.33

FIRST ANNUAL TRUCK NUMBER

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 23, No. 2. NEW YORK, APRIL, 1917 Monthly, $1.00 per year Single Copy 10 Cents

PARTIAL CONTENTS

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SHORT CUTS—New Methods of Doing Repair Work Which Will Often Save Time. Illustrated.

MOTOR TRUCK LIFE—How to Give It the Length of Life It Merits By Proper Care and Use. Illustrated.

TRUING UP CYLINDERS—Important Information and Experience Upon Reboring and Grinding.

WOMEN DRIVERS—Advice From a Pioneer Who Has Always Been a Conspicuous Enthusiast.

NOVEL CAMPING OUTFIT—A New Outfit That Will be Useful for the Summer Tour. Illustrated.

SENSIBLE AUTOMOBILE LEGISLATION—Something That Will be Approved by Car Drivers.

THE REPAIR SHOP—How to Do the Work and How to Keep Track of Its Various Stages.

THE TROUBLE DEPARTMENT—Some Inquiries by Readers That May be of General Information.

(For Full Table of Contents See Page 152.)

Buyer's Guide and Index to Advertisements, Pages 99, 100 and 101. Table of Contents will be found on Page 152

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HUDSON REPUTATION

Helps Dealers to Sell More Cars

"Reputation is the best ingredient in merchandise. . . . For when a man or firm undertakes to build a reputation for an article he quite naturally guaras it as he would his life."

LOUIS D. BRANDEIS,
Justice of the Supreme Court of the U. S.

SINCERITY in all merchandising and manufacturing methods has built an enviable reputation for Hudson. Today we are the largest maker of fine cars in the world.

Men who sell the Hudson Super-Six profit by this reputation. They share it. They are recognized as the leading automobile merchants of their communities.

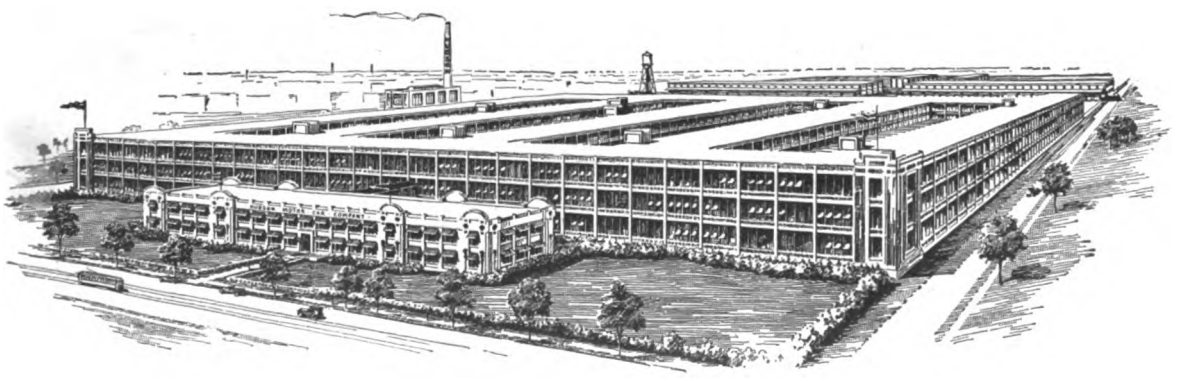
Because of this reputation, it is easy to sell the Hudson Super-Six. Last year 28,000 Super-Sixes were built, but the demand exceeded this by many thousands. This year production will be increased, but conditions will be much the same for the Hudson Super-Six is the most wanted car today.

It is easy to understand then why Hudson franchises are in such demand. Rarely is there one available. From time to time new opportunities arise. Sometimes a dealer fails to measure up to the Hudson standard and must be replaced. At such a time we want to know the names of all real automobile merchants.

If you feel that you some day might like to become a Hudson dealer and to share this reputation that other Hudson dealers enjoy, send us your name.

HUDSON MOTOR CAR COMPANY

DETROIT, MICHIGAN



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Fair List Prices — Fair Treatment

GOODRICH

SILVERTOWN CORD TIRES SAFETY TREAD FABRIC

AND THE ONE-PRICE SALE

WHEN a tire customer walks into your store, it is worth much to you to know that all you need do is to hand him the tire, and he buys it without hesitation because he has a deep-rooted confidence that he is getting the *best* tire at the *lowest* price.

It is worth much in time, argument, and self respect *saved*, and many a dollar *earned* in quick sales and the satisfaction that brings the customer back to you for his NEXT tires.

That is the asset, which produces big yearly profits, dealers acquire with Goodrich tires.

The Goodrich Dealer the One-Price Dealer

Experienced tire buyers have *learned* to stop at the FIRST Goodrich sign because they know THERE is a ONE-PRICE dealer doing business on the Goodrich Fair List.

The Goodrich sign vouches for the steadfast high quality, the old and trusted B. F. Goodrich Company makes no effort to cheapen.

Because tire buyers, feeling *safe* with ANY Goodrich dealer, buy at the NEAREST Goodrich store—buy without haggling, and seldom leave without buying—Goodrich dealers waste no time in bargaining, but give it all to attention of the customer.

Therefore, mutual *good faith* and *good feeling* between dealer and customer make their home at the sign of Goodrich.

Where You See This Sign Goodrich Tires are Stocked

GOODRICH TRADE MARK TIRES

Ask Your Dealer for Them

The B. F. Goodrich Co., *Akron, Ohio*

"Best in the Long Run"

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ONE THING WELL DONE



STA-TITE PISTON RINGS

WE manufacture only one thing — piston rings. All our thought, all our time, all our effort is directed towards the making and perfecting of these rings.

Sta-Tite Rings are therefore the result of the highest specializing. That is how we have reached perfection in their making.

Each ring is cast separately from a special formula iron. Experts handle every operation in their manufacture. Each ring, before it goes on the market, is subjected to the most rigid inspection. No flawed ring, however slight its defect, is allowed to leave our factory.

More Power—Less Fuel

Sta-Tite Rings, by their scientific construction, make leaky cylinders impossible. They give you a smooth-running, more powerful motor. They prevent the piston from wearing dry and scoring the cylinder walls.

Sta-Tite Rings save you oil—save compression—save you gasoline—and save you repair bills. They cut down the carbon deposit—they preserve your spark plugs. In short, they pay their own cost many times over in the savings they make for you.

Make New Friends

Sta-Tite Piston Rings will bring you more business and more friends. Every set you sell means a satisfied customer—one who will not only enthusiastically endorse these rings, but who will tell his friends of the satisfactory service you have given him.



We are also the makers of Quality Snap Rings. No better proof of the demand that exists for these rings could be given than that we have been forced to increase our capacity to 15,000,000 rings in 1917.

Here is a chance to increase your business and your profits. Both Sta-Tite and Quality Snap Rings offer you attractive profits.

Write us today for complete information. Act quickly—don't let someone else get the business and the profit that should be yours. Address Dept. 109.

THE PISTON RING COMPANY
MUSKEGON, MICHIGAN

THE ETERNALLY TIGHT RING

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It's extravagant—and a downright **waste of good, cold cash**—to throw away your worn tires, or sell them to Jimmy the Junkman for a few cents a pound—because you can now get 5000 miles **MORE** service out of them by doing what European motorists have done for the past three years—and this will result in a ***SAVING*** of $50.00 to $200.00 a year to you.

European Motorists Get 10,000 to 15,000 Miles From Ordinary Tires

For the last three years European motorists have been getting from 10,000 to 15,000 miles out of a set of *ordinary rubber tires*, while American motorists have been satisfied with 1,000 to 3,000 miles—and what is even more important, European motorists have almost entirely eliminated the constant **dread** of punctures and blow-outs.

They do it by "half-soling" their tires with Steel Studded treads—and in the last 8 months over 40,000 American motorists have followed their example and have "half-soled" their tires with Durable Steel Studded Treads.

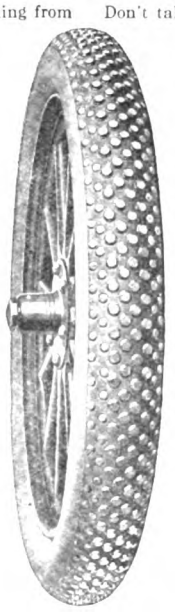
Guaranteed 5,000 Miles Without Puncture

To many motorists this fact—**guaranteed 5,000 miles without puncture**—is of more interest than the money saved by eliminating tire repair bills. The constant dread of puncture or blow-out spoils the joy of motoring. Each unnecessary noise—each bit of broken glass or sharp edged stone—each bump or "pop" makes the motorist think of tire trouble FIRST.

Durable Treads are backed by a signed guarantee—as good as a government bond—**for 5,000 miles without puncture**—many users get 10,000, 12,000 and 15,000 miles. Think of the joy you could have in motoring when you absolutely KNOW in your own mind that your tires are protected by Durable Treads and are *impervious to the roughest roads*. When you KNOW that you won't have to get out and sweat fixing a puncture—and the guarantee holds good whether your tires are new or old.

No More Skidding

"Durable Treads" are as sure footed as a Rocky Mountain burro—look at the photograph—**see those steel studs**—they're simply bound to be safe—the sharp edges grip the slipperiest **roads and make skidding almost an impossibility**. With **Durable Treads your tires are protected** instead of injured and you **don't have to *climb out in the mud and slush to put on chains.***



Protect Your New Tires Small Cuts May Ruin Them

Don't take chances with them—don't wait until they are cut up with sharp stones, glass, etc. Remember that a small cut usually develops into a sand blister—water soaks in and *weakens* the fabric—with the result that the tread of your tire comes loose from the fabric or else you have a blow-out. Either way it costs you **money, time** and **trouble.** Take a stitch in time and put on Durable Steel Studded Treads **immediately.**

We Deliver Free

Without a cent deposit—prepay the express—and allow YOU to be the judge. Remember that the new 1917 Improved Full Cover Durable Treads have **no springs or attachments.** They are gripped tightly by the rim, just the same as a tire—*absolutely water and sand proof*—and **easily applied in your own garage in thirty minutes** without special tools.

Special Discount

We offer a Special Introductory Discount to motorists in new territory where Durable Treads have not been introduced, on the **first** shipment direct from the factory. The sales of Durable Treads (the PRACTICAL Tread) increased 800 per cent in the United States alone during the past year—over 40 per cent of these sales were **unsolicited**—made through the recommendations of other Durable Tread users. Where is there another automobile accessory that has received such countrywide endorsement?

Mail the Coupon

Tear it off now—don't run your tires **another** week in a barefooted condition. Whether your tires are old or new you should protect them *at once*. We have an interesting book, "10,000 Miles on One Set of Tires," sample and guarantee ready to send *you* **FREE**—*mail the coupon TODAY* and find out how to get at least 5,000 miles **more service** out of your tires.

The Colorado Tire & Leather Co.

25 Tread Building, Denver, Colo.

B-5 Transportation Bldg., Chicago 720-52 Woolworth Bldg., New York

TEAR OFF—MAIL

THE COLORADO TIRE & LEATHER CO.
25 Tread Bldg., Denver, Colo.
B5 Transportation Bldg., Chicago.
720-52 Woolworth Bldg., New York.

Gentlemen:—Without any obligation send me your free book "10,000 Miles on One Set of Tires," copy of guarantee, and tell me about your Special Discount Offer.

Name .....

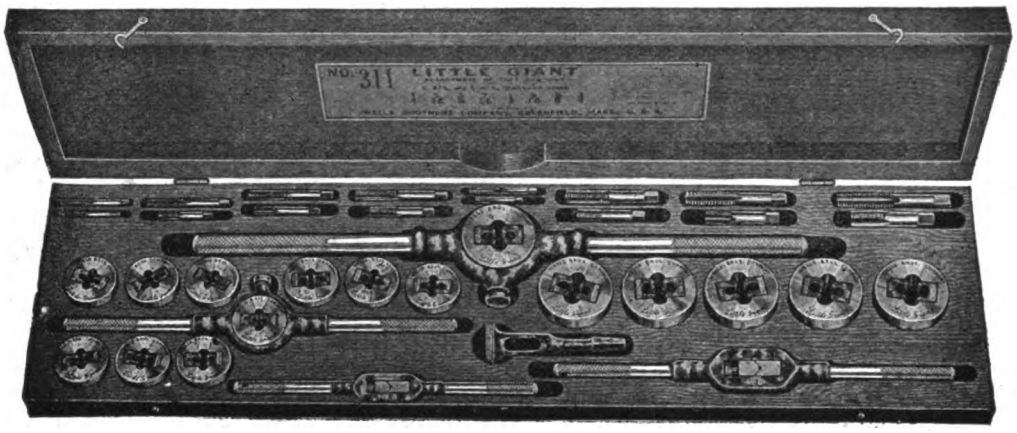
Address .....

.....

My tire sizes are .....

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How Complete is Your Screw Threading Equipment?



No. 311 *Little Giant* Combination Screw Plate

Every need of the garage and repair man, or the car owner who makes his own repairs, for tap and die assortments can be supplied from the diversified line of the Greenfield Tap and Die Corporation. For instance, the

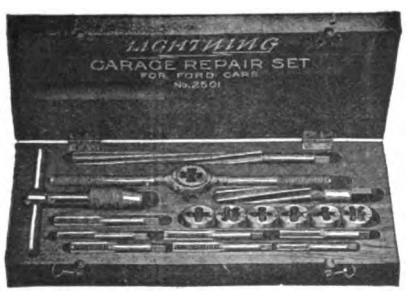
Little Giant Combination Screw Plates

(Shown above)

contain both United States and S. A. E. standard taps and dies; each die is contained in its own collet and is adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in hard-to-get-at places.

A few more assortments are shown below.

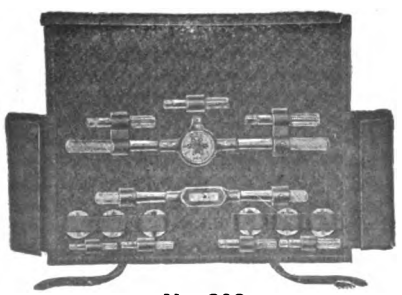
Send for No. 37 Catalog—showing the complete line.



No. 2501
G. T. D. Garage Repair Set
For Ford Cars

Seven sizes taps and dies. Two reamers for important bushings. Die stock and tap wrench.

A new set that is meeting a real demand.



No. 308
G. T. D. Screw Plate
In Leather Roll

Seven sizes taps and dies. Stock and tap wrench. Very convenient and compact for emergency cases.

Look for one of these trade marks on any screw plate you buy:

Little Giant

GREENRIVER

SMART

LIGHTNING

G T D

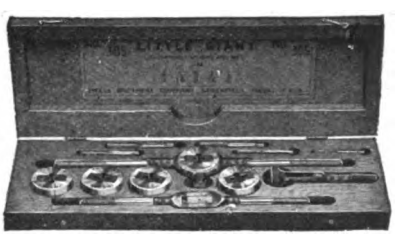
Greenfield Tap & Die Corporation

GREENFIELD, MASS.

Wells Brothers Co. Division
Wiley & Russell Mfg. Co. Division
A. J. Smart Mfg. Co. Division

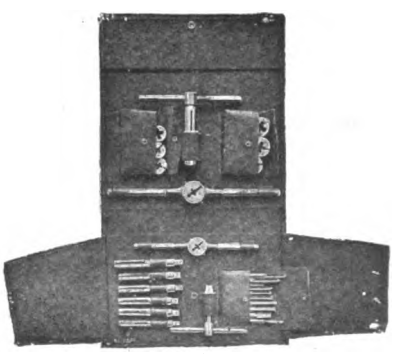
New York, 28 Warren St.
Chicago, 13 So. Clinton St.
London, 149 Queen Victoria St.

Canadian Factory
Wells Brothers Co. of Canada, Ltd.,
Galt, Ontario



No. 305
***Little Giant* Screw Plate**
One of the most popular assortments.

Five sizes taps and dies. Die stock, tap wrench and bit brace die holder.

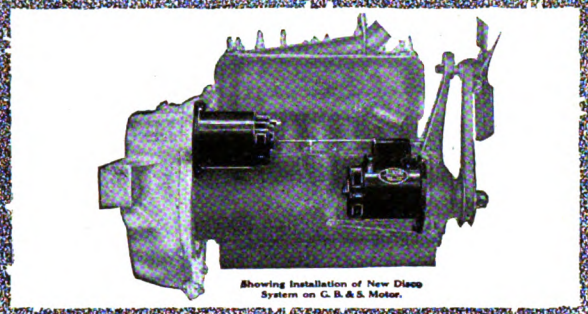


No. 2500
G. T. D. Emergency Kit
For Ford Cars

Sixteen sizes taps and dies—being practically every screw thread on Model T Ford that ever needs replacing. Thousands of these are in use.

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DISCO



Showing Installation of New Disco System on G. B. & S. Motor.

All cars would be better cars if Disco Eqipped

4 Reasons for the Superiority of the NEW DISCO Starting and Lighting System

Performance

The generator of the New Disco Two Unit System will run sparklessly and noiselessly at the highest engine speeds. This was proven by running for days at 7500 R. P. M. The generator cuts in at from 6 to 6½ miles per hour—will charge even in city driving. The starter will break loose and spin a 4x5 six cylinder motor with the lowest possible current draw from the battery.

Workmanship

Built in a new factory equipped with special machinery such as is usually found only in the largest automobile plants. The machining of field frame is done in a single chucking operation, assuring the proper alignment of all surfaces.

Construction

Two-unit, four-pole type—each unit weighs only 22 pounds—Norma bearings throughout generator. Regulator and cutout mounted integral with generator. The famous Bendix drive used on starting motor.

Accessibility

Removing 4 thru-bolts is all that is necessary to disassemble either unit. Easy to clean—no skilled mechanics required. Neat covers on the end-plates permit casual inspection of brushes and commutators in operation.

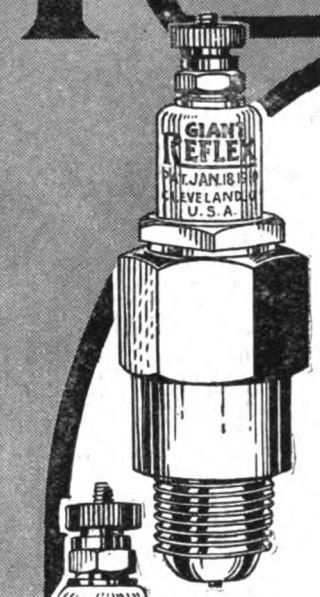
For the Ford this system sells at $75, including an ammeter and a lock-protected switch and starting-button for the steering post.

DISCO ELECTRIC STARTER CORPORATION

Detroit, U. S. A.

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REFLEX SPARK PLUGS





Year after year Reflex Dealers find their sales growing by leaps and bounds—find that in the greater majority of cases when they sell one plug to a motor car owner he comes back and buys a REFLEX for every cylinder on his engine.

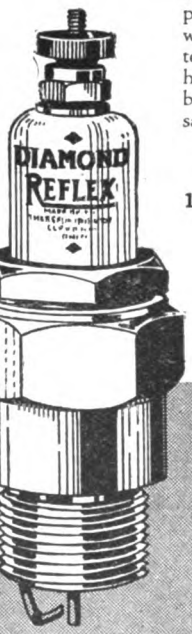
Reflex Plugs are sold on the basis of service—not on freak features introduced as sales bait to the unwise motorist. And nothing but absolute satisfaction to your customer can ever follow the sale of a REFLEX Spark Plug. Any Reflex Plug that proves defective will be repaired or replaced free of all charge.

There is a REFLEX Plug built to meet the requirements of every motor. Reflex Dealers never miss a sale because they can supply the exact type plug that is needed.

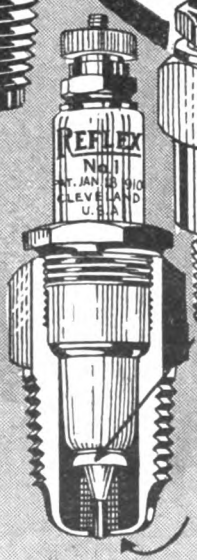




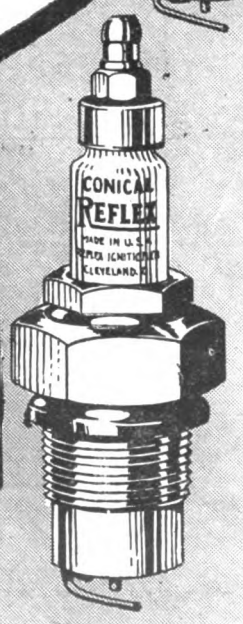
If you are looking for the best live-wire proposition in the spark plug field, we want you to drop us a line today. Let us tell you about our dealer proposition—how we give real co-operation that brings bigger sales and a bigger profit on every sale. Write us today.



THE REFLEX IGNITION CO.
1711 Payne Ave., CLEVELAND, OHIO



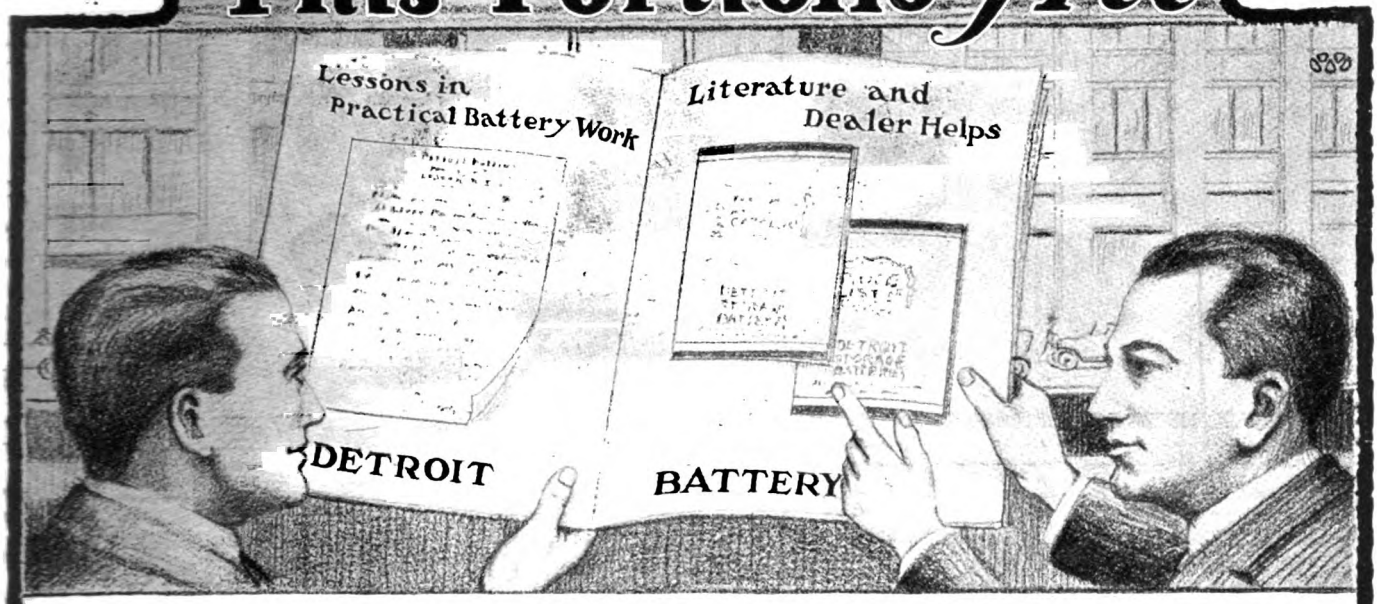




"KEEP THE CAR ON THE GO"

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We Want to Send You This Portfolio *free*



This Proposition is Intended Only For Progressive Dealers

MEN who have made the most careful study of the motor car field say that the battery business is the most profitable and the fastest growing branch of the automobile and supply business. The business is still young in spite of its enormous volume. Motorists have only now come to recognize electric equipment as a positive necessity.

Scarcely half the cars running today have electric equipment. Two years from now over five million cars will be on the road *and* from eighty to ninety per cent will be electrically equipped. The battery business will be doubled or trebled. At least four million car owners will be buying batteries and service *again* and *again*. For, bear this important fact in mind: there are only two things on a car that are sure to wear out periodically—tires and batteries. This is what makes the battery business such a sure, safe-selling proposition.

We believe every progressive dealer should seriously consider entering the battery business now right at the beginning of its greatest growth. Few sections have enough good battery service stations. The business is sure. The profits are large.

The Detroit Battery Co. have a propositon for assisting any live, progressive dealer to enter the battery business, such as has never been made by any other battery concern. This large portfolio explains it fully.

Page 2 shows the big new Detroit Battery Plant that backs up the dealer and makes possible the shipment of orders and parts the day they are received.

Page 3 holds a specially dictated proposition to you—detailing exactly what will be necessary for you to do to enter the battery business in your particular locality—the expense and the probable profits.

Page 4 shows the equipment you will want to install and its cost.

Page 5 shows a sample of the course of lessons in practical battery work we give absolutely free to Detroit Battery men who have not had sufficient battery experience. We take the mystery out of the work. No Detroit Battery sales or service station will fail from lack of practical knowledge.

Pages 6 to 13 are devoted to displaying actual samples of our dealers helps sales and promotion plans—signs, catalogs, bulletins, direct advertising, etc.

Page 13 shows the simple office and accounting system we have had planned by an expert accountant for our dealers and service stations. You can see that our co-operation extends to points never before touched by any battery maker.

Page 14 shows a sample contract giving all details of our proposition.

By all means you ought to send for this portfolio at once. It may show you the way to a tremendous increase in business and profits.

DETROIT BATTERIES

Detroit Battery Company

Detroit, Michigan

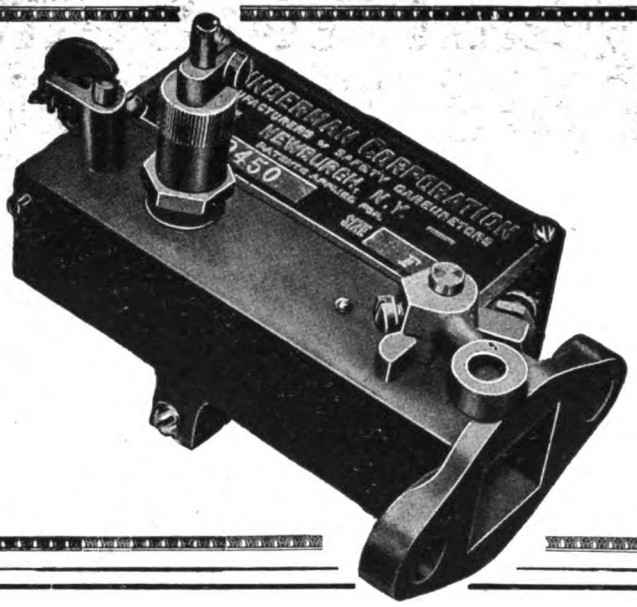
Detroit Battery Company,
109 High Street, Detroit, Mich.

Send me the portfolio.

*Name*_____

*Address*_____

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Efficient Break-Up

Fundamental to all of the Sunderman proved superiorities is its principle of breaking up the gasoline globules.

Exactly as a furnace will not work efficiently when the lumps of coal are too large, neither will your motor's combustion chamber fire its charge at highest efficiency when the gasoline globules are too large.

They must be broken up—smaller coal for your furnace, finer particles of gasoline for your motor. The

$5 F. O. B. Newburgh

SUNDERMAN

Vacuum Carburetor

$6.50 for other than Ford or Metz

$5 F. O. B. Newburgh

does this supremely, producing a mixture that extracts from gasoline the last atom of energy that it contains. More complete combustion ensues—and therefore in relation to other carburetors the Sunderman needs less gasoline to secure a given power impulse. With as much gasoline as other carburetors need to function, the Sunderman gives MORE power—so much more that on a badly fouled motor tested at our laboratory at Detroit the dynamometer showed 47 brake horsepower, when the motor in its original fine condition had developed only 42 brake horsepower at the factory in which it was made.

We'll give you the evidence of the above if you ask us for it.

But economy is not the only advantage of our proved principle. We make the following simple claims, and ask you to let the carburetor itself prove them:

INCREASES MILEAGE

More Power, Easier Starting, Greater Flexibility, Safety, Improved Acceleration, Decreases Gearshifting, Idles without Loading, Saves Money with any grade of fuel.

Dealers: Write at once to get our 1917 proposition. Good territory is still available.

SUNDERMAN CORPORATION

9-11 Chambers Street **Newburgh, N. Y.**

Western Sales Offices: 403 Kresge Bldg., Detroit

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EDELMANN High Grade Specialties for Ford Cars

OIL GAUGES FOR CRANK CASE

No. 41 PROTECTED GLASS .35

No. 44 HEAVY CAST BASE .75

No. 40 GLASS - .25
No. 42 GLASS - .40

VALVE PARTS AND TOOLS

FORD VALVE GRINDER .30

FORD VALVE STEM .25

VALVE RESEATER .50

VALVE REFACER .30

VALVE ADJUSTERS COMPLETE SET BOX .25

VALVE SPRING .05

RADIATOR AND HUB CAPS

No. 55 RUBBERIZED RADIATOR CAP .30
No. 57 GENUINE RUBBER TOP RAD. CAP. .40

BRASS T-HANDLE RADIATOR CAP .40

No. 20 PRESSED STEEL HUB CAP WRENCH -.15

No. 21 COMBINATION MALLEABLE IRON WRENCH .30

FORD HUB-CAP
BRASS .25
N.P. - .30
BLACK .25

No. 312 CUT-OUT 1½" PIPE COMPLETE OUTFIT 1.00

No. 400 REAR TIRE HOLDER FOR FORD TOURING CARS 3.00

BALL RACES - BUSHINGS - CONES - HUBS

BALL RACES
FORD - 2804 - .10
2805 - .15

RETAINERS
2806 - .03
2807 - .05

REAR HUB ASSEMBLY 1.50

ADJ. CONES
FORD - 2705 - .15
FORD - 2706 - .15

No. 2713 - 10 - 2714 BUSHINGS .05

STAT. CONES
FORD - 2704 - .20

FRONT HUB ASSEMBLY 2.00

ANTI-RATTLING DOOR SPRINGS .15

FENDER BRACES - BALL JOINTS SWITCH KEYS - BOLTS - ETC.

BALL & SOCKET JOINT FOR FORD .10

HOSE CLAMPS FOR RADIATOR HOSE

2⅛" HOSE CLAMP .05
2⅜" " .05

FAN BELT GUIDE .15

FENDER BRACES

No. 1 LARGE .10
No. 2 SMALL .05

BOLTS
2718
2710
No. 2710 2½ .15
No. 2718

SWITCH KEY .05

LICENSE CLAMPS FOR ALL CARS

PER PAIR .25

ANTI-RATTLING BALL SOCKETS

No. 1 STEERING ROD pair .40
No. 2 RADIUS ROD each .30

REAR AXLE TRUSS FOR FORD. MALLEABLE IRON CLAMPS & STEEL ROD Complete .75

ROBE RAILS

No. 301 SOLID - ½" - .35
No. 303 HOLLOW - ⅝ .60

ANTI RATTLING BRAKE ROD SUPPORTS PER PAIR - .60

E. EDELMANN & CO. - 341-361 E. Ohio St. - Chicago, U.S.A.

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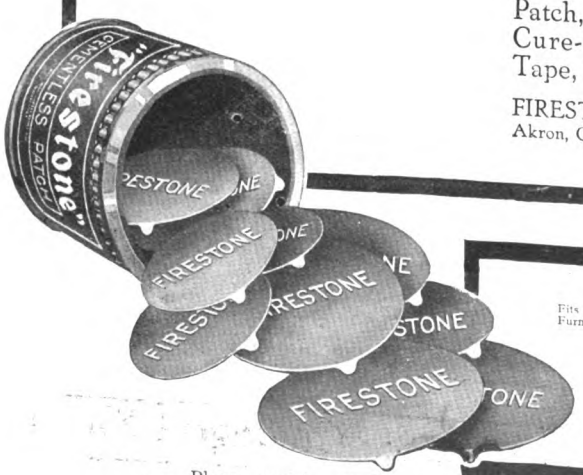
Firestone
ACCESSORIES

Quick Repair Gets You There!

QUICK aid when you must get there on time. The Firestone Hook-On Boot fits either straight side or clincher tires. Hook it on, inflate the tire and you are on your way. The boot will carry you home. It is another one of the little things that meet emergencies, included in the line of Firestone Accessories.

Motoring helps that genuinely help, including, as well as the Firestone Hook-On or Lace-On Boot, the Firestone Blow-Out Patch, Firestone Tube Patches, Firestone Cure-Cut, Air Pressure Gauges, Tire Tape, Tire Mica, etc.

FIRESTONE TIRE & RUBBER COMPANY
Akron, Ohio — Branches and Dealers Everywhere



FIRESTONE
LACE-ON BOOT
Fits any style or type of tire. Furnished with extra long laces.



FIRESTONE
"CURE-CUT"
A soft, strong rubber gum for filling in tread cuts and snags.



FIRESTONE
INSIDE BLOW-OUT PATCH
Strong and reliable—holds tire securely after cut or blow-out.



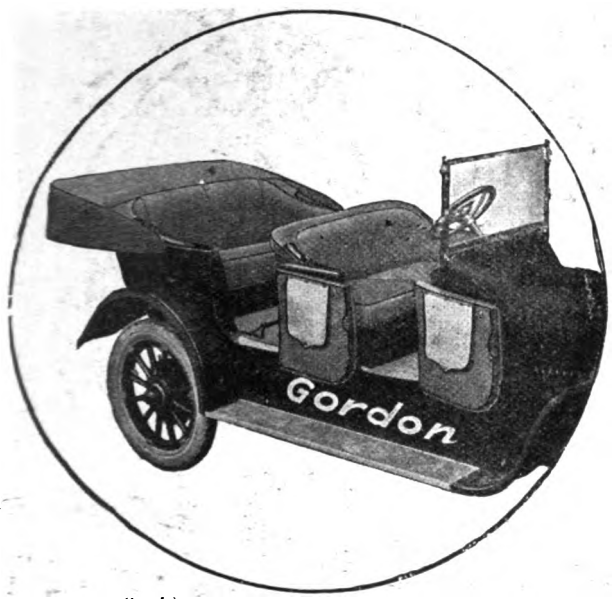
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You To Profit By Gordon National Advertising!

JUST now, at this very instant, there is being launched a National Advertising Campaign of wonderful significance to the Automobile Accessory Trade.

Its purpose is to stimulate and extend - through dealers—the sale of Gordon Automobile Fabric Specialties.

These goods are too well known to the trade to need description here; but there is need of driving home the vastly greater opportunity for profit that this advertising will bring to local dealers everywhere.



Gordon Covers are "Tailored to Fit", lie as smooth as the glove on a lady's hand.

Gordon Automobile Fabric Specialties

cover a field hardly touched by any competitor. Thousands of car owners know and profit by them; and there are still other car owners who only need the push of the advertising story to sway from a position of indifference into active buying.

Gordon Seat Covers—Top Slip Covers—Easy on Tire Covers—Radiator Robes and kindred fabric specialties, have a hold on popular approval that assures beyond question a vast increase in a volume of sales already enormous.



Gordon Easy On Tire Covers are actual Tire Insurance.

Where do you stand on this proposition?

Are you ready to put your shoulders to the wheel—as we do—and push for greater business? Nothing is gained without effort. The jobber and retailer must help as well as the manufacturer—and yet we are willing to take—and do take, the "brunt" of the burden and expense.

All we ask of you is co-operation—you doing your best in your lesser field, and we, reaching out over the whole with printed helps, trade letters, circulars and merchandising counsel.

How about it?

Will you let this golden opportunity go by, or will you "hitch your wagon to our star" and gain the profits that fall so abundantly to enthusiastic enterprise?

The J. P. Gordon Co., 306 North Fourth Street, COLUMBUS, OHIO

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DEALERS: THIS SEARCHLIGHT DELIVERS: Satisfaction to The User Business For You

VESTA WINDSHIELD SEARCHLIGHT

THE VESTA Windshield Searchlight is a powerful, versatile, sturdy lamp with a number of distinct advantages that make for both convenience and stability. We believe that it is by far the biggest lamp value on the market.

This Vesta Searchlight throws a clear beam 800 feet ahead, or in any direction. It is light, strong and easily manipulated. Can't rattle or jolt loose. Turn it in any position and *it stays put.*

The same high quality that has made Vesta Batteries and other Vesta Lighting Accessories leaders throughout the world, is embodied in the Vesta Windshield Searchlight. It is a *real* light—a glance over the list of features will convince you.

You can always depend on the Vesta to deliver *absolute satisfaction to the user.* This means *business for you.*

Find out about the Vesta Windshield Searchlight. The field is big—the profits sure and liberal. Let us send you illustrations and complete information about this lamp leader. Use the coupon.

VESTA ACCUMULATOR COMPANY, 2101 Indiana Avenue, Chicago

VESTA ACCUMULATOR CO.
2101 Indiana Avenue, Chicago, Ill.

Send me prices and complete information on the Vesta Windshield Searchlight.

Name.....

Address.....

Note These Superiorities

Cutler-Hammer Switch in Handle—Right at your finger tips. Dependable and lasting.

Machined Taper Joints—Makes easy manipulation and ability to stay put. Center piece of brass gives two perfect bearings—brass to iron. Regulation of lock nuts produces desired tension.

Malleable Bracket—Made of best malleable iron. Will bend before it will break.

Perfect Attachment—We make dozens of styles of brackets to fit different cars. In ordering mention name and model of car.

Conductor Cord—Five feet of good double conductor cord.

Hinged Doors—Hinges on both sides. No rattle—doors cannot drop off as with cheap bayonet arrangement.

Reflectors—True parabolas; heavily silver plated.

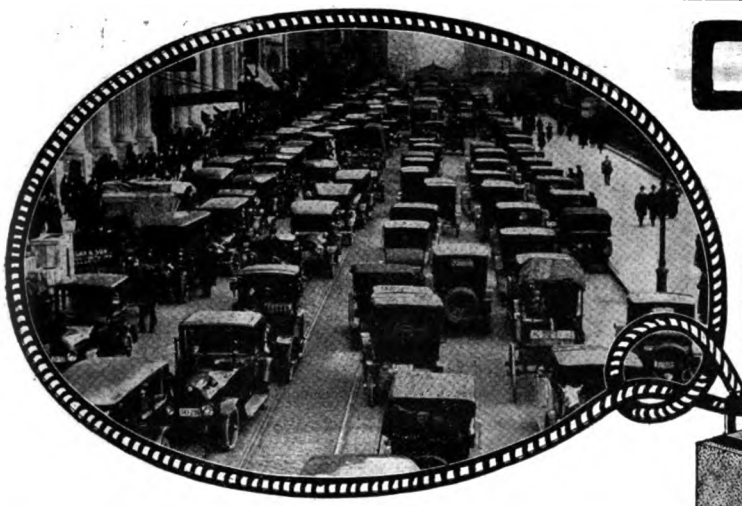
Nitrogen Bulbs—All lamps equipped with new Mazda Nitrogen filled bulbs 50% more light.

Sturdy Doors—Heavy gauge steel, insuring perfect, permanent fit.

Steel Body—Heavy gauge, cold drawn black japanned steel—lasts indefinitely.

German Silver Handle Cap—It will not tarnish.

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Corral the Battery Business



THROUGH its *double life* and remarkable all-'round superiority the Vesta is literally corraling the battery business for its dealers.

Three great triumphs—the only automobile storage battery improvements in the last twenty years—have placed the Vesta in a class by itself. The Vesta positively lasts twice as long as any other battery made. Vesta scored a great triumph with *Vesta Indestructible Isolators* which lock the plates apart and prevent short circuits.

Next Vesta announced a second remarkable feature—*Vesta Impregnated Wooden Mats* which prevent "treeing" and its disastrous consequences.

Now comes Vesta's third great improvement—*the use of Titanium,* a rare mineral which greatly prolongs the life of the battery. Titanium enters into the lead plates, hardening them and giving them longer life. It also precipitates all minerals and impurities in solution, adding vastly to the efficiency of the battery.

Every one of these discoveries is an exclusive, patented Vesta feature and can be used by no other battery. Even the use of Titanium in batteries is covered by U. S. Basic Patents belonging solely to the

VESTA
DOUBLE LIFE
STORAGE BATTERY

These three great triumphs make the Vesta last twice as long as any other battery—and longer. In service, satisfaction, economy—from any standpoint—no other battery can even compare with the Vesta. Yet the Vesta costs no more. It is easy to see that the Vesta Service Station connection is the logical battery connection for the dealer, just as the Vesta Battery is the logical battery for the motorist. Write for our Service Station Plan.

VESTA ACCUMULATOR COMPANY
2101 Indiana Ave., Chicago

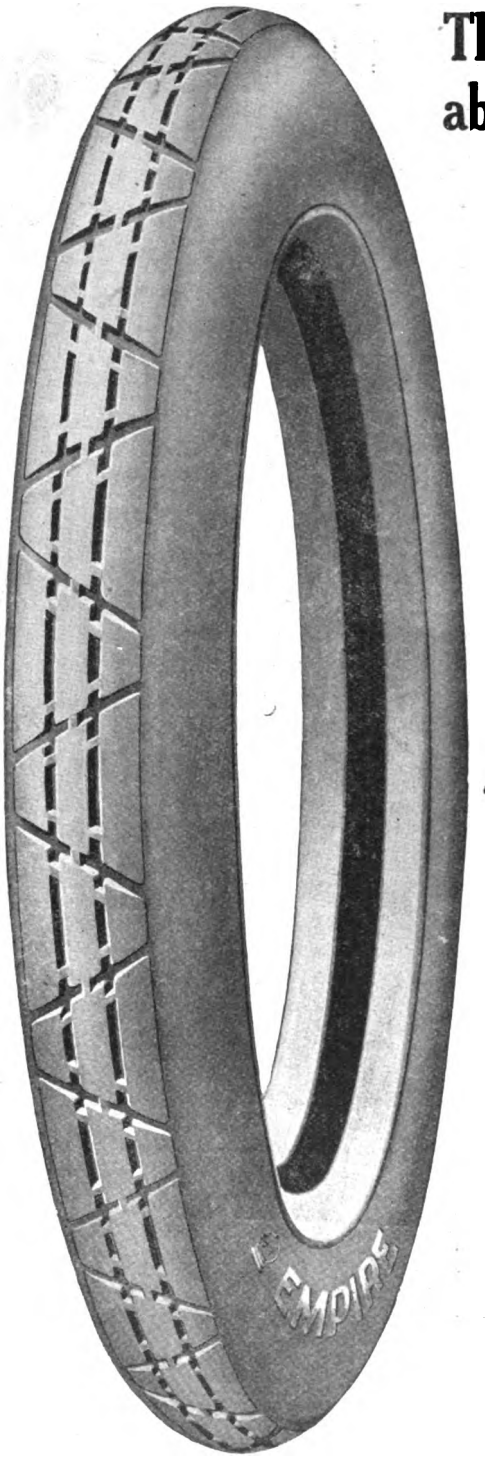
COUPON

VESTA ACCUMULATOR COMPANY
2101 Indiana Avenue, Chicago
Please send me your booklet, "BATTERIES ARE DIFFERENT," and details of your SERVICE STATION PLAN.

Name _____

Address _____

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The Two Things Most Desirable to the Dealer Selling Tires

Naturally, profit is the first consideration. But profit, however large, on a sale that does not make a satisfied customer, is not good business.

If it can be demonstrated to you that you can handle Empire Tires at a better profit to you than any tire in its class, and sell them at a price that will insure lower mileage cost to the automobilist, would you be interested? We can show just those two desirable points. There isn't a better proposition in the whole tire field than

Empire Tires

It's worth money to be the "Empire man" in your locality.

Besides giving you more profit, every Empire Tire advertises you and brings you more trade. Empire Red Tires are adjusted on the 5,000-mile basis; Empire Gray Tires on the 4,000-mile basis.

Our advertising runs in leading newspapers and magazines. Ask us to prove to you the greater dealer profit and the lower mileage cost. We have started a campaign for a few more dealers. We will protect you in a territory not now occupied. Write or wire.

EMPIRE TIRE AND RUBBER CORPORATION
Home Office and Factory, Trenton, N. J.

BRANCHES AND AGENCIES:

New York City	Philadelphia	Pittsburgh	Los Angeles	Minneapolis
Boston	Buffalo	Chicago	Detroit	Newark

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AKRON-WILLIAMS

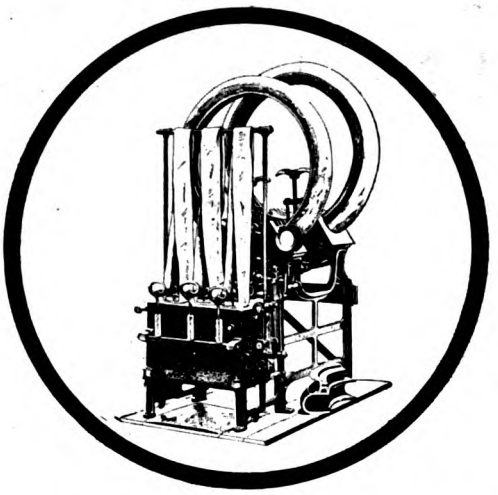


Tire Repair Equipment

Developed by the Leading Tire Companies

Each and every piece of Akron-Williams Tire Repair Equipment has been designed and brought to perfection with the active aid and co-operation of experts employed by the Akron Tire Factories — the largest in the world. These engineers work side by side with us to develop the most efficient Tire Repair Outfits, **firstly,** to use in their own factories, and, **secondly,** to sell and recommend to their dealers and agents throughout the country.

As a result, Akron-Williams Tire Repair Equipment is always the latest and most improved. The Repair Outfit we offer you is the same in every way as used, sold and recommended by more than 60 leading Tire Manufacturers.



Akron-Williams Outfits are built to make the most efficient and lasting tire repair in the shortest possible time — the kind of work that builds trade and profits. No essential tools are lacking. Nothing needless is included.

START RIGHT—WITH AKRON-WILLIAMS EQUIPMENT

More than three million cars are now in use; over a hundred million dollars is being spent this year for tire repairs. Tire repairing offers wonderful opportunities either as a separate business or a department of a garage or supply business. A few hundred dollars will start you. BUT **—your success depends absolutely upon the equipment you choose.** Start right—don't experiment—use the equipment all leading tire companies use, recommend and sell.

NOTE: We do not take any other outfits in exchange. Write for Free Booklet, "Your Share of the 100 Million Dollars."

"Everything for the Tire Repairman"

Just out—our new catalog illustrating full and complete line of tire repair machinery, equipment, tools, etc., for every size shop. Brimful of new time and labor-saving devices. Write for it today.

The Williams Foundry and Machine Co.

Glendale Street **Akron, Ohio**

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A Big Profitable Field for DEALERS

$ $ $

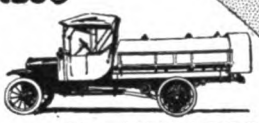
A Money-Maker Every Month of the Year—



FARM



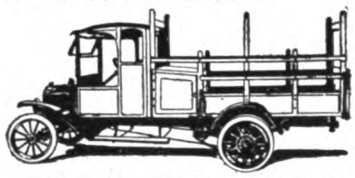
EXPRESS



OIL DEALERS



FURNITURE



CONTRACTOR



HARDWARE



LUMBER

THERE are more live prospects for the Ford-Dearborn One-Ton Truck than for any other commercial car on the market. Grocers, farmers, contractors, lumbermen, expressmen, manufacturers, truck gardeners and scores of others are *real* prospects for the Ford-Dearborn.

You can sell the Ford-Dearborn to people who would not think of paying $1,500 for a truck (the price of the average one-ton truck). The Ford-Dearborn is actually far cheaper to operate than horse and wagon and many times more satisfactory and efficient.

The Ford-Dearborn Truck is a combination of the Ford chassis and the Dearborn Unit. It has all the economy, simplicity and efficiency of the Ford — and the strength of the Dearborn.

$350 and a Ford, New or Old, Makes a

FORD-DEARBORN One Ton Truck

90 per cent of the load is carried on the sturdy rear axle and heavy truck wheels. Full 9-foot loading space; any style body can be furnished. Wheels are of heavy artillery type with guaranteed hickory spokes and felloes; tires are solid rubber. Tread is standard (56 inches) same as Ford front wheels. Baldwin roller chains and Baldwin steel sprocket.

The Dearborn Unit is make complete in our own factory and is completely guaranteed in every detail. There is no other attachment like it. Any auto mechanic can attach it to Ford chassis in a few hours time.

Find out about the DEARBORN today. Write or wire for our Dealer's Proposition with complete information on the Dearborn Unit.

Dearborn Truck Company
1252 S. Campbell Ave. Chicago

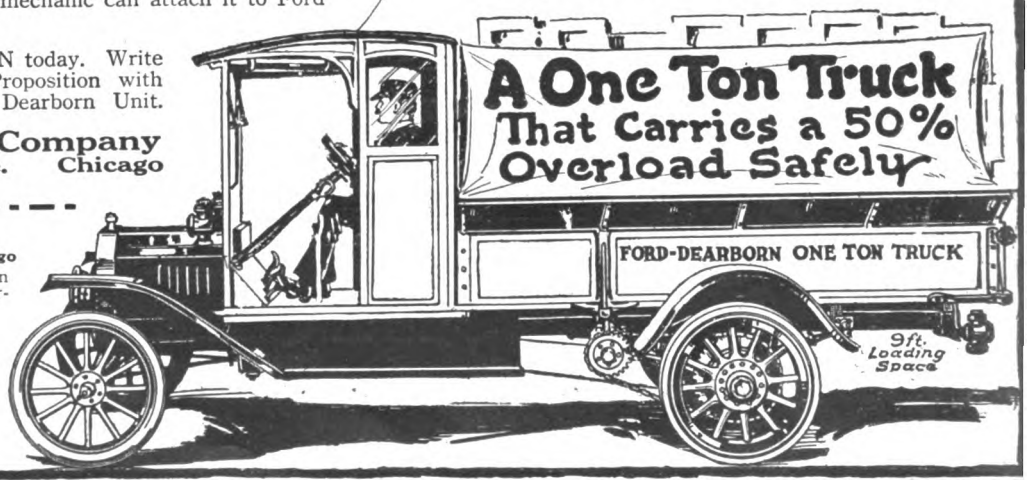
—--COUPON-—---

Dearborn Truck Co.,
1252 S. Campbell Ave., Chicago

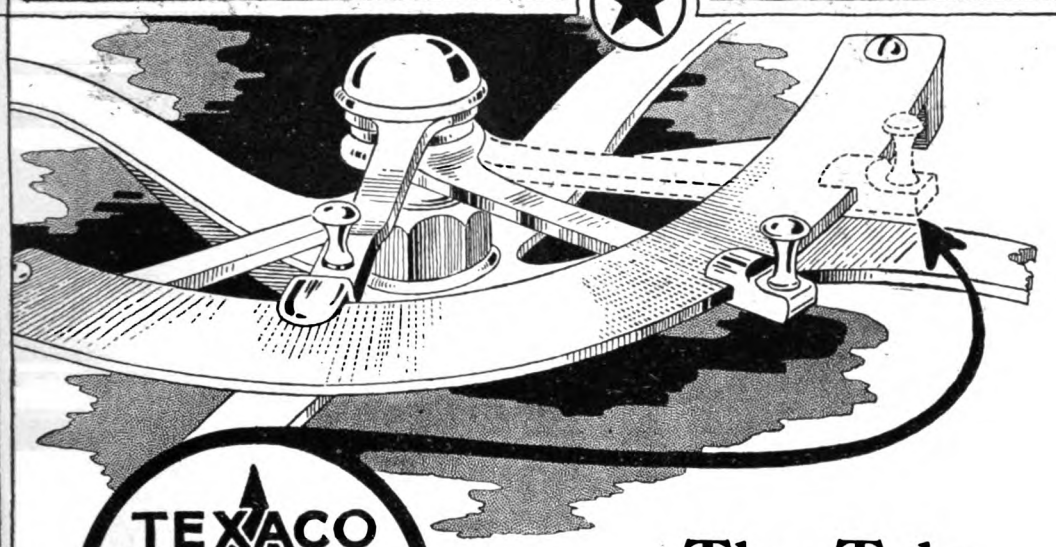
Send me your Dealer's Proposition and complete information on Dearborn Truck Unit.

Name.....

Address.....



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TEXACO

REG. U.S. PAT. OFF.

The Tale The Throttle Tells

THE throttle of your car tells an interesting tale to those who will listen—a tale of power developed, of gasoline and oil consumed.

You know that when a motor is running at its best the throttle need not be advanced so far to obtain a given speed as when the motor is not quite up to par. This means that it takes less gasoline in one case than in the other to go a given distance.

Try this simple test—mark lightly on the sector the point to which the "gas lever" must be advanced to obtain a speed of twenty miles an hour on a level road with the motor oil you are now using. Then drive over the same road at the same speed after having substituted for the old oil

TEXACO MOTOR OIL

Unless your car is one of the exceptions which help to prove all rules you will find that the lever does not reach the mark previously made. What does this show? Simply, that with Texaco Motor Oil, you are getting more power and using less gasoline.

Why does Texaco Motor Oil produce this result? For several reasons.

Texaco Motor Oil is a southern oil with an asphaltic base. It is admitted by the most eminent authorities that the hydrocarbons composing the asphaltic base oils *cannot* form hard carbon.

Texaco Motor Oil stands up well, maintains its body and lubricating qualities in use because it gives a good seal to the piston and rings and prevents leakage of gasoline into the crank case.

Because of these facts Texaco Motor Oil enables a motor to run at its highest point of efficiency, enables the gasoline to deliver its maximum power, and as a result gives high mileage.

You can judge a motor oil very fairly by its color. Compare Texaco with others. Note its clear, clean color.

When you buy motor oil buy Texaco. The best way, the safest way, is in 1 or 5 gallon cans.



THE TEXAS COMPANY

17 Battery Place New York



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1000 LOCKS in one

CASKEY-DUPREE
REG. U. S. PAT. OFF.
Thiefoil
IGNITION LOCK
"THE NATIONAL GUARDSMAN"
PAT. DEC. 24, 1912 – NOV. 11, 1913

THERE is a strong sales argument in the fact that in **Thiefoil Ignition Locks** you are selling your customers a thousand locks for the price of a single lock.

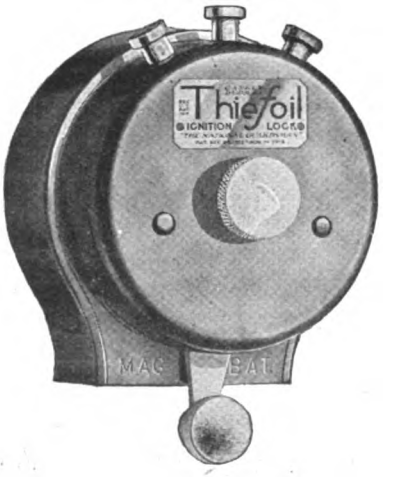
And when, in addition to this, you show him that he dispenses once for all with the bother of carrying an Ignition key for his Ford—that in this lock lies absolute safety from theft—the sale is made.

Hundreds of dealers in every section of the country rank **Thiefoil Ignition Locks** the easiest selling accessory they have ever handled.

THOUSANDS of Ford owners boost their merits---continually send new customers to the dealer who handles them.

Every assistance is offered the dealer who handles **Thiefoil Ignition Locks.** Signs, circulars, window displays, and other proven business getters are furnished absolutely free.

If you haven't already taken advantage of our offer — don't delay longer. Someone is going to sell nearly every Ford owner in your territory—the opportunity is yours. Write us today.



For Ford Cars Only Price $3.50

Easily Attached By Anyone

THE CASKEY-DUPREE MFG. CO.

MARIETTA, OHIO

Thiefoil Ignition Locks are sold by all Jobbers

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How "Dann Insert" Made Greater Tire Mileage Possible

A tire is built up by vulcanizing a number of layers of fabric together with rubber, which structure constitutes the wall of a tire.

The wall of a tire is capable of only a limited number of deflections or bends, before breaking down, and blowing out. These deflections are the result of running a tire on the road.

When a tire is subjected to continuous excessive deflection, the fabric breaks down sooner than it should; in consequence of which, the tire blows out early in its life.

There are two things in the construction of an automobile which absorb road shock, and they are

Springs and Tires

If the springs are stiff and inefficient, the burden of absorbing the majority of the road impacts falls upon the tires, and that shortens their life.

With poorly working springs, tire life is shortened to such an extent that in some cases the mileage is reduced to a half or a third of what it should be.

Spring efficiency depends on the quick sliding motion of the spring leaves upon each other. The utmost spring efficiency is obtainable by installing a lubricated bronze bearing between all the leaves from end to end.

With such bearings between the spring leaves, the springs are able to respond instantly to the slightest impact, and instead of most of the blows being absorbed by the tires, the greater portion of them are absorbed by the springs, which relieves the tires of excess strain, and results in greater tire life.

DANN INSERT will maintian spring efficiency and *can be installed in any make or model of car.* DANN INSERT will make your car ride better than it ever rode before. We guarantee easy riding—or your money back.

DANN INSERT brings every spring into perfect action, because *you install it between all the leaves in all of the springs from end to end.*

The best proof that DANN INSERT increases tire life, and saves its cost by the increased mileage on two tires alone, is the fact that DANN INSERT dealers themselves give an extra guarantee of 1500 miles on a standard make of new tire properly registered with them, and used on a car equipped with DANN INSERT.

There is no guesswork about the 1500 extra mile guarantee. It is given to you in writing, and we challenge any one to show that DANN INSERT does not save its cost quickly by increased tire mileage. Every one who has DANN INSERT in the springs of his car is entitled to register his new tires without extra cost, and receive the written guarantee of 1500 extra miles.

DANN INSERT never fails to get a result. There is no uncertainty in its action. There is no guesswork about what it does.

Every dealer that is not handling DANN INSERT now, has an opportunity to investigate the possibility of getting the DANN INSERT Agency.

Mail This Coupon Now!

DANN INSERT is standard equipment on the following cars:

Winton—Austin—Disbrow

THE DANN PRODUCTS COMPANY

1095 East 125nd Street, Cleveland, O.

"Demand Dann Insert in the Car You Buy"

ADR 3

The Dann Products Company
1095 E. 152nd St.
Cleveland, Ohio

Please send me complete information relative to the above, as pertains to my requirements.

I am a { Car Owner. / Dealer. / Manufacturer.

Car.....

Model..... *Year*.....

Name.....

Address.....

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New York Coil Co. New York Coil Co.

STOLEN FORDS ARE NEVER FITTED WITH THE NEW YORK "SECURITY" SWITCH LOCK—PRICE $3.00



It is entirely unlike any existing device. There is no other Switch "just as good" or similar in construction. It consists of a steel plate heavily nickeled, containing a non-pickable barrel lock.

INSTALLED IN THREE MINUTES BY SIMPLY REMOVING PRESENT NAMEPLATE, AND FITTING OUR SWITCH LOCK IN ITS PLACE BY THREE SCREWS. First turn of key causes metal bars to cover screws, SECURELY LOCKING IGNITION AND PROTECTING SCREWS. Switch cannot be removed, short circuited or "beat" in any manner. **Ford Switch is not disturbed**—wires and attaching bolts remain just as they are at present. No possibility of wrong connections or difficulty of replacing bolts, screws, etc. No loose connections, bad contacts or similar troubles, often occurring when a complete new "so-called" Lock Switch is installed.

DO NOT ACCEPT AN IMITATION. THE ONE REAL SWITCH LOCK BEARS THE NAME—"NEW YORK COIL COMPANY" on barrel of Lock.
At all reliable dealers. If he offer you one "just as good" send—$3.00 direct.
Sold subject to an unconditional guarantee.

FORD CARS CAN NOW HAVE



A splendid light at medium or high speeds, and instantly operated dimmer for any speeds by using the NEW YORK "SENIOR" HEAD LIGHT CONTROLLER—PRICE $5.00.

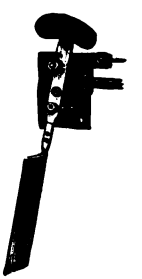
BOTH lights **ALWAYS** lit.

At 10 miles per hour, Controller supplies a better light than you now get at 20.

OPERATES ENTIRELY AUTOMATIC—without attention of the driver.

The only instrument using the regular Ford bulbs, wiring and switch, that **CAN-NOT** harm Magneto or affect ignition or horn.

IT ALSO CONTAINS A DIMMER, which is operated by a rod running through dash—a touch and you can dim in passing other cars, or in City driving, to comply with traffic regulations.



YOU KNOW the necessity of good lights especially at crossroads and other dangerous places. There is but one solution—**THE NEW YORK CONTROLLER.** It is a well-made, scientific, trouble-proof device, not a "choke" coil "transformer" or other makeshift, but is **strictly guaranteed** to do just what we claim.

$5.00 complete—You can install it in ten minutes. Send Post Office Money Order now, and have lights equal to those on the big cars.

WE ALSO SUPPLY OUR "JUNIOR" MODEL WHICH DOES NOT HAVE DIMMING ATTACHMENT, OPERATES IN THE SAME MANNER, BUT CUTS OUT RIGHT-HAND LAMP AT LOW SPEEDS, PRICE $1.75.

NEW YORK COIL CO., 338-340 Pearl Street, New York, N. Y.

GRAY-HEATH COMPANY, *Mid-West Distributors*, 1440 Michigan Ave., Chicago, Ill.

New York Coil Co. New York Coil Co.

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New York Coil Co. New York Coil Co. New York Coil Co.

A BIG HOT SPARK

IS WHAT YOUR FORD ENGINE NEEDS

After all, of what use are tight valves, high compression rings, good carburetor, etc., unless your ignition is **absolutely perfect?** Our high tension Distributor Ignition is the same type adapted and used by almost every car in the United States today. We supply Ford car owners two types. **The Rhoades' Battery Ignition**—for use with battery only (6 dry cells supply ignition for 2000 to 3000 miles), price $20.00, and the **Uni-Coil Ignition System** which is operated from the **Ford flywheel magneto** — Price $15.00—Both distribute current to the spark plugs from but **ONE** coil by means of the **high tension distributor system**—The only method that insures perfect timing, uniform spark, and complete firing of any grade of gasoline.





By eliminating the Timer and all difficulty of adjusting Virbrator cells, **your car is transformed into the big car class. Ignition troubles are forever ended.**



Perfect ignition means easy starting, more power, greater flexibility and better all around efficiency. We supply each outfit complete, cables, wire, cable carrying tube, all connected up, ready for use with diagram and instructions, so plain and easily followed up that you cannot fail to successfully install—no machine work—A pliers and screwdriver are the only tools required. **Thousands of these Systems in use for six years,** insures you against an experimental, untried product.

NEW YORK COIL CO., 338-340 Pearl Street, New York, N. Y.

GRAY-HEATH COMPANY, *Mid-West Distributors,* 1440 Michigan Ave., Chicago, Ill.

New York Coil Co. New York Coil Co. New York Coil Co.

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The Test that Showed Over 59% Greater Gasoline Mileage With the Wilmo Manifold

Scene — Lincoln Park, Chicago. Date—Thursday, January 25th, 1917. Temperature —15 above zero. Road conditions—Ice and snow. Weather—"Blizzardy."

Present—Gathering of representatives of Chicago newspapers and national automobile publications. Their attitude —"Show me."

Car used — Ford, License No. 172017, Illinois. Owner —W. T. Magrane, 5704 Washington Blvd., Chicago.

Speed of tests 20 miles an hour.

Using regular factory equipment only, 14 4-10 miles to the gallon were obtained.

Then a Wilmo Manifold was attached in a few minutes by means of an ordinary monkey-wrench.

With the Wilmo Manifold 23 miles to the gallon were obtained—a gasoline mileage increase of 59 6-10% as against the mileage made with regular equipment only.

Following right on the heels of other official tests made under the direction of L. A. Hillman, Chicago, technical representative of the American Automobile Association, and which showed an increase in gasoline mileage of 42% to 54% as a direct result of Wilmo Manifold efficiency, this "newspaper man" test has an added appeal to you as an automobile man.

Shorn of details, the Wilmo Manifold utilizes the heat of the exhaust gases to superheat and completely vaporize the incoming mixture so that every vestige of gasoline is converted into clean, full-bodied power.

And in addition, practically all carbon troubles are eliminated. The diagram below tells the story.

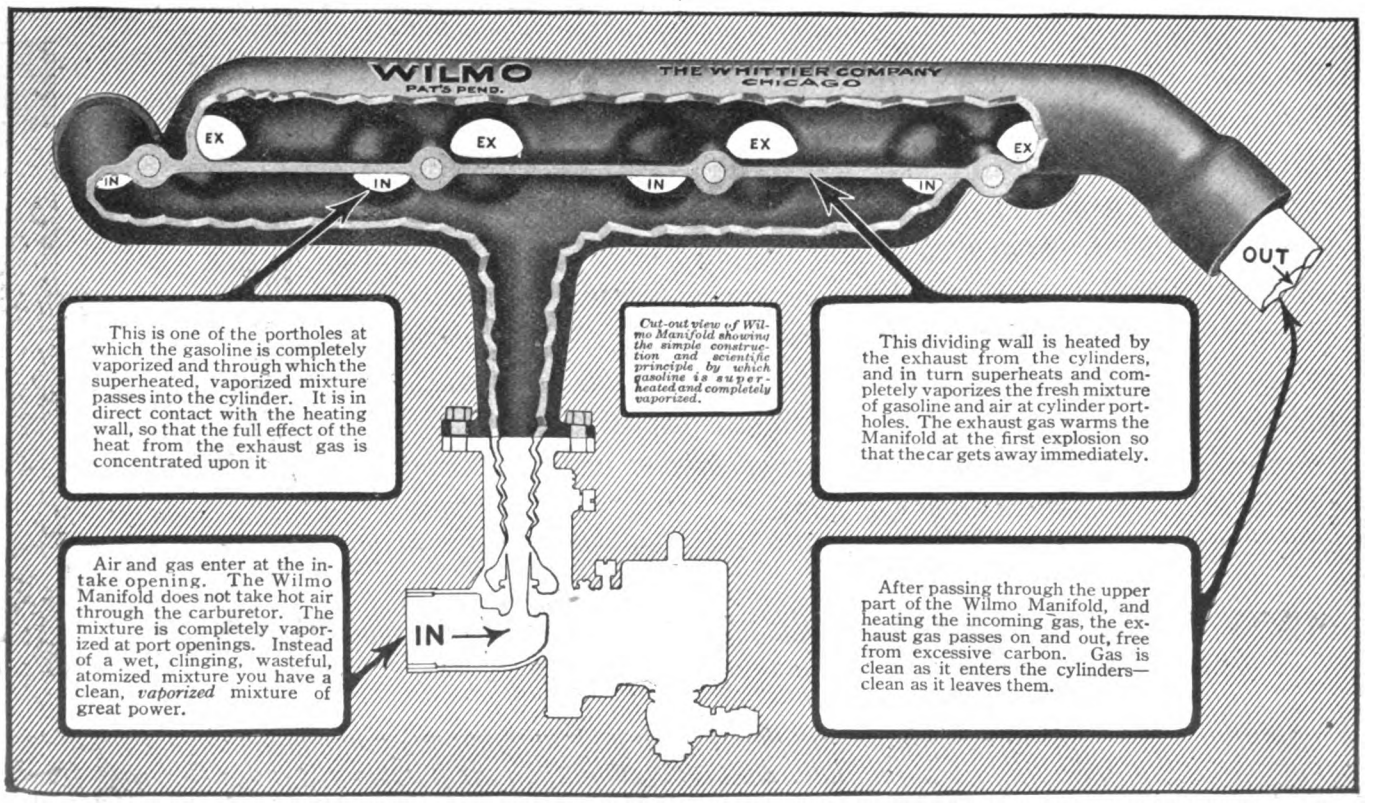
The Wilmo Manifold is being nationally advertised in the country's foremost publications. Sales are made through dealers—through *you*.

Retail prices, $7.50 to $15, depending on the make of car.

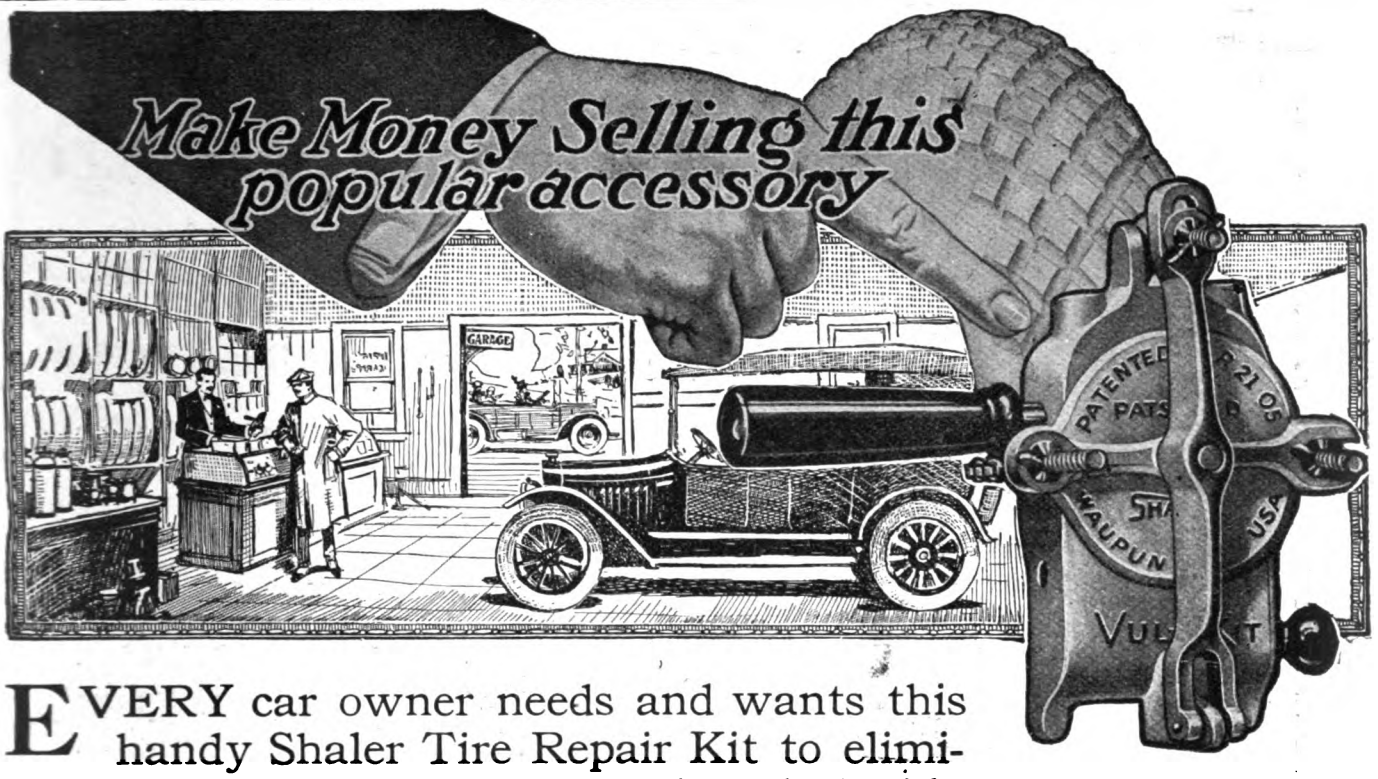
Attached to the engine in thirty minutes with a monkey-wrench. No holes to bore.

A year 'round seller. A money maker and prestige builder for you. Write today for all official tests, prices and dealer plan.

The Whittier Company
First National Bank Building, Chicago, Ill.



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EVERY car owner needs and wants this handy Shaler Tire Repair Kit to eliminate tire trouble on the road and double his mileage. It means many additional accessory sales and profits because the motorist is compelled to buy one from his dealer, as no car comes equipped with a tire-saving device. Every one of your customers is a likely prospect.

SHALER

Tire Repair Kits

For motorists to carry in their tool boxes

Each sale gives you a liberal profit on the kit itself and besides gives you a continuous permanent profit on the sale of repair material and supplies that the motorist must buy from time to time, for use on the road.

Every Shaler user praises this handy Shaler outfit when he discovers how easily and safely it works and how much tire money it saves for him.



He will praise it to his friends, which will result in more sales for you.

Because the Shaler Tire Repair Kit is such a practical, necessary accessory—especially in view of the increasing tire prices—every motorist is eventually going to buy one. And some dealer is going to make the sale. You might as well get the profit as let the next fellow have it.

The Shaler is advertised regularly throughout the season in the Saturday Evening Post and more than fifty other magazines. Motor car owners know the Shaler and call for it by name.

Write on Your Letter Head for Catalog and Dealers' Prices

Write today for complete catalog of Shaler Tire Repair Kits—dealers' discounts and full information about Dealers' Helps we furnish, including Counter Stands—Posters, Wall Hangers—Window Displays—Booklets, Circulars, Signs and Window Cards.

C. A. SHALER COMPANY

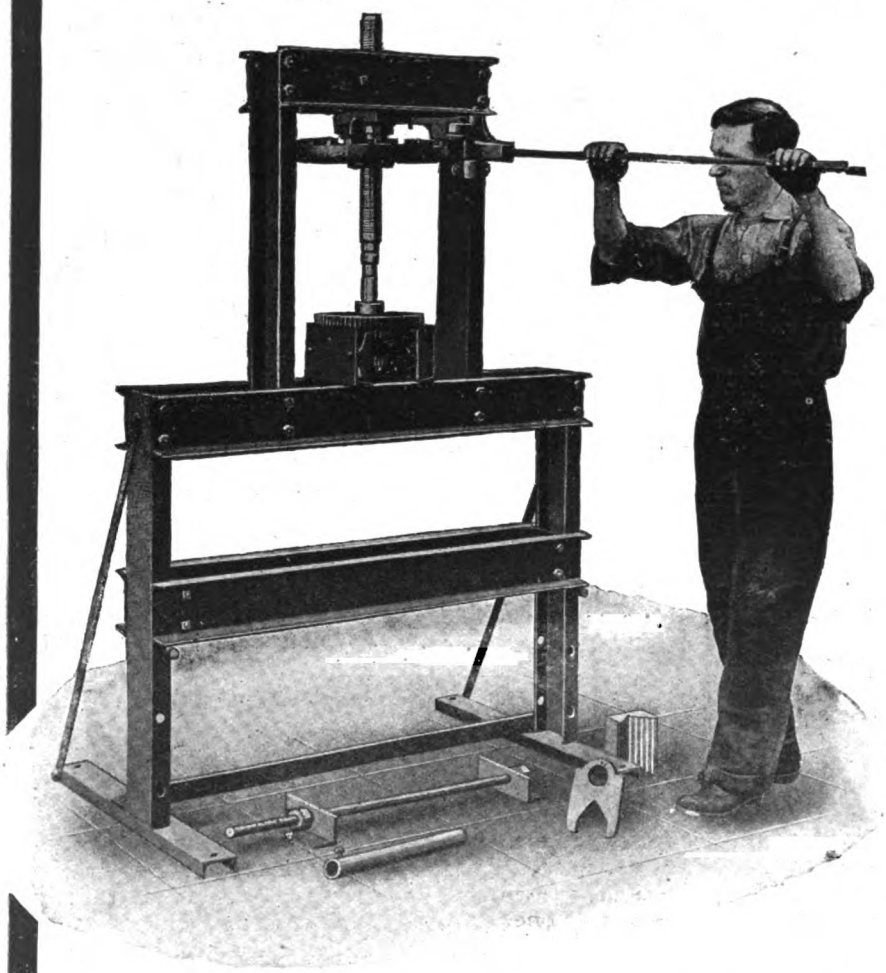
802 Fourth Street, Waupun, Wisconsin

Oldest and Largest Manufacturers of Vulcanizers

Canadian Distributors: John Millen & Son, Limited, Toronto, Winnipeg, Montreal, Vancouver

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Don't You Think You Owe It To Yourself To Buy a Press Having These Eight Essential Features



1. 42-inch Capacity so that you can handle the widest work used in automobile practice. To work on truck wheels especially, look around and satisfy yourself that you must have this clearance. Also for straightening shafts and axles this extra clearance is most valuable. It is there when you need it.

2. Two Leverages—high speed and low speed. Would you buy an automobile with only a low speed gear?

The high speed leverage of 1,000-1 is not a ratchet, but simply an extension of the 14-inch hand wheel to 80-inch by means of the lever. You can revolve the hand wheel one-half revolution almost as quickly as you can ratchet one notch in other presses, and it is, therefore, ten times quicker than a ratchet for light work. You also use this high speed leverage for quick releasing.

The low speed leverage of 2,200-5,000 to 1 is a ratchet giving you tremendous pressure for heavy work. The change from high speed to low speed leverage is made instantly by simply turning the lever around and inserting it in a socket. No bolts to remove, no time lost.

3. In this press you can straighten a frame, no matter where the bend is located, because by taking out six bolts you can get the frame under the screw at any position.

4. The screw is exposed at the top so that you can hit it a blow if 22 tons pressure alone will not start a rusted shaft or any other work, which might take 50 or 75 tons to move. This blow in connection with the 22 tons pressure will do the trick. This blow will in no way damage the press, as the whole screw mechanism was designed to take care of just this condition. The importance of this feature cannot be overestimated.

5. Lower Table instantly adjustable on pins, no bolts to remove, no danger to workman.

6. Both Tables have wide faces to properly support the work.

7. Channel Blocking properly braced (will not crush).

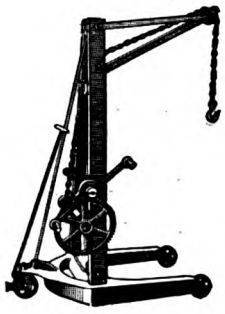
8. "V" Plate which automatically adjusts itself to fit any size shaft, arbor, bushing or hub.

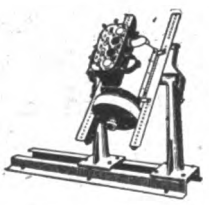
The Manley 22-Ton Universal Auto Press has all these eight features and it is the only press which has them

Price $55.00 Complete

Ask your Jobber and do not be persuaded that these features are not vital and absolutely necessary for your present and future work

Write Us At Once for Catalogue No. 32-A







Manley Garage Equipment
Will Double the Efficiency of Your Shop

Presses, Portable Cranes, Engine Stands and Portable Benches

Write for Complete Catalogue

The United Engine & Mfg. Co.
Hanover, Pa.

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In Every Overhauling Job Install

-the genuine McQUAY-NORRIS LEAK-PROOF PISTON RINGS

Whatever the size or model the motor happens to be, you can get a set of Genuine McQuay-Norris LEAK-PROOF Piston Rings of *exact* dimensions—*at once.*

Note that—*exact; at once.*

Over 250 Jobbers stretching from coast to coast carry complete service stocks. Back of them is our factory stock which comprises over 2000 different sizes of rings; over-sizes in both widths and diameters as well as standard sizes, all ready for prompt shipment.

The Genuine LEAK-PROOF Piston Rings are made only by the McQuay-Norris Manufacturing Co., St. Louis—the inventors. Known only by the makers' name. Constructed in only one way. Packed only in this special carton, under this copyrighted label; each ring separately enclosed in this sealed parchment container.

That is your protection against substitution. Accept no others.

Send for Free Booklet

"To Have and to Hold Power"—the standard handbook on gas engine compression. It shows how power depends on piston rings and why McQuay-Norris LEAK-PROOF Rings are more efficient than any others. Write Dept. R.

Manufactured by

McQuay-Norris Manufacturing Co., St. Louis, U. S. A.

BRANCH OFFICES:

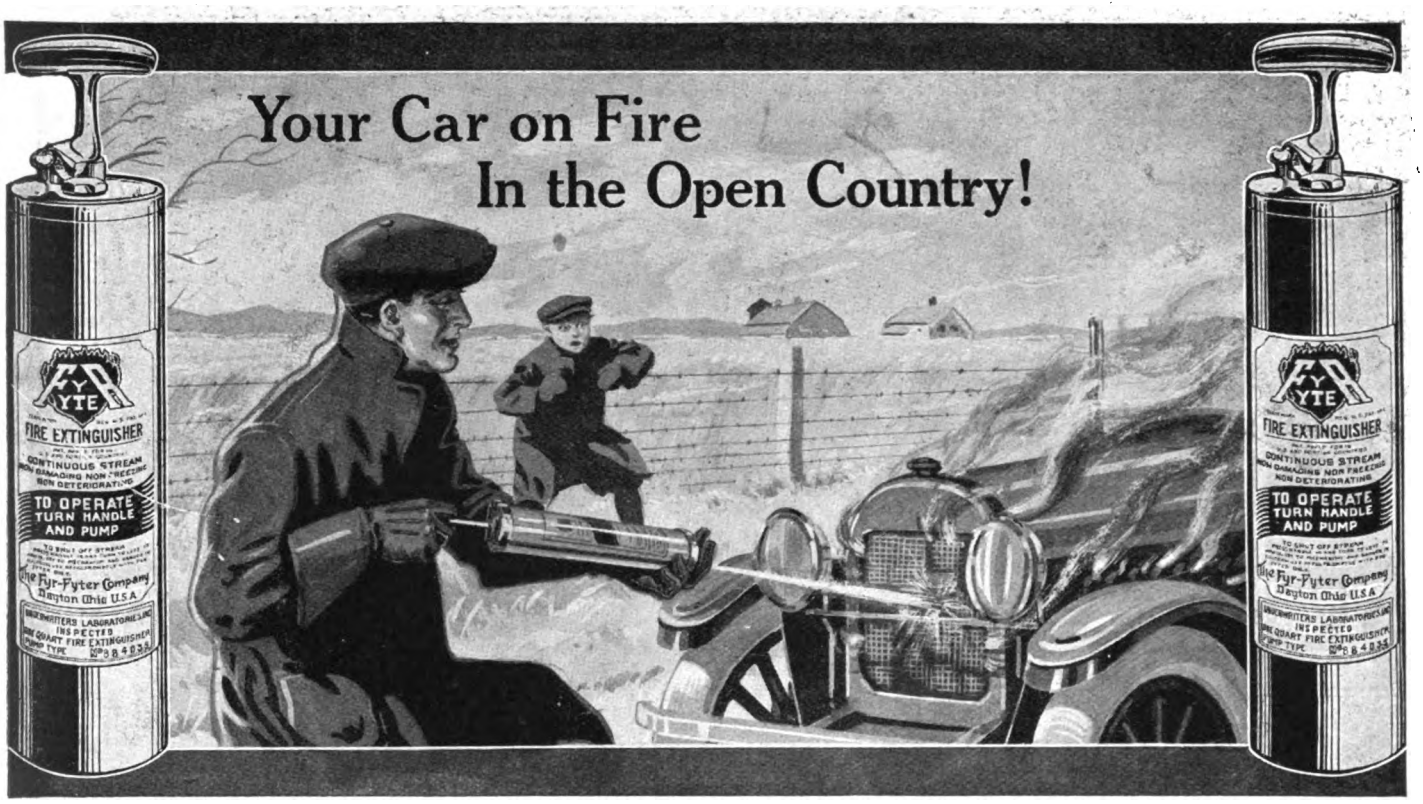
New York, Chicago, Philadelphia, Pittsburgh, San Francisco, Los Angeles, Cincinnati, Seattle, Kansas City, St. Paul, Atlanta, Denver, Dallas

Canadian Factory
W. H. Banfield & Sons, Ltd., 372 Pape Ave., Toronto



The genuine is packed this way for your protection

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IMAGINE the disheartening scene: Vacant fields, the lonesome road, a maddening wind, and your car—a small blaze scorching one side. Nearest farm house is far up the road; the blaze is spreading into flames. Helpless, powerless to act, you stand by and watch your car wither away to a mere chassis. Don't let this happen to you; prepare for it; equip with a fire protector.

Fyr-Fyter Quickly Kills Gasoline Fire

Smothers it in its infancy. At the first sign you snatch Fyr-Fyter from bracket, turn handle and pump; a few strokes and the fire is out. Always at hand, always ready, swift and sure; *Fyr-Fyter never fails.*

Fyr-Fyter shoots a straight-to-the-mark, continuous stream of fire-killing liquid 25 feet with first few strokes. No time lost under stress of excitement; pump handle unlocks to right or left. Pick-up mechanism insures discharge in any position, at any angle. Turning handle shuts off stream.

Fyr-Fyter fluid will not injure car or upholstery; contains no ingredients harmful to woodwork or fabric. Will not freeze at 50° below zero. Is non-deteriorating; effective today, effective a year from today.

Extinguisher measures 14 inches x 3 inches in diameter, and weighs seven lbs. filled. It may be recharged when supply is exhausted. Fyr-Fyter comes *guaranteed* in sealed package, with bracket ready for attachment to wall or automobile.



Underwriter's Approval Label on Each Extinguisher Allows 15% Reduction in Insurance Rates

The practical motorist will not drive unprotected; he knows fire may break out at any instant. Remember *your* fire will come without warning. Don't leave yourself open to the time-worn regret: "If I had only—."

See Your Garage Man for Demonstration Today

THE FYR-FYTER CO., 103 Patterson Bldg., DAYTON, OHIO

Garage Men

Your customers will read this advertisement. We are directing them to you for demonstration. Write for details of sales policy. *Write Today.*

Fyr-Fyter NEVER FAILS

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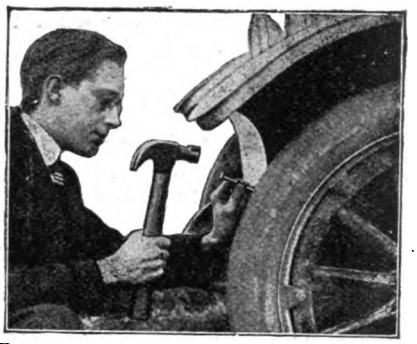


DEALERS! HERE'S PROFIT YOU NEVER HAD BEFORE

It's taken us five years to put

KOR-KER PUNCTURE CURE

on the map, but now *it's been proven a success.*



Driving Nail into Tire Treated with Korker Puncture Cure. This is the strongest proof anyone can ask and will convince the most skeptical. Try it yourself. Write for Free Test Set.



Motorists have tried Korker out and found it's *made good* under the *most severe tests.*



KORKER *seals punctures* instantly, and permanently.

It ferrets out and *stops slow leaks.*

KORKER *prevents under inflation* — you dealers know what that means to the life of a tire.



KORKER is a *preservative of rubber.*

We *guarantee* it *will not injure* tires, but on the contrary *give them longer life.*

For years men have tried to find a puncture cure — *and now we've got it.*



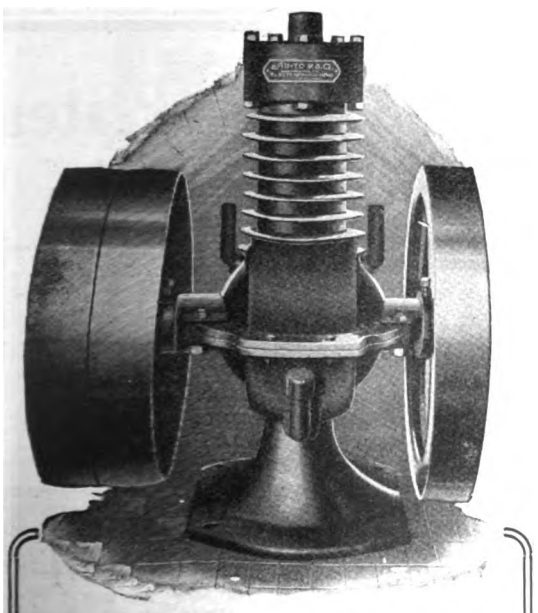
We have distributors in U. S., Canada, England, France, Russia, Norway, Sweden, Holland, Spain, Portugal, India, Egypt, S. Africa, S. America, Australia, New Zealand, Java, Philippines and Trinidad.



You can see what a sale of Korker you can make at *big, liberal profits.* But first make us prove to your satisfaction that we've got the goods. **All You've Got To Say Is, "Show Me."**

ALCEMO MFG. COMPANY, (Desk M 2) Newark, N. J.

Compressed Air *Always* on Tap!



Most any air compressor could be installed in an automobile plant, but there is only one genuine **Au-To Air Compressor.** Remember this and specify the **Au-To Air Compressor No. 0.**

ALWAYS. Not **sometimes.** Air in abundance for every requirement in garage and repair shop with plenty to spare for the man with a soggy tire. No cumbersome truck machine to drag about from place to place, but a stationary plant that occupies very little space in the cellar with pipes extending to shop and street. A dependable, year-in and year-out machine at low cost—it is the

AU-TO AIR COMPRESSOR

Small in Size but Large in Capacity

Built so sturdily that it stands up under severest service. Sold and used wherever motor cars are driven. Every **Au-To Air Compressor** is sold under rigid guarantee. We have never yet made a charge for repairs.

Furnished separately or with pressure tank, relief valve and 3-way cock.

Sold by Jobbers Everywhere—Write for Catalog

The Au-to Air Compressor Co.

SOLE MANUFACTURERS

Department 62 **Wilmington, Ohio, U. S. A.**

C. K. TURNER & SON, Export Agents, 116 Broad St., New York City

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Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

This Tirefiller is made of the finest quality of pure rubber treated under spe ial processes, never gets "flat" and will last indefinitely.

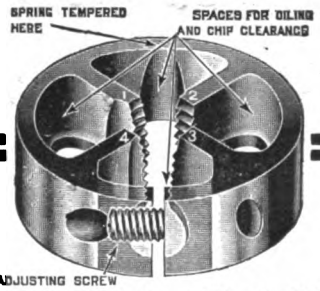
One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.

National Rubber Filler Co.

MIDLOTHIAN . . . . . TEXAS.

O. K. Dies



THE O. K. DIE—Patented Dec. 31, 1912.

and Screw Plates

Are designed to secure great strength with minimum weight. They are hammered from flat bar steel and subjected to our special hardening treatment which insures exceptional toughness and durability.

Plenty of room for oiling and chip clearance insures smooth accurate threads and ease in operation

O. K. Screw Plates are the result of forty years practical experience in making Thread Cutting Tools.

The Adjustable Guide Jaws used in these plates can be easily set by turning the cam plate to fit any size iron, thus eliminating the changing of bushings.

The Tap Wrenches are strong and durable, made from Drop Forgings of our own manufacture.

F. E. WELLS & SON CO.

GREENFIELD MASS., U. S. A.

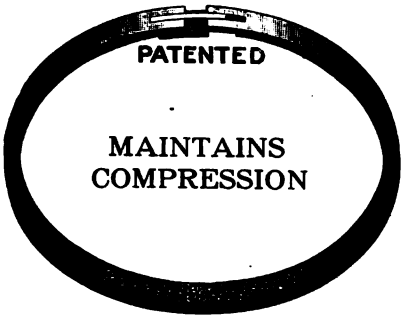
F. E. WELLS & SON COMPANY — Wells — GREENFIELD, MASS. U.S.A.

Catalog 7-A for full details.

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PEERLESS PISTON RINGS

Are the Best



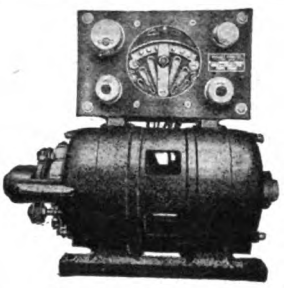
PEERLESS RINGS are similar to the standard type of rings in every respect EXCEPT—that they will not leak.

Selling them means more money to you—improves your standing with your trade and makes you a better purchasing agent for those depending on your ability and judgment.

Write today for prices and descriptive matter.

LARSON & HILKER, Distributors
19 S. La Salle Street Chicago, U. S. A.

BATTERY CHARGING RINGS BIG PROFITS



A Trenton, N. J., garage is clearing $89.00 PROFIT EACH MONTH on one HB Battery Charging Outfit, and have ordered a second machine. Charging Auto Starting and Lighting Batteries *is profitable business*—PROVIDED YOU HAVE THE RIGHT CHARGING EQUIPMENT.

The HB Charger was designed with YOUR needs in view. It will charge from one to six Auto Starting and Lighting Batteries at one time. The Average Current Cost is 15c per battery. You get from 75c to $1.50 for each battery charged. Figure your profits when you can charge six batteries on each run of the generator.

Every Auto Storage Battery needs a full charge outside the car at least once a month, as a well charged battery means—a *quick start, brilliant lights and plenty of power.* Car Owners are asking for Battery Service, and will go where they can get it.

HB Battery Charging Will Bring You a Net Profit of $20.00 to $60.00 Each Month

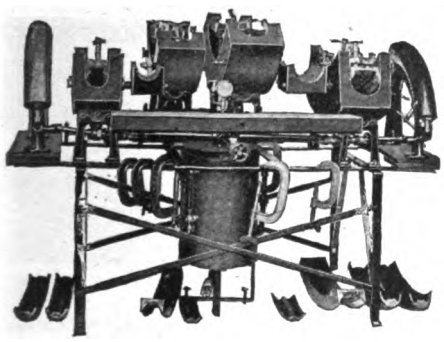
HB Users are actually clearing these profits each month. A Cuero, Texas, Garage clears $40.00—a Stromsburg, Nebr., Garage clears $54.00—Douglas, Georgia, $58.00—Topeka, Indiana, $48.75—Trenton, N. J., $89.00. These figures are actually taken from customers' letters. Names can be given, if desired.

$10.00 PLACES THIS MONEY-MAKER IN YOUR GARAGE. The balance in ten monthly payments of fourteen dollars each. Your only expense to have the HB set should be the initial payment, as your profits each month should more than take care of the small payments. Where city current is not available, we can also furnish a belt-driven outfit.

Mail this ad today with your name. We'll gladly tell you more about this money-maker. *Delays don't pay dividends.* DO IT NOW!

Hobart Brothers Company, Box 23, Troy, Ohio

Vulcanizing With A Vanderpool Vulcanizer Brings Big Profits.



3 CAVITY COMBINATION VANDERPOOL VULCANIZER

HERE is an exceptional opportunity for Garages as well as Vulcanizing Companies to secure a vulcanizer that will turn out high-grade work at a small cost. The fuel saved alone, will pay for the machine in a short time—then you will "cash in" on your investment. This plant, the *Vanderpool Vulcanizer,* is meeting with the enthusiastic approval of hundreds of satisfied users all over the country. Unsolicited testimonials from the various companies now using the *"Vanderpool"* testify to the dependability, efficiency and economy of this "Vulcanizing Wonder". One man writes that the first month's profits paid for the plant. No experience needed – we teach you how. It occupies very little floor space, and "once bought, you will never have to buy again".

Send in this ad with your name and we will mail catalogue and prices.

VANDERPOOL COMPANY,
Springfield, Ohio BOX 53



Why Are So Many Cars *Leakless?*

Largely, perhaps, because people realize the expense and annoyance of leaks. So they seek materials which will stop them.

ENDURA Sheet Packing is oil-proof, gasoline-proof, hot-and-cold-water-proof. People have found it, and are asking for it in larger quantities each year.

Do you sell it? Do you stock it? Discount sheets and a full dealer plan gladly on request. No obligation.

ENDURA Manufacturing Company
6305 Eastwick Avenue
Philadelphia, Pa.



Gentlemen:—Please send me full information on selling and stocking ENDURA. Of course this does not obligate me.

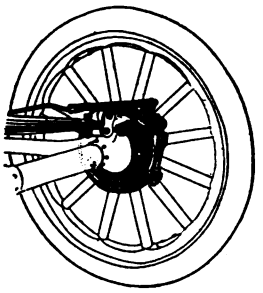
Name.....

Address.....

City.....

State.....

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The "Improved Emergency Brake"

FOR FORD CARS

An Absolute Necessity for Safety

The "Improved Emergency Brake" is a large external Brake, lined with the best of lining, fitting the drum neatly. Guaranteed to lock the wheels instantly and hold the load on any hill.

Simple to install, light in weight. Each set packed in separate cartons, making a neat shelf package and weighing less than 15 Lbs.

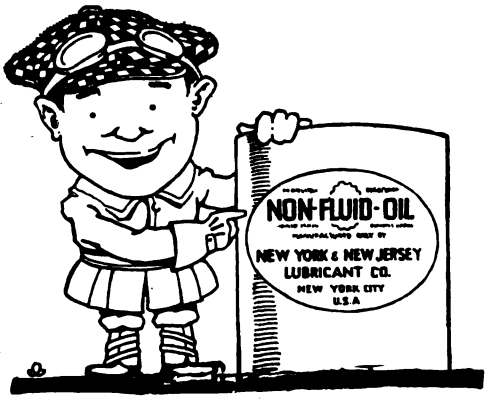
One Ford Sub-Dealer controlling only one rural township installed twelve sets last season and has ordered another twelve sets for spring shipment.

Another Ford Dealer sold twenty-one new Ford cars during December, of which nineteen went out equipped with the "Improved Emergency Brakes." What these men are doing you can do.

The price is **$10.00** installed, with a liberal profit to dealers. Do you want some of this profit? If so write for prices today.

Our co-operation from the office will sell you 25% of the Ford Owners in your district.

L. A. LEATHERS CO.,
Brookville, Pa.



"This is my Standby"

"I passed up common greases a long time ago. Haven't had a noisy, gritty gear since. NON-FLUID OIL'S my choice—*now*.

"B'lieve me, those gears and bearings work quiet, contented and happy-like, these days. Don't even hear 'em murmur."

TRADE MARK REGISTERED IN
NON-FLUID OIL
UNITED STATES PATENT OFFICE

Gets between the metal parts and *keeps* them ALWAYS apart. Never lets up lubricating because, unlike grease, it doesn't freeze. Neither does it melt and escape from where needed. With NON-FLUID OIL, gears and bearings are *always being lubricated.*

Ask your dealer for "K-00 Special" grade for gears—"K-000" grade for bearings.

Write for free booklet, "Lubrication of the Motor Car."

New York & New Jersey Lubricant Co., 165 Broadway, N.Y. City

Profitable Repair Work

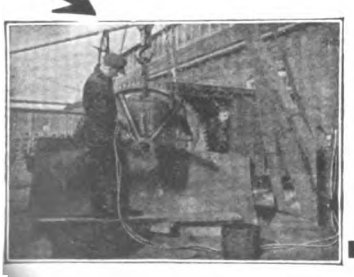
Now is the time to equip your shop so you can handle profitable repair work this season. Automobiles, tools, machinery, in fact practically all metal work can be quickly repaired by the Oxy-Acetylene process with

IMPERIAL WELDING CUTTING EQUIPMENT

A relatively small investment in one of our outfits will give you exceedingly large returns. The man in the picture received $40.00 for repairing crack in hub of large gear and saved his customer $200.00.

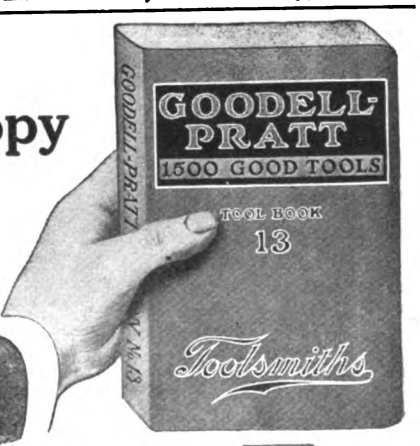
Practical Mechanics grasp the operation of the process quickly and with a little practice soon become efficient welders. Do not permit the most profitable work to go elsewhere—equip now—you will never regret it—particularly if you select an Imperial Outfit.

GET THE FACTS. *Our new illustrated catalog shows work actually done, gives cost of Operation and other valuable data. Write for copy today.*



IMPERIAL BRASS MFG. CO.,
520 So. Racine Ave.
CHICAGO

Reserve Your Copy Now



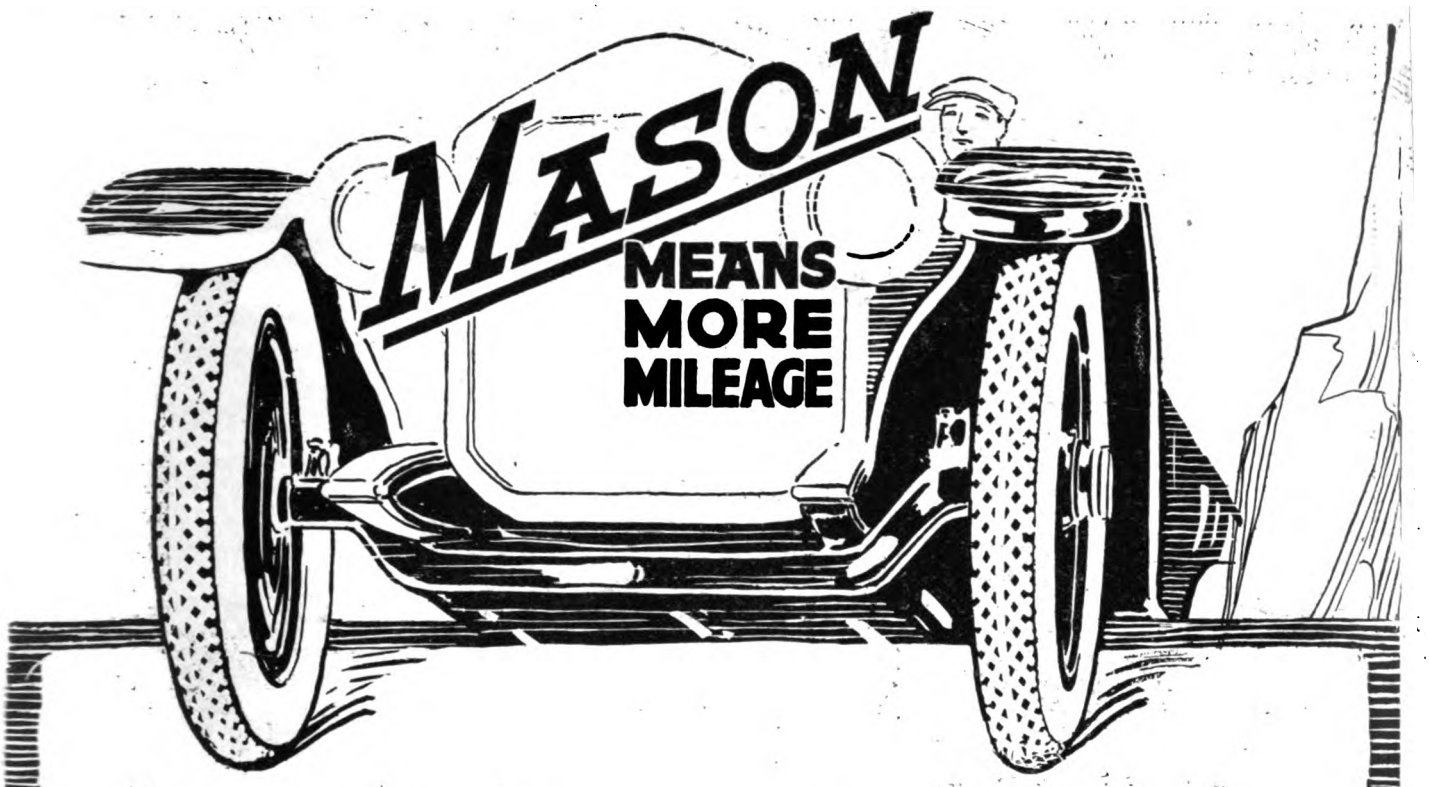
This Book

shows over 1500 Good Tools for all trades. Every garage, every repair shop and every accessory dealer should have one.

It will be issued late in March; write for your copy now.

GOODELL-PRATT COMPANY
Toolsmiths
GREENFIELD
MASS., U.S.A.

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Sturdy Quality at a Popular Price

This is the MASON story in a nutshell. MASON Tires have all the sturdiness that fine materials and skilled craftsmen can weld into the serviceable qualities that the year-in-and-year-out motorist demands.

Wherever you find MASON Tires, you find car owners thoroughly satisfied with their tire values. More—you find dealers so enthusiastic over MASON merits that they're conscientiously recommending MASON as the tire that lives up to its slogan.

You should be well acquainted with the MASON plan—you'll find it well worth while to learn something of it.

MASON is establishing its distribution firmly—a few territories that are still open offer broad opportunities.

MASON Tire and Rubber Company
Factory, Kent, Ohio

Akron suburb

Direct Factory Branches in Kansas City—Cleveland—New York

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Live dealers everywhere are getting "next" to the profits and prestige in handling "Chemically Correct"

AUTOMOBILE SPECIALTIES

Are you one of those dealers? If not, you had better hook up right now with this meritorious line of labor savers.



SE-MENT-OL

The Original Self-Acting Radiator Cement

The big leader of the "Chemically Correct" line, every item of which is just as good as Se-Ment-Ol.

Se-Ment-Ol repairs a radiator leak in ten minutes, without the aid of tools, torch or solder.

Poured into a radiator, it dissolves in the hot water and is congealed by the cool air at the edge of the leak into a permanent repair.

Drain and refill and the radiator is like new.

Se-Ment-Ol is nationally advertised.

THE NORTHWESTERN CHEMICAL CO., MARIETTA, OHIO

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING.

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AMONG INDIANA GARAGES.

The Fan Belt, Closing in New Pistons, Cylinder Head Bolts.

BY JAMES F. HOBART, M. E.

"That chap is worrying me to put on a new fan belt," said the garage man as he gathered up a small wrench and a screwdriver, and walked out of the shop. He turned back the left side of the hood, slacked away on the fan tightener, then went around the other side, raised that side of the hood and slipped the belt over one vane of the fan, then over another, and finally got the belt down beside the little belt pulley.

"Some folks," said the garage man, "make all kinds of trouble putting in a new fan belt. They take off some of the fan bearings and tear things out generally, but none of that in mine." As he talked, he poked one edge of the little belt down between the jaws of the crank clutch, and after getting the upper edge of the belt right below the jaw which chanced to lie horizontal, he pulled on the left fold of the belt just hard enough to take up the slack, then gave the starting crank a half turn, and 'squeeze' went the belt, right down between the parts of the clutch and in two seconds, it was in place on the pulley just behind the clutch. Then, the top end of the belt was brought up and the attempt made to push the belt into place upon its flanged pulley behind the fan.

"But the belt wouldn't push. The fan was lowered until its vanes touched the lower side of the fan-circle, but it was of no use. The belt was too short and had to be taken out again. This was accomplished in much the same manner that the belt was put in. Then, the left fold was caught between the clutches, this time, the right hand fold was engaged under a clutch jaw and the belt came out on the left hand side of the clutch. It was put in from the right side.

"What's the matter with that belt?" the garage man was asked. "Do they send them too short sometimes?"

"The belt's all right," was the reply. "The belt was made for a 1914 model car and this is 1916, which seems to take a longer belt." A roll of fan belting was then brought out, placed around the pulleys, marked, cut and the little belt put together with a belt hook or two, then the belt was juggled through the clutch, the fan screwed up until the belt was tight, and the job was done. Time, including the putting on and off of a belt, and the making of a new one, just twelve minutes.

Two of the pistons in a Ford car motor had become too small and made an audible noise at each revolution of the motor. Two new pistons were made and turned a few thousandths of an inch too large. Then, with the rings removed, the pistons were treated to carborundum and oil and the new pistons ground into place until they worked easily yet fitted snugly.

The cylinders were then washed well with gasoline, wiped clean, and every effort made to remove the grinding material. After it had been well cleaned out, the piston rings were put in place, the pistons inserted and connected and everything made ready for closing them in.

The mechanic found a seat on an empty box, took the head casting between his feet, the lower end resting on the floor, the top, against one shin. With a screwdriver and a small cold chisel, every bit of the inside of the casting was scraped clean. Every particle of material which was in any way loose, was rooted out of the combustion chambers. The bolt holes were cleaned out well, and the gasket surface of the casting was carefully gone over and every suspicion of foreign matter carefully scraped loose and wiped away. The threads in the spark plug holes were very carefully cleaned out and wiped.

The upper end of the cylinder block next got the "once-over". The valves had been ground in only a short time before the new pistons were inserted, so

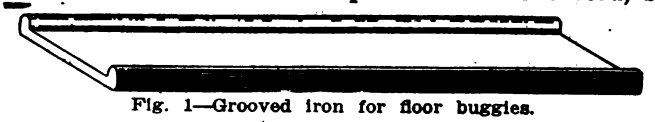


Fig. 1—Grooved iron for floor buggies.

it was not considered necessary to remove the valves and grind them in at that time. But each valve was raised and wiped clean both the valve and its seat receiving great care in this respect. To make sure that the exhaust valves were in good shape, the crank was rotated until an exhaust valve was raised, then a little carborundum and oil was daubed around the edge of the valve, the shaft cranked again, the valve tool slipped in place and the exhaust valve given several to and fro movements, after which, the valve was raised again, the abrading material cleaned off and the next exhaust valve treated in a similar manner.

The inlet valves were not given any carborundum. Only the outlet, or exhaust valves were thus treated, so that if any carborundum should get past the wipe rags and remain in any valve, it would be driven out by the exhaust and not be driven into the cylinder as would be the case were the inlet valves treated with carborundum without removing them from their cylinders. All the above was done while the engine was in place in the chassis, that is, all the valve cleaning. Even the piston fitting was done without removing the block from the automobile.

The mechanic quickly discovered that he was doing a good deal of cranking to raise each exhaust valve, lower it again, then raise and lower it a second time to remove the grinding material. Here were four valve movements, each requiring two complete revolutions of the crank. The mechanic did a

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bit of thinking, gave the crank one turn, and "buttered" the exhaust valve which opened at that revolution. Then he gave the crank one more turn, the first valve closed and another one opened. This one was "buttered," then the first valve was ground the little bit necessary. Another turn of the crank, another valve up and "buttered," the second one down and ready to be ground. In this way, by taking advantage of the valves as they came up in turn, they were all ground and cleaned with the minimum of cranking, and of course, with less time spent at the work. The mechanic next gave attention to the bolt holes in the top of the cylinder block. Each hole was carefully wiped out with a bit of rag and a small screwdriver, and every particle of loose material removed from each hole.

"Here is where I wish the shop had a compressed air service," said the mechanic as he dug out the several holes. "I have seen more than one cap bolt twisted off," the mechanic remarked, "by dirt in the holes so the bolts bottomed before they clamped the cover. They kept putting power to the bolts to stop the leak, and twisted the bolts in two without stopping the leak. Something which never will happen if they only keep the bolt holes clear."

The gasket next received a "once-over." The gasket had not been injured in opening the cylinders. It was scraped clean of every suspicion of dirt, all loose particles of fiber removed and if any bit of packing showed that it had projected past the edge of bolt hole or cylinder, that portion was carefully cut away. Some shellac, good and thick, was brushed upon the gasket to fix it solidly against the metal of the cylinders. This man took no chances that any bit of that gasket, between bolt holes, would be blown out by the terrific pressure of the ignition pressures. The shellac, baking fast to gasket and to metal, held the gasket solid as in a vise. The cover was then laid in place and all the bolts entered. Not one was screwed down, just all of them were entered a couple of threads, and the cover was lifted a couple of times after all the bolts were entered and the lifting of the cover showed that it was entirely free and did not bind against any of the bolts.

Next, all the bolts were screwed down with the fingers as far as they would go. Then, a short wrench was applied and each bolt tightened a turn. After this, they were each and all tightened another turn. During this round of the bolts, the mechanic several times cranked the engine, turning it over a couple of turns each time. He did this to ascertain if any portion of the gasket had worked its way past the edge of a cylinder and rubbed against a piston. Some mighty disagreeable knocking has been traced to a bit of gasket striking against a piston and this mechanic was taking no chances of this kind.

"I don't want to have to open this block again," he remarked, as he gave the crank still another turn to see that the pistons still ran free. And he didn't have to open it again. The engine started the second turn of the crank and ran well and smoothly. He let it run at slow speed for half an hour, then turned in the job card of that car as "completed."

Grinding-in Buick Valves.

The cylinders had been taken out and were lying on the shop floor. A box was pulled up for a seat and the mechanic sat down, pulled a block of two cylinders between his feet and began to loosen the nut ring with a punch and hammer. He did not use a round punch, that would batter the nut ring too much. He had a square punch, much like a cold chisel with the end ground off square and large enough to cover the entire surface of the notch in the nut ring. In this way, each ring was driven loose without damaging the metal in the notch to any extent. With each ring loosened and removed and thrown into the "job box" which accompanies each car while it is in this shop, a screwdriver was inserted as far down the valve spring as possible. A pry taken with the screwdriver over some convenient adjacent portion of the cylinder block, and while under strain in that manner, several light hammer blows upon the end of the valve stem soon loosened the valve cage from its seat in the cylinder block.

As each valve cage was loosened, it was removed the brass ring on top of each valve carefully removed and placed in the "job box" but each valve

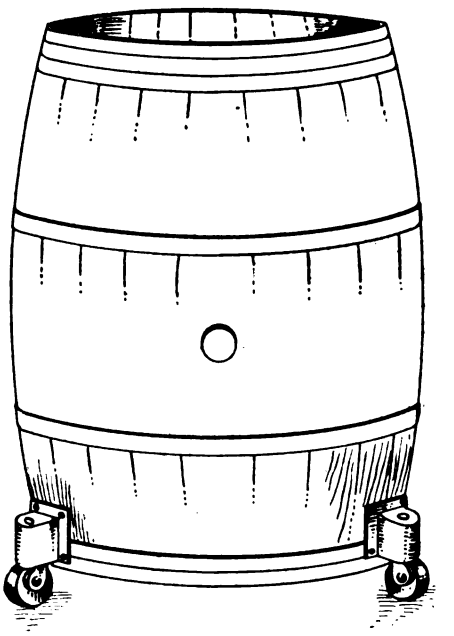


Fig. 2—Barrel Motor Bench.

was carefully set back into its own hole in the block. There was no chance of mixing up those valves and holes by taking out more than one at a time. These valves were not found in very good shape. The exhaust valves in particular were badly pitted and full of small holes. The cages, however, were in better shape, but the valves, as is usually the case, were worse than the cages. Evidently there must be a whole lot of grinding done on those valve-disks in order to bring them down smooth, and there was no lathe in the shop, otherwise the valves would be chucked and turned down a bit, which would cut out nine-tenths of the grinding.

But, although there was no lathe in this shop, the mechanic "got there" all the same, and in jig time too. He picked up an electric drill, caught it in a bench vise in such a manner that the spindle lay horizontally. Then he slipped a valve stem into the chuck of the drill, tightened the chuck and started the drill. The valve wobbled horribly. The chuck was loosened, the stem rotated a bit, chuck tightened again, and this time the valve ran as true as a die. With a mill file, the honeycomb portion of the valve was quickly cut away, and the valve went to the

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grinding nearly as true as though it had been faced up in a lathe. The valve was then ground by slipping it into its cage, catching the end of the valve stem horizontally in a bench vise, then "buttering" the valve with carborundum and oil, and moving the cage back and forth with the fingers until the valve had been brought to fit the cage in good shape.

Some of the valve-cages showed that gas had been leaking past them, while other cages showed up tight. The leaky cages were ground into their seats until there was no further opportunity for gas or anything else to get past them without going through while the valve was open.

Re-Tightening Cylinder Head Bolts.

During the grinding-in of the Buick valves, the Ford engine with the two new pistons had been running slowly and easily. After a half an hour of it, the mechanic stopped the engine and then went carefully over the bolts again. He was able to set up each one a portion of a turn by doing it while the engine was hot. The gasket was thus clamped so firmly in place that it never would blow or leak. And the shellac becoming baked, would bind it immovably in position for as long as the bolts should be allowed to stay tightened. Many a gasket has been spoiled by leaking or blowing, through not having been retightened after the engine had been well warmed up.

A Steel Floor-Buggy.

Recently, during a visit to a repair shop, I counted three wrecks of "floor-buggies" scattered around the premises. These are the little carriages with casters underneath, upon which a man can lie with more or less (probably less) ease and push himself underneath an automobile, the casters permitting the little vehicle to move in any direction.

"Something or other is all the time falling on the floor-buggies," said the owner of the shop as I was looking at a badly smashed wreck. "I am not going to buy any more of them. It don't pay. The boys can lay a tarpaulin on the floor and use that upon which to roll under a car. Meanwhile, I am getting some grooved iron and am going to make up some floor-buggies from that material."

Grooved iron, you know, is almost like a little channel bar, only not as heavy. It looks like the section shown in Fig. 1. I am just going to make up a half dozen buggies from that material, making them up exactly the same as the wooden ones. Then, if something falls on a buggy, it will not split all to thunder and be good for nothing. It may bend the thing all out of shape, but I can take the parts in the forge and straighten them out again and the buggy will be as good as new!"

"I'm not going to put a single screw into one of them, either. Everything will be riveted together, fast and strong. If I can't straighten the bars without taking them apart, then I'll cut off the rivets necessary. I won't have screws in them for the reason that tapped-in screws are always breaking off when the bars get bent up a little. And I won't have through bolts for they are forever getting loose, and when you try to tighten them, they turn around and a whole lot of time is lost for nothing. No, sir! I am going to rivet those floor buggies so they will stay put, and don't you forget it!"

A Barrel Motor Bench.

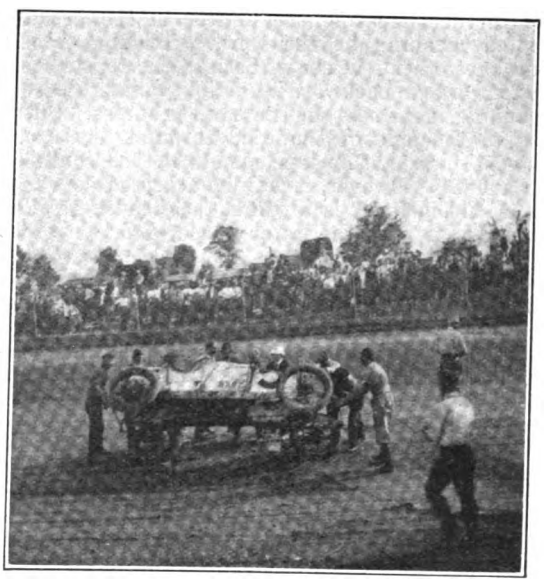
One repair shop has a couple of motor benches which take up so much room that they are seldom used. There are nice trucks under the benches, but room in that shop is at a premium and stout half barrels, like the kind used for oil, seem to make ideal supports for motors during the overhauling process. One mechanic got hold of some of the heavy side casters with 3-inch wheels and bolted them to a barrel outside of the hoops, same as shown by Fig. 2.

The rig makes a very fine bench. The projecting casters get kicked once in a while, but the casters don't seem to mind it and they do extend the wheelbase of the bench, so there is very little danger that the barrel will tip over, even when ideally supported upon three of the big casters. On a good floor, one man can easily push the barrel-bench with one hand, even when a big six-cylinder motor is perched on top thereof.

The owner of this barrel-bench says he is going to make a sort of manhole flange of 1-inch angle iron, first chance he gets, then he will cut down from the top of the bunghole, making a hole about 8 inches in diameter, reinforcing it with the "manhole" flange. Then, he says, he can keep all his tools in the bottom of the barrel and put the job box in there, too. Then he will have everything right at hand with no tools lying around on the floor.

Queer Cause of a Mishap.

From Felix J. Koch, Ohio.—Just what a small piece of rubber—so small a piece as to escape the eye of even the practiced driver of a racing auto, who knows that life or death, let alone such matter as injury, rests in his avoiding any obstacles in his way—may do toward upsetting a car, is evidenced by the accompanying photograph. It occurred at the great motor races at Cincinnati recently, in connection with the opening of the giant Speedway. The car was in charge of Gil Anderson and coming along at a winning clip. Suddenly—and before the astonished spectators could guess the reason—the car had "turned turtle" and was lying upside down.



Caused by a bit of rubber.

The next instant it was found that both Anderson

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and his colleague aboard the racer were badly injured and must be removed to the field hospital near. It was learned that the ill-starred car had hit a piece of rubber; from what other car or off just which place, could not be found. Suffice, the terrific speed of the racer could not stand even such slight deflection and it turned over, hurling both its riders beneath it and leaving them to be extricated as might be. Anderson was hurt sadly, though he has recovered and is again in prime condition. The mechanician, Shields, however, has since died of his injuries.

SKIDDING DANGERS.

The Whole Subject Treated from a Practical Standpoint.

The majority of motorists, in the course of their experience, happen upon the day in which they have a big surprise owing to the occurrence of a bad skid or sideslip. Many drivers habitually take such liberties with their car that it is frequently on the point of breaking away from its good behavior into misbehavior, being no longer able to withstand the treatment to which it is subjected. On such an occasion, if the driver experiences a bad skid, he is generally lucky if he gets out of it without harm to himself or his car.

Unfortunately, nomenclature in motoring matters is of an uncertain type, and "skidding" is generally looked upon as the correct phraseology for either a skid or a sideslip. As a matter of fact, they are quite different, but for the purpose of this article, beyond recording the inaccuracy, we will go but little further, treating the matter in the broadly accepted meaning of the word. Skidding really means the rotation of one or both of the rear wheels in a forward or backward direction, minus the corresponding movement in the car's progress. Slithering to the side of the road through any cause whatever is a sideslip, and should not be confused with a skid. However, it may be accepted as a fact that a skid in itself is a prima facie cause of sideslip, and it is with the latter phase of driving that we wish to deal.

Now, in a sideslip, which in future we will call "skidding," there is on occasion both a distinct element of danger and a distinct element of safety. In the case of a bad skid in the hands of an inexperienced driver admittedly great danger lurks. The expert, however, often employs a skid to save the situation.

Now, to those without experience, a warning may be issued that no ordinary tire can be effective in all circumstances against the possibility of bad skidding. In fact, it is both unreasonable and unmechanical even to think that it could. Given certain conditions which are frequently met with and often practiced by inexperienced drivers, a car will and must skid—so long as the laws of mechanics remain what they are.

Two Types of Skids.

In this question of skidding there are two distinct types, i. e., the front-wheel skid and the rear-wheel skid. The former one is luckily far less common than the latter type, and also much more difficult to deal with. In most cases drastic methods are needed successfully to cope with a front-wheel skid, and any driver, even the most experienced in the world, may quite reasonably be involved in an accident due to a front-wheel skid. It is often very difficult to foresee the danger spot, and some pieces of road which look quite dangerous are often found to be perfectly safe, and others, which hardly even enter into consideration from the danger point of view, are found to be veritable hotbeds of front-wheel skids.

A front-wheel skid on a dry road at an ordinary driving speed, with any type of tire, may almost be ruled out of the area of practical politics. It is, however, in the case of greasy roads where the great danger lies. Even with a nonskid tire on one of the front wheels, the writer has experienced on more than one occasion a pronounced front-wheel skid, but memory does not recall a case of such a skid with both front wheels fitted with non-skid tires, but then few cars are so equipped, and consequently one does not have much opportunity of coming across such an occurrence. A front-wheel skid, even under such circumstances, is conceivable.

The Front-Wheel Skid.

Suppose that one is following a vehicle at, say, 15 miles per hour on a street in town, and that for some reason the bus applies its brake so suddenly

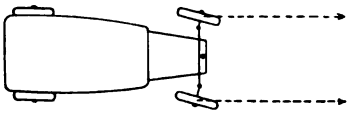


Fig. 1.—A front-wheel skid—car refuses to answer to the helm.

that one would have to swerve out in order to avoid running into it. Naturally one steers fairly quickly to the left, but if—to one's utter consternation—the car goes along in a perfectly straight line, taking no notice whatsoever of the steering gear, that is a front-wheel skid. Such occurrences usually happen on a well cambered road with a greasy surface, more especially if one has not got a non-skid tire on one of the front wheels. In such an eventuality it is hard to lay down a definite rule; in fact, it is not over easy to give any advice. Obviously, if there is time to stop by a violent application of the brake (which one would not have indulged in otherwise), by all means stop. Failing this, endeavor to remember (if conscious of the fact that the amount which the steering wheel has been turned would be sufficient to clear the vehicle in front under normal conditions) not to increase the lock, as this will in some cases make matters worse.

As already stated, it is not a subject upon which it is easy to give advice. The writer, however, has frequently experimented on greasy roads with imaginary obstacles and put certain theories to practical test, and has often been rewarded with success. The following three propositions are given in the order in which the writer would try them if faced in practice with a front-wheel skid under the circumstances which have been alluded to.

In the first place try a fairly quick "dab" with the brake, which has the effect of momentarily increasing the adhesion of the front wheels, by piling up the weight of the car on them, which may give them sufficient adhesion to commence the desired direction.

First of all, declutch; then race the engine and slam the clutch in for a second with a jerk, and

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then take it out again. The effect caused here is a lifting effort on the back of the car, thus increasing the weight on the front wheels. This will probably cause the rear wheels of the car to skid a little to the right and so bring them more or less in a parellel line with the front wheels, and then on driving under power the direction may be picked up with less likelihood of the skid continuing.

The final resort is one which the writer was forced to employ quite recently: Lock the front wheels full over to the left, leave the clutch in and

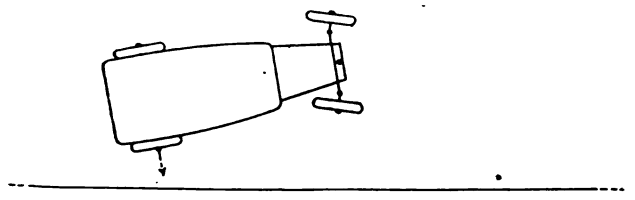


Fig. 2.—Rear-wheel skid.

give the brake a fierce bang, but holding it down for a sufficient length of time to cause the car to turn completely round. Just when the back of the car is beginning to face where the front was when the manoeuvre was started, let the brake off and also declutch and slow down gradually with the brake, when the control of the direction of the car has been regained.

These suggestions are not put forward as part and parcel of ordinary routine driving, but they should be carried at the back of the mind and held in readiness for any occasion where the driver is suddenly confronted with an almost impossible situation, when the car refuses to acknowledge control through the steering gear. Prevention is, therefore, better than cure, and one steel-studded non-skid tire on the off front wheel, maintained in a reasonable state of efficiency so far as the studs are concerned, is enough to guard against the trouble in the large majority of circumstances.

When taking a right-angle turn on a greasy (greasy—not merely wet) road, always exercise a certain amount of care in case a front-wheel skid should develop when part of the turn is made, and, speaking in general terms, learn to have a regard

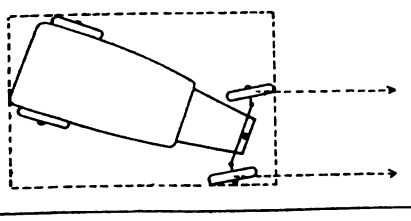


Fig. 3.—Car proceeding crab fashion. Note that in this case the car occupies much greater space than it would normally.

for the steering gear when on greasy roads, more especially if both the front tires are of the plain rubber type.

Another point which should be remembered is not to adopt that common phase of bad driving, overtaking a vehicle at a good speed in a direct line behind it, and only starting to steer out at the last moment. Start to get to the offside of the vehicle which it is desired to overtake in good time, and then, even if a front-wheel skid should occur, there is plenty of time to correct it.

Rear-Wheel Skids.

As already indicated, this type of skid is far more frequent, and luckily it is also far more easily corrected. So long as both rear wheels are driving equally (we are referring to skids caused by progression) all goes well. If, however, from any cause whatsoever, such as sudden acceleration or a difference in the road surface, one wheel suddenly starts to revolve at a speed considerably in excess of the rate of progression of the car, then certain circumstances are set up which render the vehicle susceptible to rear-wheel skidding.

On consideration, it is seen that, with the wheel spinning round faster than the car's progres, the adhesion between the wheel in question and the road surface is less than it is at normal times, and consequently the car is more susceptible to a lateral thrust, or, more likely to slide down a camber of the road.

Opinions rather differ as to the precise cause of this type of rear-wheel skid, many people holding that it is due to a lateral thrust at the back of the car caused through engine acceleration, others thinking that it is due to a slight touch of the brake or some variation in the steering, or, yet again, some combination of the three. The slightest suspicion of lateral thrust at the back of the car, no matter how generated, is sufficient, if one of the wheels is revolving faster than the relative progress of the car, to render the vehicle susceptible to rear-wheel skidding.

For instance, the mere fact of letting in the clutch suddenly has some small effect upon the steering gear, and the after effects of this are especially noticeable if the road has a decided camber. If it should be the near side road wheel which is revolving at a greater speed than the relative progress of the car, or if the tires should be under inflated, then the conditions are still further aggravated.

It must also be remembered, in this connection, that a considerable camber on the road may have the effect of altering the adjustment of the cables controlling the rear-wheel brakes, so that a slight brake application may be brought into being quite apart from the intention of the driver.

Still other causes which are helpful to rear-wheel skids are such things as the distribution of the weight of the people and load carried. For instance, if the greater portion of the weight is not in the central axis of the car; or, yet again, if both wheels are revolving too fast on a slippery surface, and the surface under one wheel is more slippery than under the other.

If from any of these various causes or from any other cause, when one is driving along and the car begins to skid at the back to the driver's left, then he must do exactly what he probably feels inclined not to do, that is to say, steer to the left: in other words, in exactly the same direction as he is skidding, and towards the spot from which he is anxious to get away. As he does so he must dab on the brake, which has the effect, in the first place, of piling up an extra proportion of the weight of the car on to the front wheels, and so increasing their adhesion, and then through their angular setting they convey a counterbalancing thrust, tending to thrust the rear of the car back again from the direction in which it was going.

Sometimes, on very greasy roads with much camber, one finds it practically impossible to maintain a straight line of progress for the car, and it is only possible to get along in a crab-wise manner. On

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such occasions one must steer a little bit to the left, and if even this is not sufficient to keep the car going in the direction in which it is intended to take, the brake must be "dabbed" frequently, though gently, even against the power of the engine. Quite gentle brake application is enough, but of course even this should not be used against the engine unless it is impossible to get along otherwise.

These notes may be said to cover rear-wheel skids caused simply by circumstances connected with the car's progression, and there remains for consideration the question of controlling a skid which one causes by applying the brake rather more suddenly than anticipated.

Other Types of Skids.

The writer, many years ago, took out an old chassis on to a lonely country road and experimented assiduously, and, selecting a nice greasy part, spent a considerable time in studying skids of various types and learning how to control them. It must be remembered, in all seriousness, that, whereas the skidding of a car in the hands of a novice or an insufficiently experienced driver is a source of danger to himself, his car, and other folk, the knowledge how to skid a car wilfully and how

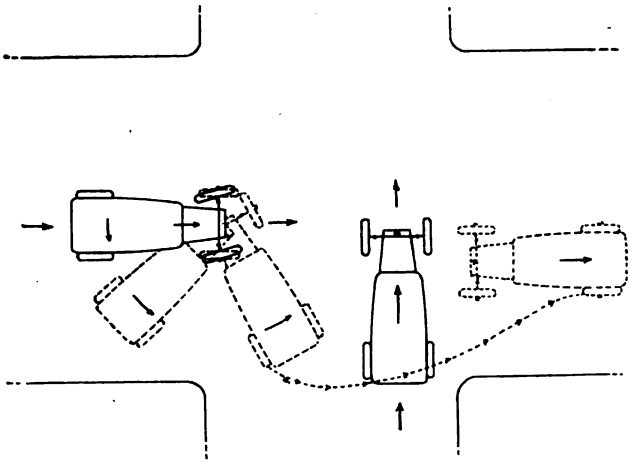


Fig. 4.—Example of skidding car round.

to control its skidding is, in the hands of an expert, very valuable knowledge; in fact, on some occasions, it is the one and only available means of safety.

Consequently, therefore, although in plain black and white the information to be imparted may look a trifle extravagant, the writer would nevertheless suggest that those who are not au fait with the subject should seek an opportunity of learning by practical experiment.

Sometimes when traveling at a good speed where one imagines everything to be clear, and it is suddenly found necessary to put on the brake very much quicker than it is ever anticipated (either on a greasy road or dry road), a good driver will perhaps have as many as half a dozen of these corrected skids, taking off and replacing the brake in exactly the right order in each one, carefully preventing the car from getting out of control beyond a swing of perhaps a yard or so.

It must be remembered in this connection that the highest braking efficiency of a car is never obtained by having locked wheels, and unless the driver is thoroughly experienced and collected in his control of the car in a case of emergency he is inclined to think that he has done everything possible by putting the brake on to its full extent. Such an assumption, however, is quite erroneous. A series of dabs, each one tending to cause a skid which is corrected by steering against it, then straight again for the fraction of a second, another dab of the brake and another skid and so on, is very much more efficient as the quickest means of reducing the speed of the car.

A thoroughly capable driver—on a car which he knows—will, in cases of emergency in traffic driving, frequently execute such a manoeuvre and skid his car within a few inches of the traffic at his side, and yet what looks like a lucky escape from a collision is neither more nor less than a perfectly executed scientific movement.

There are also some occasions when racing the engine and letting the clutch in suddenly may be brought to the aid of the aforementioned movement actually to cause a skid, but that is getting rather beyond the limits of any except the most expert drivers, and consequently it will be as well perhaps not to pursue the subject further.

Once again, it is well to point out that the information given is not intended to be used as an ordinary driving proposition, but at the same time it is seriously suggested to the reader that a knowledge of the manner of controlling a skid of the rear wheels is an item of information with which he ought to be acquainted. Even with a careful driver, every now and then occasions crop up where a sudden brake application is necessitated through the unanticipated action of a third party, and then a skid of the rear wheels is a very likely sequence. It is, therefore, well to know how to control such a skid, and to take full advantage of the possibilities which it carries with it. A lack of knowledge may mean dashing one's wheel against the curbstone and perhaps breaking it, or at any rate putting it out of truth, damaging the wheel against the side of some other vehicle, or even running into some person, and in the face of all, greater braking effect can be obtained by controlling this skidding, whilst probably avoiding the hypothetical damage mentioned.

Skidding for Safety.

It is only after some little deliberation that it is deemed advisable to deal with this subject, as in the eyes of some readers it might appear in an exactly opposite sense to that in which it is intended to be taken. The last thing the writer wishes to do is to lead any driver to start taking right-angle corners or sharp bends by skidding round them, or, on the other hand, to turn round in the road ready to go back in the direction from which he has come by means of "waltzing" his car round. Such maneouvres should never be carried out or attempted except in a case of emergency where no other conceivable means can secure safety.

One night, then, returning very late from the office and in a hurry to get home, and anticipating no cross-traffic, a corner was being taken at a speed which was perhaps rather in excess of what one should do, even at an hour when practically no traffic was about. When well up to this corner, a huge mail car appeared, apparently acting under similar ideas, though as it was coming from a side street and crossing the writer's car, which was on the

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main road—well, the question of blame is not material to the situation.

The fact remains that it was a situation in which it would have been absolutely impossible to avoid a collision in any other way than that adopted. Neither car could have stopped sufficiently to have allowed the other to pass, and the only possible solution was to turn the car completely round in the hope that the time so taken up before continuing in the same direction, though backwards, would be sufficient to enable the mail van to cross out of the way. Luckily the driver did the only thing which he could do, and swerved as far as was possible to the right. The writer put the front wheels sharp to full lock, jammed on the foot brake with the clutch in, the car becoming stationary for a moment while the back swung round and faced in the opposite direction, and then, of course, continued on its way, being steered to the near side of the road away from the van. By a combination of luck and skill no damage whatsoever occurred to either car, and all that remained was to turn round again and to continue, giving a little more regard,

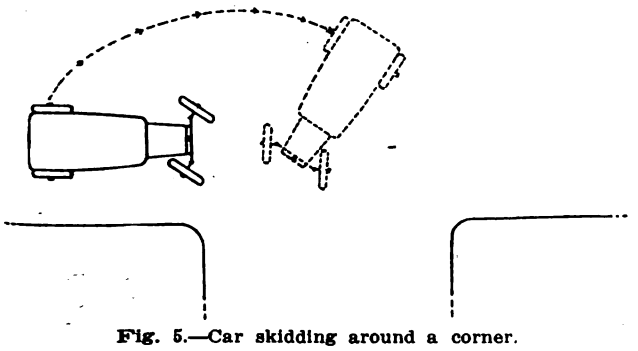


Fig. 5.—Car skidding around a corner.

however, for cross-traffic—however improbable—at the other crossroads.

The manoeuvre executed may be gathered from the illustration given. In some cross-road encounters of this nature it is possible to swerve behind the other vehicle, or sometimes to swerve out in front of it, and take the other side of the road, but it is a matter of the merest fraction of a second which is allowable to make up one's mind whether cases, it is absolutely impossible, and neither by braking and steering to the rear of the other vehicle, nor by accelerating in front of it, can a collision be avoided. In such cases, the one and only hope for safety lies in taking advantage of the fraction of time gained by making the car turn round on its own axis as it were, that moment of time allowing the other vehicle to proceed out of the danger zone.

Corner Work.

Another part of the art of skidding which may be considered is one which with good driving should not really need mention, and that is the situation where one is confronted with a right-hand turn or a sharp bend when traveling at a speed too great to take it by ordinary steering methods without a distinct risk of either overturning the car or slithering into the bank. A large number of accidents, however, have been caused through this bad driving, generally at night where the road suddenly appears to end abruptly, and a sharp corner or quick bend is encountered. As before stated, such a situation should never be encountered unwittingly, as it is nothing but rank bad driving so to do, and such turns should only be met with intentionally in racing.

However, if such a situation does confront one, and it is seen that to take the corner merely by steering round it is going to overturn the car or slither it into the near side of the road, then, instead of taking the corner by steering around it, one can do it with perfect success by skidding it in the following manner:

In the first place, there will, of course, even in the most flagrant case of bad driving, be a second or two to spare between the time when the driver is suddenly aware of the fact that he has to negotiate a corner at greater speed than he is able, and the time when he has actually to do so. This time should be employed in brake application and with deceleration of the engine but not declutching. The brake must not be applied to such an extent as to lose control over the precise direction of the car. Head the car directly at the near-side corner, and just as the front wheels arrive there set the steering wheels to steer round the corner, firmly dab on the brake (which will cause the back of the car to swing round), and the instant the back wheels are approximately parallel with the front wheels accelerate to the utmost. Sometimes it is necessary to make a dive for the offside of the road into which one has thus turned, waiting until the last moment to correct this direction into a straight line up the road. The latter part of the manoeuvre is, of course, to counterbalance the after effects of the skid, and a corner can be taken at greater speed if this movement is adopted than by the former part of the manoeuvre only.

There is another situation which has likewise caused a number of accidents, that is, where the driver is foolishly driving at too high a speed for the distance of clear road actually under his observation, and is then encountered with something which directly blocks up the road, as, for instance, a tree blown down or some other obstruction. In such cases, if it is impossible to stop by brake application in the ordinary way, safety may be ensured by turning the car round completely in the road and advancing backwards as before described, and then turning it round again from backwards to forwards, and continuing in the ordinary way. The side slithering of the tires in these two manoeuvres has a very great braking effect. Here, again, nothing but rank bad driving or inordinate stupidity by some third party should bring into being the necessity for such an action. To some readers it may even sound a little fantastic, but some very bad accidents could have been avoided if the drivers had known how to do it.

It is certainly preferable for all to go on the assumption that prevention is better than cure; in other words, always drive carefully, and, so far as it is humanly possible, avoid the necessity for such drastic action.

With regard to the question of skids in general, many people consider that the higher the speed of the car the quicker the tendency to sideslip. They may be correct in this opinion, but the writer does not personally agree with it to the full. For a sudden brake application he is inclined to think that the rear wheels slip more readily at moderately slow speeds than at high speeds, though conversely there is no doubt that the front wheels will skid more

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easily at high speeds than at slow speeds. In conclusion, it must once again be pointed out most distinctly that these manoeuvres are mentioned solely to provide the knowledge of how to act in such cases, and are not in the slightest shape or form intended to constitute a part of the daily curriculum of the average driver.

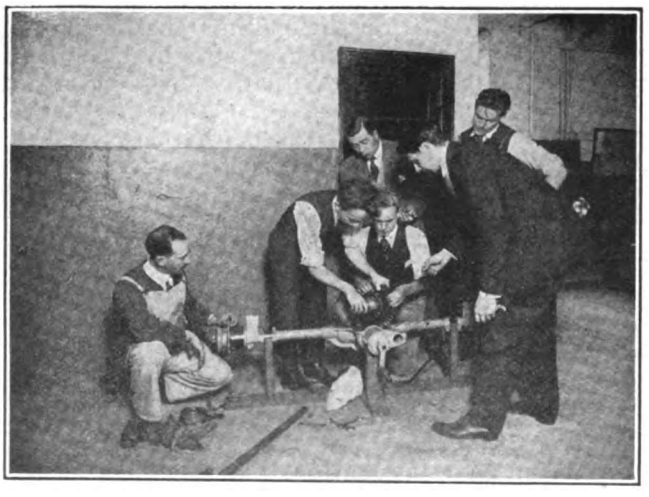
HOW TO SHOFE.

Methods of Teaching in the Largest and Oldest Automobile School in the World.

From Charles A. Starr, New York.—When a certain character of history, long touted as being the wisest guy ever, uttered his famous: "Wisdom crieth aloud in the street," and along with it, "Fools hate knowledge," he must have had in mind the present day, when there is so much and so little known about the chief mode of transportation, the automobile; so much by those who really have studied its mechanical principles, and so little by those who are running them about the highways. Yet in this day of automobile schools and service departments there is no need of a single individual being ignorant, nor of his coming under the condemnation of the same wise one, "The careless ease of fools shall destroy them."

Solomon measured up to the size of a prophet on the "crieth aloud" score when a New York automobile school recently sent out a truck with a moving picture outfit and screen mounted thereon and showed pictures of the school in operation and telling folks how to "get wise" to the auto, to make it eat out of your hand and stand unhitched and how to put its bucking energy to work.

"How do you do it?" was the question put to H. Clifford Brokaw, principal of the New York West Side Y. M. C. A. Automobile School, who last year turned out 1915 men and 141 women who were able



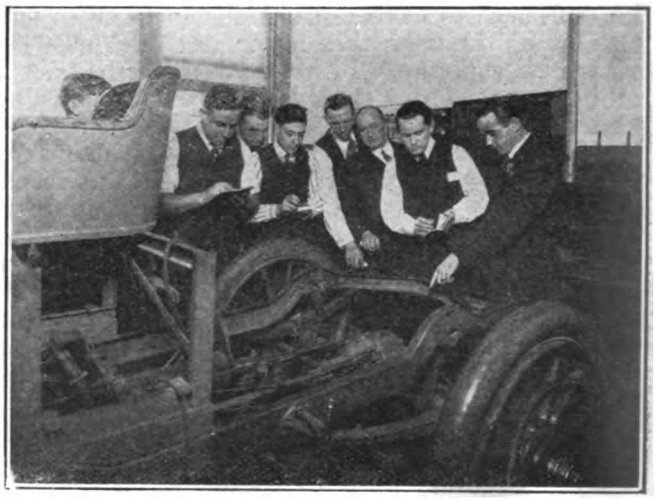
How one learns to be a repair man. Class disassembling the differential.

to spot trouble instanter and juggle wires and valves and plugs and things into complacency, no matter what might happen.

"Give me an individual of average intelligence, in overalls and jumper—the women wear 'em, too—and a mind devoid of the 'I know it' error, and 99.99 per cent. of such can be taught. The chief obstacle is the half knowledge-half error which some possess. Josh Billings once said: 'I'd rather not know so much than to know a lot that is not so.' Get the idea?

"The overalls, of course, have nothing to do with the course, but are mighty handy in keeping the clothes clean while handling tires, or taking apart a greasy gear box.

"The first thing the student is told is what a car is, with an explanation of the parts necessary to make a car go. He is shown the levers and pedals and how they work and what they do, and then is shown how to remove and replace a tire. This is



Explanation of the brakes.

done first because many of the students take road instruction from the very first day and need to know the simple essentials. The tire instruction, however, begins with the gathering of rubber gum from the tree and its treatment and application to fabric to build up a tire, illustrated with cross sections of various makes and instruction as to the weak points, where a tire falls down and what to do in case of a puncture, or other accident, and other necessary things as to the care. The lesson includes, for the reason given above, the things needing attention before leaving the garage, including oil, gasoline, water, position of levers before cranking, and inflation of tires.

"In the second lesson we give the student the parts of the engine, their use and care. This is done by a lecture, with sketches of the working parts and their relation, and by reference to sectional engines, which show the parts in motion and their correlation. Each student must handle the parts and become familiar with different types and know by trying them out how each works and what it does, when and why. This will familiarize him with the principles of the four-cycle gas engine and just how it pushes a car along.

"Another lesson teaches all there is to know about lubrication, the systems, what oil is for in various places and how it is applied to the bearing surface; where grease is used and why; how often lubrication needs attention, particularly in the hidden places, and something about the lubricating material itself. Each student has to examine every car in the school and determine the character of the lubrication. This lesson also takes in the cooling systems and these are inspected to note differences and care required.

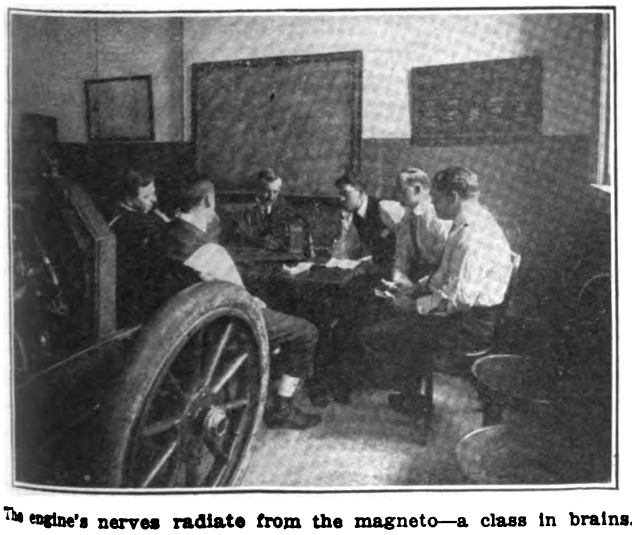
"A fourth lesson is given over to carburetors and fuel systems, including the manifold, gaskets, fuel line, carburetor adjustment for various types and cold weather devices to assist carburetion.

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"There are other lessons on valves—grinding, timing, push rod adjustment—on batteries, coils and plugs; magnetos, low and high tension, their function, circuit breakers, distributors and the timing and adjustment of these parts; engine assembly, in which the student takes down an engine and puts it together again so that it actually works right; transmission parts, including clutches, gears, chains, radius rods, universals, differentials, steering gears and brakes, wheel bearings, chassis parts and their lubrication; automobile laws, including equipment for cars, speed limits and traffic rules, not in the order given, but covering all parts of the car from crank handle to tail light.

"Not alone is the proper working of the car and its separate parts taught in detail, but all of the ills to which a car is subject are shown so that the student may know how to diagnose and locate troubles and make the repair or adjustment. The engines are 'queered' by the instructors in many ways and the students alone must locate the trouble by rule and get the engine running properly. Over and over this is done, until the student can call the engines by their first names and feel that they are chums.

"One of the things taught is not to do useless things; somehow this is about the hardest lesson to learn for many folks. Over and over the students will do things contrary to rules and make extra work for themselves. Perhaps this is a good thing, for it enables the instructors to point out the futility of going at the thing wrong end first. There was one class particularly stupid in this respect. They were set to locating engine troubles, forgot all about the rules and took turns cranking the engine, expecting to find out why it would not run in that way. The instructor, looking into the class room found how things were going. All but one student were intent upon turning over the engine; that one



The engine's nerves radiate from the magneto—a class in brains.

man stood in one corner grinning, apparently having a good time with himself. The instructor in feigned amazement called out to him:

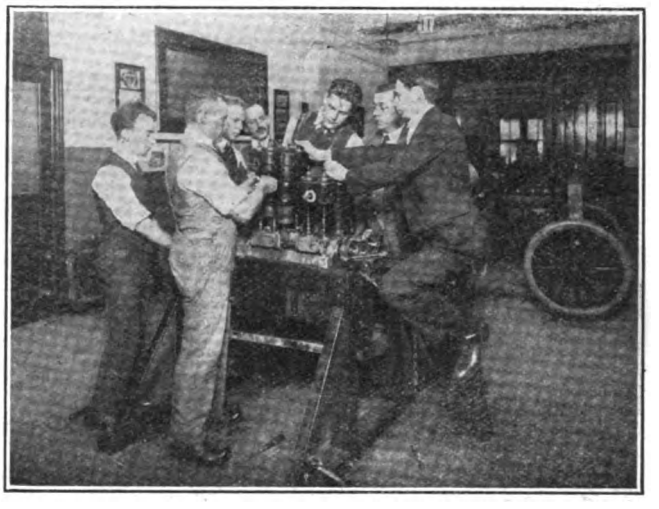
"'Here, why are you not cranking the engine, too.'

"With a grin perfectly idiotic the fellow drawled out:

"'What's the use of cranking if she ain't goin' to run?'

"You can figure out for yourself the relative degrees of idiocy or stupidity in that class. The instructor quickly set them to work by rule, and they all knew before they left the school that troubles are not located by cranking alone, and are successful drivers to-day.

"This article does not pretend to tell just how the teaching is done, or all the minutiae of a course of instruction, but, in general, the system is to give the theory, illustrated by actual handling of the part under investigation, and then to try out the



Getting at the inside of things. Stripping down an engine.

theory in actual practice of one or more engines. Thus the student actually 'sees the wheels go 'round,' and when they do not go 'round knows why and how to make them go.

"In the road work the system is the same. The student must get the car ready to leave the garage, filling radiator, oil receptacle, gasoline tank and pumping the tires; must put the various levers in proper position for starting and crank the engine. Then, with the instructor by his side and controlling a duplicate set of levers and pedals, the start is made. First lessons are given on quiet streets, in starting, backing, turning, running to curb for proper stop, hill climbing and descending, with use of brakes, and, when the student is master of these things he is taken into crowded conditions and finally lands at Fifth Avenue and Forty-second Street calm, confident, the perfect driver, able to withstand the most exacting traffic cop.

"I think beyond all question the West Side Y. M. C. A. Automobile School is the largest in the world, as it is one of the very oldest. In twelve years it has had an average of nearly 1,000 students per year and last year had nearly double that number. Women's classes are instructed separately.

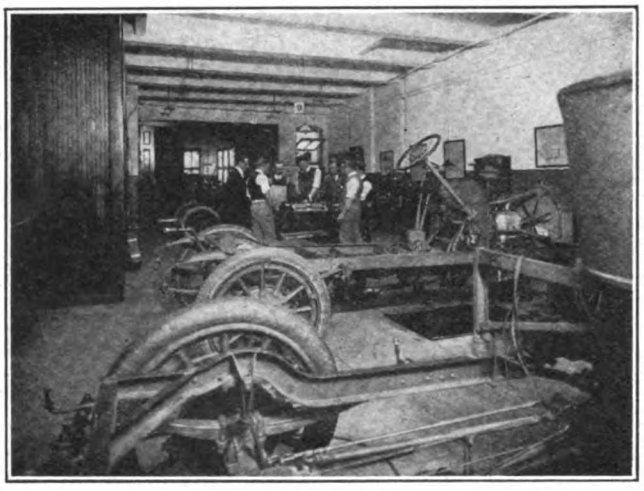
"The instruction of women was not contemplated when the school was opened. The school came as a response to a demand for competent instruction about the time the auto came into popular use. Women did not do much driving in those days. It was too hard to crank the engine. With the coming of the self starter, removing the disability, women, who had learned to steer an electric car, wanted to know about a gasoline engined car, and, as the application came through the Y. W. C. A., it finally was decided to make the experiment of teaching a few women. The demand has so increased that a separate department seems inevitable.

"One feature of the school is that students who

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find they are deficient in regard to some operation or part of the car may return at any time and repeat the shop work until they know and know that they know. Classes are in groups of not more than ten, so that instruction is definite and personal and the addition of a former student to a class for a session or two does not interfere with class work. Sessions last three hours, being arranged to come on different days and evenings so that one may find classes at convenient seasons. Private instruction also is given."

It will be seen from Mr. Brokaw's description of



Where everything is exposed.

the methods of instruction that much depends upon the application of the student and his side reading recommended by the instruction. If he is slovenly, careless, he will not compare with the man who believes:

"Wisdom is the principal thing; therefore get wisdom; yea, with all they getting, get understanding."

But the course is so carefully planned that none may fail to learn the working of the automobile. Like everything else, however, it is the hustler who really gets there.

A WOMAN CHAUFFEUR.

She Tells a Piquant Story of Her Experience in London.

From Gladys de Havilland, in Motor, England.—It was about a year ago that I became chauffeuse to a well known cabinet minister, and spent some very interesting and enjoyable months in his employ. It happened this way. While desultorily reading the Morning Post one day my eye fell on the "Wanted Chauffeurs" column, and after reading the advertisements through I came to the conclusion that being a chauffeur was rather jolly. Judging by what I read it seemed quite possible to get a luxurious car to drive, a cottage or rooms to live in, coal and light and about $10.25 a week. The advertisement which took my fancy most ran: "Wanted, chauffeur-mechanic for 35 h.p. Sunbeam limousine; must be careful driver and know town well; excellent wages to capable man."

I sat down and drafted a letter describing my motoring experience, and my willingness to come on a week's trial. Two days later I received a post card asking me to call at 12 o'clock at a house in South Kensington. When I arrived the sight of fou very smart and experienced looking men drive waiting in the hall to be interviewed rather dashe my spirits. However, in the drawing room I foun the very charming wife of my employer-to-be, an after a few minutes conversation I felt that if sh were to decide the question I could feel pretty ce tain of getting the job. As I was leaving her las words were: "Well, if my husband agrees about em ploying a lady-driver, do you think you could fetc the car up from Bournemouth next Monday?" said I could easily arrange it.

Next morning I received a letter engaging me, an to my delight Mrs. Blank allowed me to choose my self a uniform, and I chose a very dark blue coa lined with British warm, and a blue cap to matc with a black patent peak.

I went by train down to Bournemouth and drov in a crawling cab out to my employer's countr place, and discovered the Sunbeam car in the garage It was a bitterly cold day, and I had some troubl in starting up, but when I had got about two mile from Bournemouth she began to pull splendidly; i fact, I felt the most smilingly contented being as drove the beautiful car through the New Forest an up to London.

That night, when I arrived at South Kensingto and drove into the mews where my employers rente a lock-up, the two chauffeurs whose cars were lodge each side called in and asked if they could be of an assistance. After the train journey down to Bourne mouth and the drive up to town the same day, I wa feeling pretty tired, but as the car was very mudd I felt obliged to wash it. One of the chauffeurs—known throughout the garage as "Pat"—lent me hi jack-boots and also kindly helped me to get the mu off under the mudguards. And here, I might state a rather amusing experience that happened to m in connection with washing the car. It happene only a few days later and before my jack-boots ha arrived. One night I drove into the garage after long run over muddy roads and began to make prep arations for washing the car. I took off my uni form and put on my overall, and then knocked at th door of Pat's lock-up, but he was out, so, unable t borrow his jack-boots, I was obliged to wash the ca in my ordinary shoes. Of course these got soake through, so when I had finished and driven the ca into the lock-up I took them off and stuck them o the still warm exhaust pipe to dry, and put on a old pair that I kept in the garage to go home in Next morning I had orders to be round at 11 o'cloc and I did not get to the garage till 10.50. In a des perate hurry I started up the engine and tore roun to the front door. Mrs. Blank wished to go to True fitts in Bond Street, and she was in there some time so that when she did come out and I went to star up the engine I found that the carburetor neede flooding. I pulled up the flap of the bonnet, when lo out tumbled my shoes—baked hard! I shall neve forget the look of astonishment on the faces of Mrs Blank and the on-looking commissionaire.

Perhaps the most inconvenient part of being chauffeur is the fact that you never know what tim is your own. You may be driving your employer all the morning and afternoon, and, even then, yo may get orders to be round at 7.30 to take them t the theatre, and, of course, you are generally oblige to fetch them from it later.

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I remember on one occasion I had been driving all the morning and afternoon, and so feeling I should not be wanted again I accepted an invitation to dine out. This meant donning an evening frock, and as I drove my employer home from the park about tea-time I was delighted to think that I should have plenty of time to change. But, alas! at the door she said, "I'm going to the Lyric to-night, so will you be round at half-past seven?" Dreadfully disappointed I drove round to the garage and told Pat about it.

"Well, can't you wear your best dress under your uniform and go after you've dropped your lady?" he said. I began to think deeply, and after a time I decided to try it. I flew out of the garage and hailed a taxi to take me home, and there changed into an evening frock. A little later I was back again in the garage, and, seated on the running boards, I put on my high driving boots which completely covered my pink silk stockings, put a satin slipper into each pocket of my uniform coat which entirely covered up my short pink frock, and arranged my cap on my carefully done hair! But it was very chilly round the shoulders.

Pat started up the engine for me and I drove round to the front door, picked up my employers, and drove them down to the Lyric. Then I drove at highest possible speed to the Piccadilly Hotel where I was to dine, left the Sunbeam in charge of the commissionaire, and went inside. In the lounge I discovered the extremely surprised person with whom I was to dine. Certainly it must have been rather quaint to see a person advancing to meet one in a chauffeur's blue uniform over a pink tulle low-necked frock!

One difficulty that I had not foreseen was the fact that I did not know London as well as I imagined to be the case. I discovered that though one may know one's own London other people's London may be quite strange to one. So that it happened that very often my employer would say "To Blanks," and I had not the haziest idea where Blanks existed. It was awkward, as, naturally, my employer was not a man with time on his hands, and I felt very regretful when I had to keep him waiting while I hurriedly looked up the street in a map of London, or had to put him to the trouble of telephoning the way to me as we went along. In fact, I often think that the most nerve-racking part of being a chauffeuse is when one's employer jumps in and hastily says "To So-and-So," and one is expected to start off straightaway with scarcely time to think out the most direct route. Another trial is the waiting about, especially in cold weather, while one's employers are shopping or visiting. The only thing to do is to make oneself as happy as possible in the circumstances, and I followed the example of chauffeurs and carried a newspaper in my pocket.

Since then I have driven a Member of Parliament and a well-known duchess, and had, in the first case, a Napier landaulet to drive, and, in the second, a very beautiful Rolls-Royce.

Among the many chauffeuses I know a good number object to the wearing of a uniform, and on this point I have something special to say, I wish to point out that by wearing it they will gain in every way. Without it they are indistinguishable either in the garage or on the road from a possible owner of the car, and will receive no attention other than the kind that has an eye to tips in the background. On the road, too, the woman at the wheel may be looked at in more or less hostile fashion as one desirious to swank by driving her own car. But when a uniform is worn everything is changed. The male drivers at once recognize a girl as one of themselves when she enters a garage. They admire her pluck in handling a car at all and in earning her own living, and they respect her patriotism if they see she is not doing the work for reward alone.

They will proffer help without being asked, whether as to shifting their cars out of the way, fixing a refractory tire, or doing a ticklish repair; and I can state definitely that many of the men drivers and garage hands alike have proved the soul of courtesy in dealing with paid women-drivers who are definitely doing men's work, especially on a big car and not merely showing off at the helm of a light car. The same thing applies on the road. Bus drivers and others show extraordinary consideration when a uniformed woman comes in sight, and the amount of courtesy she receives, for example, if driving up to a store like Harrods and seeking to find a place among a crowd of cars is totally different from what would be the case if she was wearing her ordinary attire. I can only account for what is an undoubted fact on the supposition that the uniform is regarded in two lights, each of which evokes sympathetic treatment. The men think in the first place that a woman who wears a chauffeuse's garb is practical and knows her work, and respect her accordingly, whereas in "mufti" she might be an incompetent amateur; and in the second place they regard the uniform as an evidence of serious intent, and indicating an absence of any undue pride.

Carbon Prevention.

A writer in The Motor Cycle (London), discussing the cause of carbonization of the cylinder, suggests the following theory and remedy:

"As the mixture of air and minute fuel particles changes into a mixture of air and fuel vapor, the temperature tends to decrease until a point is reached at which further vaporization practically ceases, and the remainder of the fuel enters the cylinder in finely divided liquid form. When this takes place the cause of carbonization is obvious. If hydrocarbons in a liquid state are brought into contact with highly-heated surfaces, then in addition to simple evaporization a chemical change (termed "cracking") takes place, carbonaceous matter is deposited, and more volatile compounds are produced.

"If the above theory of deposit, other than that derived from the lubricant is correct, then the remedy is obvious. After the fuel has been converted into fine spray and mixed with air in the carburetor, it should be brought into contact with surfaces hot enough to complete the evaporation before the mixture enters the combustion chamber. This would probably be most simply effected, not as is sometimes indirectly attempted by a hot air jacket to the carburetor, but by leading an exhaust-heated pipe through the induction tube itself. The point where the heat energy is required is where the fuel in the form of fine spray has been mixed with the necessary air, and by proper application of this principle it should be possible effectively to vaporize the dense fuels commonly in use at present."

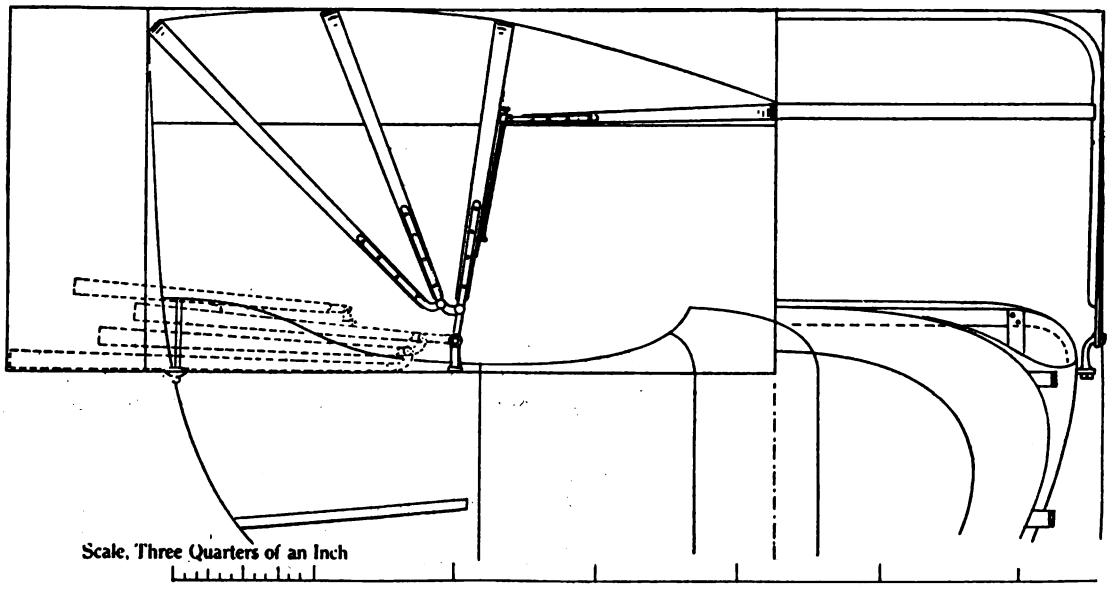
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SETTING UP A TOP.

How the Measurements Are Made to Insure Correct Size.

Set up, either to scale or full size, the side and front elevations within a rectangle, the lines of which form boundaries for the desired limits and extreme measurements of the top. Dealing with the rectangle. First set out the outline of the top portion of the body; or, if developing a hood drawing on a body drawing, begin by fixing the height by a horizontal line at the desired height above the seat; 42 inches is a popular measurement.

A vertical front line at a suitable distance forward of the screen will fix the extreme front of the top. A vertical line two inches more or less beyond the rear of the seat, according to the shape or style of the body, provides for flare of the back. Next draw a parallel line 10 inches (or less if a small top) below the top line to indicate the bottom of the valance of the top covering.



Fixing the position of the main pivot center is dependent on four things, viz.: Distance from that center to the extreme top, rearmost point on the back of the seat, the seat bottom frame and the available space between the front bow and the screen when the hood is up. If you fix the main center too low, the bows will be too long and project too far beyond the rear of the seat, unless the center is set well forward. If you fix too high the bows will be too short, and the center will require to be set well back to allow the shortest bow to fold over the rear of the seat.

The position of the hood when folded requires consideration. A low position is favored so that the folded hood is practically level with the top of the seat. When the envelope is drawn over the top everything should be trim and snug, and not likely to catch the wind.

To fix the bottom line of the rectangle remains. We find that line by taking a finger plate and pivoting it in position on the full size drawing, or drawing it to scale as required. Draw the curved line representing the top of the hood, and space the bows to suit as nearly equidistant as possible, though not essential. When the fingers are pointing in the right direction, outline them by running a mark all around. Now close and move to the position when the hood is folded. This gives the position of the bottom line of the rectangle. The bows should not be below this line at the rear extreme, but rather a little above.

The elevation of the support is now obvious, and its distance from the main center should be as long as possible without fouling the valance, where fastened to the rear bow.

The length of the extension bow and the slide rod is governed by the erected position of the front bow, and the folded position of the hood. The front elevation gives the width of the bows and distance between main centers. The length of the bows is easily measured, and may be written adjacent to them on the drawing. To mark off the bows for dressing, lay each one on the bench, the two ends upmost, and apply two clamps as far apart as possible. Hold the bow in a vertical position, with the rule standing on the bench flat against the bow, and tick off the required measurement. Mark all cut-offs by this method, and, when erecting the frame, space the bows at the top according to the positions given on the drawing. No altering will be required if carefully carried out. The trimmer may execute his work without asking for alterations. Tops mounted on five-seat cars are set out by the same system. Fix the limits by a rectangle of four lines to whatever is required, and erect the bows to the best advantage.

Three inch scale drawings on paper are worth making. They may be filed for future reference. When one has a few on hand there is generally one of them that will suit almost any job.

As a motor gets older it gets noisier. Watch the valve tappets and keep them adjusted, as they become very noisy if they open up. The clutch collar works loose and must be repaired. The timing gears wear and should be replaced. The pistons wear and give "piston slap," which can only be removed by regrinding cylinders and using larger pistons.

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This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2081 **The Cutout.**

From a Reader, Oregon.—Is there any more power obtained by using a cutout than by running on the muffler, and if so how much? Also, is there any back pressure, especially on a high speed Continental motor?

Reply.—Tests have shown that for all general use practically no increase in power is obtained by using a muffler cut-out. Mufflers of modern design will give a slight vacuum in the exhaust pipe near the completion of the exhaust stroke at all ordinary speeds if the muffler is kept clean. At the very highest speeds back pressure will cause an almost imperceptible loss of power.

2082 **Tire Economy.**

From H. M. Rush, Indiana.—1.—Is there any advantage in using old junk casings over 34 x 4-inch tires; that is in the same way that leather treads are used? We talked to a Ford owner who bought new casings and put his old ones over the new ones of the same size. 2—Is it advisable to use reliners or Interlock inner tires, either in new casings or where the fabric is beginning to give way on the inside? The dealers here say that any money spent in that way is thrown away. The Interlock inner tires look as if they would relieve the casing of some of the strain, and prevent blow-outs. They would have to add a good many miles to the life of the casing to pay for them (¼ the cost of a new casing). Do you suppose they will break or wear out before one would get the increased mileage? We would be glad to hear of experiences from users through the columns of your paper. 3—Would finely powdered phosphor bronze-bearing metal, powdered lubricating graphite and kerosene be a good mixture to apply between the leaves of the springs? (I have some old cream separator beatings, if I could get them into a powder some way or other. I got this idea from a Dann insert). 4.—Would there be any advantage in having a ⅜-inch valve on the intake pipe above the carburetor, to be opened while descending steep hills, with the motor acting as a brake? Would it prevent sucking oil past the piston rings? I suppose it would save a small amount of gasoline, as there is still enough gas turned on to run the motor idle when the throttle is closed. Sometimes there is a loud explosion in the exhaust pipe when descending hills this way (with closed throttle) unless we turn off the ignition. I don't suppose it would save much gas in usual running conditions, because we keep the carburetor adjusted as lean as weather and poor gasoline will permit. We have a 1916 Reo, 4 cylinder, with Johnson carburetor, which is supplied with warm air from the exhaust pipe, which is hot water jacketed, and is 7½ inches long. 5—Would it prevent skipping while the motor is cold if the carburetor was attached directly to the intake manifold. We have to keep the choker on the carburetor turned on part way until we run from ¼ to 1 mile. They have eliminated the intake pipe on the new cars and use the vacuum feed system.

Reply.—1—Putting junk casings over new tires is apt to cause a blowout in the new tire sooner than usual. The extra layers of fabric of rubber stiffens the casing so that it loses its resiliency and to make riding at all comfortable, the tendency is to underinflate. Even if well inflated, there is a sharp bend in the side wall of the new tire at the edge of the old tire which cracks the canvas and causes a blowout. It has also been found that the tread on the new casing becomes loosened, so that when the old casing is worn through, if the tire runs that long, there is little wear left in the new casing. If an old casing with good side walls is recovered with another old casing with a fair tread, sufficient mileage may usually be obtained to warrant the work involved. 2—Many owners report a great increase in mileage from the use of reliners. It is probably a matter of luck as with tires in general. 3—It is doubtful if the powdered bronze would add anything to the non-friction qualities of the graphite. 4—A valve as described would no doubt prevent, to a certain degree, the sucking of oil past the piston rings. It would also eliminate the explosions in the exhaust pipe. It would not save much gasoline. 5—Attaching the carburetor directly to the intake manifold would enrich the mixture very slightly at slow speeds, but this could easily be accomplished by adjusting the carburetor. It would be better to block off the radiator to prevent the passage of air through it until the motor is warmed up.

2083 **Lacks Power and Vibrates.**

From F. T., New Hampshire.—I have a 1916, or late 1916, Pullman, equipped with Apple starting and lighting system, and Dixie magneto for ignition. Now, this starter doesn't seem to have power enough to start the motor without help with the hand crank, except when it is warmed up, then it will start part of the time. The battery is O. K. and tests 1280 and 2¾ volts. I thought it might be the brushes so put on a new set of 4. It seemed to generate better but there was no improvement in the starter. After helping to start with the hand crank, it will turn the motor alone well enough, but seems to lack power to start. The car has been driven about 3500 miles. Can you tell me where the trouble might be? I think it must be in the starter as the motor cranks all right by hand. 2—Another thing I would like to know is what I can do to make my motor throttle down slower, more particularly when running idle. It is equipped with a Stromberg carburetor. If I close the throttle down to let the engine run idle anywhere near as slow as it should go, it will stop. The motor is in first-class condition and has good power. 3—When I drive this car up to a speed of 30 miles per hour, or better, there is an

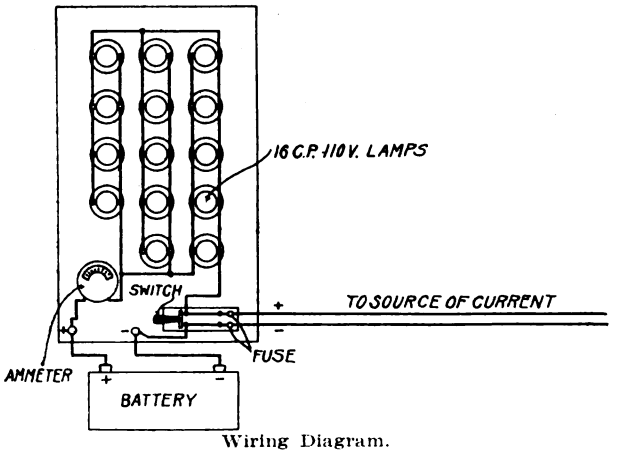
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awful vibration, much more than should be. What would cause this—would imperfect timing of the valves or magneto cause it? The motor is timed so that the pistons lower 3/8 inch before the intake valve is wide open, is this correct? The magneto is timed so as to spark with the piston on the top center, with the spark lever fully retarded. Is this correct? Any information you can give me will be gratefully received.

Reply.—We would suggest detaching the wires from the battery and cleaning the taper terminals well. Also examine the starting switch to see that the spring has not lost its tension or the blades become dirty through repeated arcing. This trouble has often been traced to high mica in the commutator. The commutator is built up of alternate pieces of copper and mica, the mica acting as an insulator. The copper, on account of its softness, wears down so that the brushes ride on the mica and touch the coppers only part of the time. This gives the exact condition you describe. It will be necessary to remove the armature and cut the micas away until they are slightly below the surface of the coppers. 2—Adjusting the carburetor to give a slightly richer mixture at slow speeds and increasing the gap on the spark plugs should help. Also examine inlet pipe and gaskets for possible leaks. 3—The inlet valve and spark timing are correct. As the engine has good power, the vibration could hardly be caused by faulty timing, but might be the result of carrying the spark too far advanced. The vibration at 30 miles per hour is probably caused by unbalanced parts. Sometimes pistons are found to be slightly different in weight and crank shafts are sometimes installed with a variation in the throws of the different cranks. The only way to determine if the fault lies here is to disassemble the engine and weigh and measure the parts.

2084 **Battery Charging.**

From T. Clarkson Woody, North Carolina. — I have an Exide storage battery for lighting purposes on a Ford car. I have to charge the battery from outside sources. The Exide battery charging rate is 6 amperes. The Exide Battery Co. said to use fourteen 16-candlepower carbon lamps in series to charge the battery. I want a board wired so as to have a meter telling how much current is going in the battery. Would you please send me a diagram



Wiring Diagram.

showing how to make such a board; also tell where I can buy a meter.

Reply.—The accompanying sketch shows the wiring for a 14 receptable board; 32-candlepower lamps will pass double the amperage of the 16-candlepow making only seven necessary. Key sockets may used for cutting out lamps near the end of t charge or the same result may be obtained wi keyless sockets by backing the lamps out of cc tact. Direct current of approximately 100 vo must be used. The Weston Electrical Instrume Co. of Newark, N. J., manufacture a meter suital for this purpose.

2085 **Magneto Removing.**

From M. O. Lynch, Washington.—I have a Pai No. 15 model, 4-cylinder car. How is the magne replaced after it is removed? If the direct curre for No. 1 and No. 4 cylinders, as marked on the wheel, is turned to the arrow (and the distribut points to the inside segment according to th book) why is not No. 1 in position to fire instead No. 4? Please give me all information, with a di gram if possible, as I am unable to get my c started.

Reply.—Connect magneto to engine; crank engi over and note the direction of rotation of the inte rupter points; also, remove the distributor cov and note the direction in which the distributor rot travels. Disconnect magneto; crank engine and o serve order in which exhaust valves open. Th may be either 1, 2, 4, 3 or 1, 3, 4, 2, calling the cyli der nearest the radiator No. 1. Stop the crar shaft at the point where the exhaust valve of No. cylinder has just become closed. Examination w show that the 1 and 4 top dead center mark is ne the arrow. Turn the fly wheel slightly to bring tl mark directly under the arrow. In this position N 4 piston is at the end of exhaust and No. 1 piston at the end of compression, ready for the spark. R tard spark lever fully. (Make sure that it mov breaker box to full retard position). Rotate arm ture in its proper direction until interrupter poin are about to open. Mesh magneto coupling at nea est convenient point and tighten coupling bolt Make magneto fast to its base. Note which poi on the distributor the high tension rotor is in co tact with and connect secondary wire from this t the spark plug of No. 1 cylinder. Keeping in min the direction in which this rotor travels, connec wires from the other points of the distributor to th other cylinders in the same order that the exhaus valves open.

2086 **A Carbon Deterrent.**

From L. M. Tuttle, New Jersey.—At the recen automobile exhibit, I saw a device for removing ca bon from a motor. It consisted of an attachmen to the water jacket and the manifold. After comin in from a drive of 50 to 75 miles, open the valv and run hot water and steam through the cylinder for 15 or 20 minutes, speeding up the motor. Is thi idea feasible, and will it keep the motor free fro carbon?

Reply.—Quite likely it would be a deterrent, bu whether it would be an absolute preventive woul depend upon other carbon forming conditions whic vary according to the mixture or fuel and the con dition of the motor; we are inclined to the belie that it would not.

2087 **Electric Lights.**

From W. E. Dern, California.—1—What candl power lamps should be used on headlights as regula

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equipment on a Buick D, 35? 2—What amperage do they require? 3—Would nitrogen lamps of the same candle power throw a better light, or use more current?

Reply.—21 candle power, 7 volt in center; 4 candle power, 7 volt at top. 2—Center lamps 3.5 amperes each. Top bulbs .84 amperes each. 3—Nitrogen lamps of 21 candle power would give a whiter light and use 2.5 amperes each.

2088 **Fitting a New Clutch Facing.**

From Dr. W. U. Taylor, New York.—Will you please tell me in the Automobile Dealer and Repairer, how to put a new clutch leather on a 1916 Dodge car, i. e., give the different steps in their order.

Reply.—Procure clutch leather from manufacturer and soak it in neat's foot oil over night. Disconnect universal joint at rear end of engine. Block up the rear end of the engine and remove entire rear housing which unbolts from the frame of the car and from the engine at the fly wheel. Remove clutch. Before removing old leather, compress springs under it and place cotterpins in the holes in the plunger stems to keep them compressed. Remove excess oil from new leather and rivet it in place. Use copper rivets and sink them well beneath the face of the leather. Draw the leather into place as tightly as possible. Remove cotterpins from plungers. Replace clutch, housing and universal joint and remove blocking.

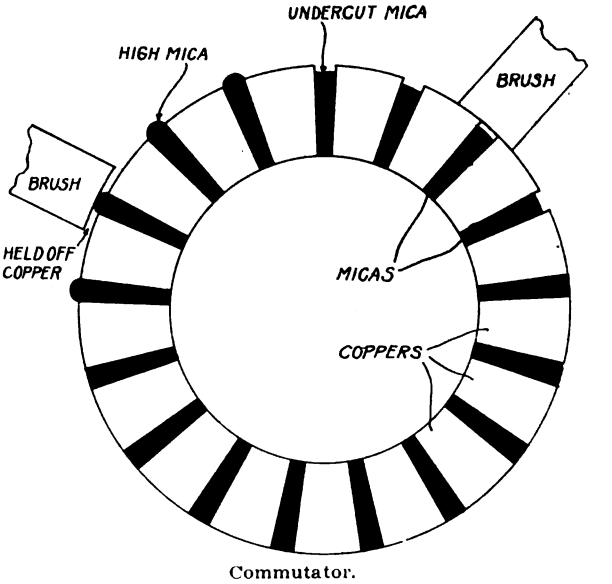
2089 **His Motor Will Not Run.**

From H. O. Hoard, Texas.—I have a two-cycle marine engine, 4 H. P., that I am using to pull a 3 K. W. direct G. E. dynamo. Last year I ran it on gasoline, but this winter on account of the price of gasoline I am using kerosene and for a while it ran as well as it did on gasoline, but lately it has developed a habit of stopping. I start on gasoline and then change and it will run for about 40 minutes as nice as can be, then for seemingly no reason, it will just stop; acts as if it didn't have gas enough, but the carburetor will be at the usual height. Now, I am in the garage business and thought I was a pretty good mechanic, at least I have that reputation around here, and have been in the business at various places for about 15 years, but this has got me stumped. This is what I have done, if not enough, tell me something else: There being no valves I took the cylinder off, cleaned the carbon, tightened up all the bearings, put a ⅛-inch gas line to the tank, cleaned the carburetor (Schebler model D); bought a special marine engine coil; put in a storage battery for ignition with a small Simms-Huff generator to keep same charged, and still it stops. I tried running the gas line through a heating pipe from the exhaust and that did not seem to do as well as just to the kerosene direct from the tank. Then I put a hot air pipe on the carburetor and that did not help any. Now I am running it without either and after starting it a time or two it will run for three or four hours without a miss. Last night it ran fine without any trouble, but the night before I had to start it four times before it would run, but every time I cranked it it would go and run for from 15 to 30 minutes. I strain all the oil and even went to the trouble of putting a water trap on the gas line. It is fine when it does run. If you can't suggest a remedy I am going to junk it and run the dynamo with a Ford motor. They may be hard to start but they will run as long as you give them gas and spark.

Reply.—Before buying a Ford motor there are two or three things you might check up. One of the products of combustion is water. This may become trapped in the exhaust line and freeze, causing a partial stoppage. Kerosene will sometimes condense in the base of the engine to such a degree that it is impossible to get an explosive mixture in the cylinder. This may also thin down the lubricating oil so much that the piston binds. If the crank shaft bearings are lubricated with grease, this may become fluid and work out after the engine has been run a while, and if the bearings are not snug, air will be drawn in and gas pushed out through them. The Mianus Motor Co. of Stamford, Conn., have a kerosene inspirator which gives good results.

2090 **Trouble With a Starter.**

From Geo. A. Bodwell, New Hampshire. — We have a Jeffery, four-cylinder, 1915 touring car to overhaul, which has a U.S.L. type starter flywheel. This flywheel has never worked right since it came from the factory. After the brushes have been thoroughly cleaned it will work well for fifty or a hundred miles, then after that the generator will not cut in and charge the battery. The starter works perfectly. The car has been taken to the Boston service station twice and the generator thoroughly gone over. It worked well for about fifty miles each time, then it was just the same as before. Any information you can give me will be gratefully appreciated.



Commutator.

Reply.—Very likely oil leaks into the flywheel housing and gets on the commutator, glazing the brushes or gumming the commutator segments. The commutator should be kept comparatively free from oil. Worn copper segments, leaving the mica insulators between them a trifle high, would cause the machine to work well as a motor at the low cranking speed. But at the higher running speeds the brushes would have a tendency to jump the segments and not pick up sufficient current to operate the cut-out. The micas should be cut down until they are slightly below the surface of the coppers.

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The spring tension on the brushes should be 1¾ pounds. This may be tested with a small spring scale by hooking directly under the brush and noting the pull just as the brush lifts.

2091 **Ford Magneto and Coil.**

From E. P., Iowa.—1—Will the 1915, '16, '17 magneto, ¾ inch thick at face, replace the ⅝ inch thick face used on the 1913 Ford car? Also could the late magneto coil assembly be used with ¾-inch magnets and replace the old coil assembly on the 1913 Ford car? Can the above change be made without altering the cylinders or the fly wheel, and can you use the same magnet clamp? If the above change could be made, it would bring the 1913 Ford quite up to date, especially in lights. 2—Had the Ford magnets any difference in the magnetic pull in the south pole and in the north pole? In other words, how is one to know by examining a magnet how it is to be placed on the fly wheel? 3—What would cause a 1914 Ford car, equipped with the Atwater-Kent ignition to run well and have considerable power on high, but when it comes to a hard pull on slow speed gear it will slow down and come to a stop? This car was overhauled a short time ago; new valves, new piston rings and a new crank shaft were installed. Everything looks to be in good condition. There were also new plugs put in and the points of these were set closer than 1/32 of an inch, for the ignition system seemed to throw a weak spark in open air.

Reply.—1—The new magnets and coils may be used in place of the old ones, provided both are changed. New magnets should not be used with old coils. No alteration of cylinders or fly wheel is necessary and the old clamps may be used. 2—There is no difference in the pull between the north and south poles of the magnet. Unlike poles attract and like poles repel. Keeping this in mind, the polarity may be determined by bringing the poles of the magnets together. However, the action is often too indefinite for the novice to depend upon and the use of a compass would probably be more satisfactory. It does not make any difference where the north or south poles are located on the fly wheel, but the north pole of the magnet should be adjacent to the north pole of the magnet next to it, and the next magnet placed so that two south poles come together. It is not necessary to know which are north or south poles but rather which are like and unlike, so that like poles may always be placed together. New magnets are shipped placed in their proper positions on a board and if care is taken in transferring them to the fly wheel no testing is required. 3—Sufficient clearance may not have been allowed between the end of the piston rings so that when the engine becomes well heated through hard pulling, the rings expand and bind in the cylinder. Likewise, insufficient clearance between the exhaust valve stems and their push rods may cause the valves to be held slightly off their seats when the engine becomes hotter than usual. The spark plug points should be all right.

2092 **Irregular Running.**

From S. A. Clark, Ohio.—I have a Ford car that seems to run by jerks. In going down hill when the motor is running idle it will run slow, then speed up alternately without changing either spark or gas What could be the matter with it?

Reply.—There is probably a partial stoppage i the gasoline line or water in the gasoline. Eithe would change the quality of the mixture at interval and cause the speeding up and slowing down de scribed. The engine speeds up when the mixture i lean and slows down when it is rich.

2093 **Lamp Trouble.**

From P. C. Bradford, Arkansas.—1—Can you tel me what causes my headlamps to burn out in a fe hours on my Buick D 6, 45, 1916 model? The light get much brighter when the engine is started. Jus the headlights are affected. I can find no broken o shorted wires, all connections are clean and tight the battery is in fine shape; generator is giving goo service, and I can see nothing wrong with the coi or switch. The ammeter reads as normal but oscil lates considerably when the engine is idling slowly I think this is caused by the engine running jerkil when running slowly. The distributor and contac have been cleaned regularly. 2—Please explain th function of the "resistance unit" on the coil, an just how to adjust the same. I have the diagram o this system and can remedy the trouble if I can onl locate it, unless it is in the coil or generator. 3—Can you tell me just what changes the Buick Co have made in their carburetor for this year's cars over last year's? 4—Do you advise the use o graphite in the cylinders or crank case? 5—Shoul a storage battery ever be taken off the car an washed out to remove sediment? Will appreciat any help you can give me.

Reply.—As the headlights only are affected, yo are, apparently, using bulbs of the wrong voltage 6-8-volt bulbs should be used rather than the ordi nary 6-volt. The oscillation of the ammeter needl at low engine speed is no doubt due to the make an break of the ignition interrupter points. 2—Thi resistance unit is to prevent burning out the coil i the switch is left on when the engine is stopped. I a large amount of current flows through the unit i heats up, increasing its resistance and automatically cutting down the flow of current. As the engine i started and speeded up, the interrupter points re main in contact a shorter length of time, which a lows the resistance unit to cool and pass sufficien current to give the best spark at highest speeds There is no adjustment to this unit. 3—1916 Buick were equipped, in a few cases, with Schebler carbu retors, but mostly with Marvels. They were a equipped with a hot air stove on the exhaust pip from which a pipe led to the air inlet of the carbu retor. The Marvel carburetor, in addition, was pipe for gas from the exhaust manifold to a jacke around the mixing chamber and, in some case through a jacket on the inlet manifold also. Th 1917 cars have a hot air stove integral with the ex haust manifold which is equipped with a valve s that hot air from this stove or cold air may be take as desired. There are no changes in the carburet proper. 4—No. 5—To wash out the battery it wi be necessary to completely disassemble it. Th should be done once a year.

2094 **Delco System on the Buick.**

From J. H. Fay, Iowa.—I would like to recei some light on the following described difficulty th

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I am having with the Delco system on the Buick D-45 of 1916. At certain times only, when the ignition switch is pulled out there is a big discharge from the storage battery as shown on the ammeter; there is no motoring of the generator; absence of the clicking sound in the forward end, and the starting pedal cannot be depressed. At other times the starting pedal can be depressed, when there is seemingly no motoring of the generator, absence of the clicking sound in the forward end, yet the engine can be started. At other times when the ignition switch is pulled out and the starting pedal depressed the whole thing works perfectly well. Where can the trouble be? We have cleaned all brushes, even the shunt or third brush, also inspected all connections. The battery has been lately charged.

Reply.—The accompanying diagram shows the starting and charging circuits of the Buick, D-45. There are two main terminals on the motor generator. These are indicated by "A" and "B" in the diagram. "A" is the larger of the two terminals. There are two wires leading from "A." One goes to No. 1 terminal on the switch panel. The large wire goes directly to the battery. One wire leads from "B" terminal to No. 2 terminal on the switch panel. When the starting pedal is in normal position, the brush "E" is bearing on the

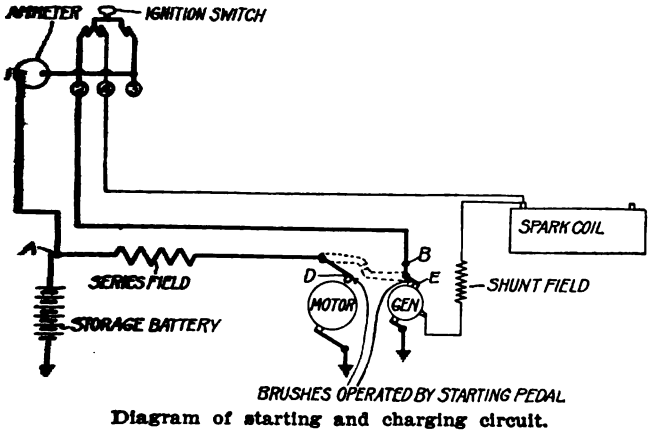


Diagram of starting and charging circuit.

generator commutator, and brush "D" is raised off the motor commutator. When this pedal is depressed it performs a double function. It lifts brush "E" and drops brush "D," at the same time bringing the starting gears into mesh. When the pedal cannot be depressed, it is because these gears are not properly lined up. If the generator doesn't "motor" when the ignition switch is pulled out, the gears are very apt to not be in line.

Your trouble is certainly generator trouble. There are four things that could be the basis of it. If you had been just a little more explicit and had advised us whether the generator charged the battery at any time when the engine is running, it would have helped to eliminate at least two of the possible troubles. However, we must credit your question with being more than ordinarily clear, and if you will follow these instructions closely, you will soon locate your trouble. When you pull out the ignition switch and get an excessive discharge, as shown by the ammeter, it may be: First, the brush "E" or the wire leading to this brush is grounded; second, the generator winding may be grounded; third, the shunt field may be grounded; fourth, the shunt field may be "open."

To test for the first trouble, insert a piece of paper between the brush "E" and the commutator, and remove the wire from switch terminal No. 4. Then pull out the ignition switch. If you don't get an excessive discharge, you can be sure that this brush and the wire leading to it are O. K. If you do get the excessive discharge, then remove the wire from terminal "B." If you don't get excessive discharge after removing this wire, the trouble is in the brush. You can then look closely and find it. If you still get excessive discharge, the trouble is in the wire leading to "B."

After you have satisfied yourself that the trouble is not in this brush or wire, then replace the wire on switch terminal No. 4, and remove the wire from generator terminal "B." If you then get an excessive discharge, the shunt field is grounded. This would be very apt to be caused by running the engine rapidly when the storage battery is removed. There is a small wire that comes out of the motor-generator at the rear and connects on to the spark coil at the rear terminal. This is the shunt field wire.

Now to test for the fourth trouble, remove both the wires from this terminal of the spark coil (while the wire is still removed from "B"). Put these two wires together. Then you should get a slight discharge—perhaps from one to three amperes. If you don't get this discharge, the shunt field is open. If you find that the trouble is not the first, third or fourth, it must be the second. Any of these troubles except the first will necessitate the removal of the generator, and will require the services of an expert electrician.

2095 **A Kerosene Mixture.**

From Otis Carr, Michigan.—I am experimenting with fuel mixtures and using one-third kerosene with the gasoline on a Ford, and find it works quite successfully, but am told it is not good for the engine. Will you inform me if kerosene is injurious to the engine in any way?

Reply.—A third part of kerosene is not likely to cause any trouble, but it is not advisable to use much more than this proportion, unless a kerosene vaporizer is fitted, as there is a risk of wet kerosene getting into the cylinder and spoiling the lubrication by getting past the piston rings.

2096 **Wants More Power.**

From Ed. Whittaker, Tennessee.—My car lacks engine power to maintain a good average speed. It takes all hills but only at a slow rate. I believe the gearing is specially low for the purpose. It has been suggested to me that by having auxiliary exhaust ports made in the lower part of the cylinders the engine would develop considerably more power than it does. Is this a practicable plan?

Reply.—To alter an engine that is reasonably satisfactory in the manner proposed by cutting exhaust ports in the cylinder walls is not advisable. It is more likely to result in spoiling the engine than to improve it, as there would be trouble with oil and water leakages. It has not by any means been proved that, even when an engine is designed with auxiliary ports, any advantage is obtained as compared with what can be obtained with sufficient valve area. A more practicable idea is to enlarge the valves.

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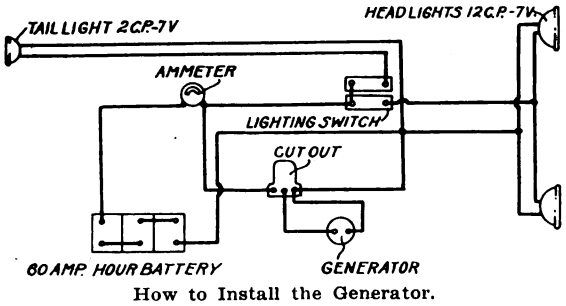
2097 **Fixed Ignition.**

From C. L. A., Delaware.—I have a four-cylinder car with which I obtain, in a general way, satisfactory results. The magneto has a fixed ignition timing point, and the explanation given is that it is better than variable timing because the spark advances itself as the speed increases. I fail to see this. The spark is bound to occur at the same time in the stroke whatever the speed may be for the position of the make and break, of course, is constant. Is there any foundation for the claim, or is it only a theory?

Reply.—A magneto cannot be self-advancing in the technical meaning of the term unless it is fitted with special mechanism for the purpose. There are several types of automatic advance magneto made. In the case of the standard type of magneto there is no more foundation for the claim that it is self-advancing than the fact that the spark becomes hotter and denser as the speed increases, and the theory is that this to a slight extent may cause a proportionately more rapid combustion of the charge. Tests that have been made, however, show that the effect is not very marked, as the modern magneto gives a fairly powerful spark even at low speeds, and there is a limit of speed reached at which the spark intensity remains constant.

2098 **Installing a Generator.**

From William A. Korizek, Montana.—I wish to install a generator on my Regal 30. The car was equipped with Prest-O-Lite before. The generator is a W.S., made in Indianapolis, which I wish to drive from my magneto shaft. I also have a governor on the generator pulley. Could I light two headlights and tail light and charge my three-cell storage battery? If so, what size globes would I need for the lights and what amperage must I have to set my governor to register on my ammeter. I have an Overland cut-out for charging my storage battery, the same as used on Overland model 80, and two snap switches for the lights. Please draw



How to Install the Generator.

me a diagram of wiring, which I will appreciate very much. I thank you in advance for any information on this subject.

Reply.—We are not familiary with the W.S. generator and have been unable to obtain any information about it. To do the work required, it should be capable of giving 6 amperes and 7.5 volts. We would suggest that you write the manufacturer for this information or test it out yourself. Wiring in accordance with the accompanying diagram will be found satisfactory. The generator must be geared to turn at sufficient speed to give an output of 6 amperes when the car is traveling fifteen miles an hour on high-speed gear. The governor may be set to give a maximum of 6 amperes. You may find it necessary to adjust the Overland cut-out. Test for closing by gradually increasing the speed of the motor and noting that ammeter needle does not move to "discharge" side when the points close. Also, with engine running at a fair rate of speed, with the lights off, switch off the ignition and, as the engine speed decreases, see that the ammeter pointer does not show more than one ampere discharge before the cut-out points open.

2099 **Wants to Charge Battery.**

From The Allen Garage, Wisconsin.—We would like some information on the following: I have a private electric light plant, 32 volts. The switchboard has a rheo-voltmeter, ampere meter, starting switch, main line switch, counter-all switch and fuses; also cut-out. I put a double pole, double throw switch on so I can switch on my battery or on same from a car. Now, I want to use some lamps for resistance so I can charge 6 volts if I need to. The way I have the lamps now is like sketch and I want to know if it will hurt the generator. It is a Western Utility outfit.

Reply.—The method of connecting your lamp bank, as shown by your diagram, is O. K. It will not hurt the generator in any way.

Each lamp that you have burning will allow the battery to charge at a little greater rate. If you use 20-watt lamps, each lamp will pass about ½ ampere of current.

If you use 40-watt lamps, each one will pass about one ampere; 60-watt lamps will pass about 1½ amperes. If you have a battery that should charge at a 6-ampere rate, you should use twelve 20-watt lamps, six 40-watt lamps or four 60-watt lamps. This will give you an idea so you can meet conditions to charge any sized battery. If you charge two or more batteries in series, each lamp will pass less current than stated above. Always be careful to not have your short-circuiting switch in, unless you are charging five batteries at once.

2100 **Stops Suddenly.**

From T. H. King, Tennessee.—My Cadillac eight stops suddenly. The lights, horn and starter works O. K., but I cannot get a spark to the distributor. I have traced all wires and find no short circuits or loose connections. It seems that no current gets through the coils, only just enough when you hold to the terminals so that you can feel a little current.

Reply.—This trouble on these cars has usually been traced to a defective condenser. The condenser is screwed to the end of the generator and may be readily detached and replaced. It cannot be repaired. Before doing this, however, clean the primary interrupter points thoroughly with a very fine file or small strips of emery cloth, being careful in the latter instance to draw the emery cloth very straight between the points so as not to round them. These points are often found coated with an insulating deposit when they appear to be perfectly clean.

2101 **Rocker Arms Knock.**

From Roy Kenney, Kentucky.—1—I have a Buick, model D-45. The valve rods knock and adjusting them does not stop the knock. Is there any manufacturer that makes fiber inserts to lessen the noise? If so, please inform me as to the name and address. The Buick model D-45 is equipped with a Marvel

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carburetor. The carburetor on my machine drips when the engine is not running. 2—After leaving the engine still for a little while and then taking off the cover of the float chamber, it is nearly full of gasoline. The tickler does not hold the float down. The float valve seems to fit tight. Please give me your advice as to what is the trouble with my carburetor. I have had some trouble in starting this winter. The machine is in good working order when the weather is mild. 3—What are some of the best methods used to prime an engine on a cold morning to make it start easy? Is it practical to use a mixture of ether and gasoline to make an engine easy to start?

Reply.—Quite likely the Wilmington Fiber Specialty Co. will supply you with fiber inserts if you state to them just what you want. The construction is such that it is practically impossible to muffle all the points where noise might occur. Cover the radiator to prevent circulation of air and run the engine until the water boils. Then adjust all push rods against the rocker arms finger tight. It is not possible to unseat the valves by this method and the engine ordinarily will not get hot enough to cause any greater expansion of the valve stems than when the adjustment is made. If much time is consumed in adjusting the valves it will be well to run the engine again after half of them have been adjusted. If this does not stop the knock, examine the cam followers and cams for possible wear. 2—If you are certain that the float valve does not leak and that the gasoline rises to too great height in the float chamber, the float arm must be bent or the float saturated with gasoline. In the latter event, the float may easily be removed and dried for several hours in the sun or on a radiator, when it should be given a very thin coat of shellac and replaced. On this carburetor there is a plate bolted to the bottom which is made gasoline-tight with a gasket. This gasket may leak. If the leaking continues only for a short time after the engine is stopped you will probably find it is due to condensation in the inlet manifold. Some Buick cars have the inlet manifold equipped with a hot air jacket to prevent this. 3—As the Buick engine has no petcocks, it would be well to attach a small priming pump to inject gasoline into the inlet manifold. This device may be procured from any accessory dealer. We do not know if tests have proven the use of ether to have any detrimental effect on the engine, but it certainly will assist in starting a cold engine, either when used alone or mixed with gasoline. However, the fact that it ignites more readily than gasoline makes it more dangerous to handle. It would be better to use a gasoline primer and wrap a cloth around the inlet manifold and saturate it with hot water.

No Getting Rid of Vibration.

From Guy C. Booth, Iowa.—Please look this over. Are my ideas, in your opinion, right or wrong? The question of balancing an engine to prevent vibration can never meet with more than partial success and though due to the weight of the cylinder block and the bore of the cylinders, their "kick" may be minimized and the resulting vibration nearly eliminated, it can never be done entirely in the reciprocating engine. The balanced crank shaft and the eight cylinder engine were hoped to solve the problem. We know that to perfectly balance a rotating mass so there will be no vibration at all speeds, for every point within the mass there must be another point diametrically opposite equi-distant from the center. Otherwise there are strains on the mass. The balanced crank shaft is the nearest possible approach to these conditions, and, of course, its rigidity holds the rod bearings to place without distortion. We know that if these were small enough they would be distorted by centrifugal force, as they are not balanced according to the above rule. The "kick" as I call it—the force of the combustion—pushes the cylinder head away from the piston, and as we cannot get another power stroke diametrically opposite, having other parts balanced, I can claim it is impossible to build a motor without vibration at all speeds or at any speed.

Speed of a Motor.

From Cherol F. Aldrich, New York.—In the February number Mr. Charles E. Duryea makes the statement that speed is short life to an engine. I agree, but would say that a run of five miles at from forty to fifty miles per hour will not affect a motor as much as one good hard pull on a hard hill. That is, if bearings are tight and true. A motor running slow will strain itself. A motor running fast, as you already know, is free, if properly oiled.

Buick Battery Failure.

From N. A. Luce, New York.—In the February issue I notice inquiry No. 2077 in regards to Buick battery failure. I have had similar trouble which in every case was overcome by turning up the battery connections as tight as possible without stripping threads.

That Hupmobile Motor.

From Henry Albert, Michigan.—In the January issue I took notice of question No. 2037, from C. S. H., California, regarding his 1915, Model K Hupmobile. I am driving a 1916, Model N, Hupmobile and had to contend with the same trouble for about four months last year. My motor acted the same way in every respect and I tried every thing I could think of hoping to eliminate the trouble. Among other things I had the Zenith Carburetor Co. make all the different adjustments possible, I used three different sets of tungsten points in the Atwater-Kent system, had a new high tension coil installed and carbon removed, valves ground and tappets adjusted but all without results.

Well, to make a long story short, I eventually discovered that my motor never acted that way when it was cool and I therefore came to the conclusion that my motor had a bad case of pre-ignition. I found that two of the spark plugs were longer than the others, by that I mean that two plugs extended into the combustion chamber farther than the others. I procured two of the shortest plugs I could find and my trouble was gone.

What really happened was this: The electrodes of the two plugs which reached into the cylinder too far would become red hot and pre-ignition result. I would like to suggest that two or three extra gaskets under the ordinary long plug will give the results; however, I would use a little graphite-paste between gaskets to insure against gas leakage.

Since I got the trouble fixed my motor has been

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running like a clock and there is no hill or mudhole that I wouldn't tackle as far as the motor is concerned. I hope that the above will be of some service to C. S. H.

Why Ford Does Not Pull on Reverse.

From Murray Fahnestock, Pennsylvania. — Answering No. 2044, as Mr. Powers' Ford car does not pull well when reverse gear is used, it is probable that the transmission band for the reverse drum overlaps the slow speed drum, so that when the band grips the drum, it grips the slow speed drum also, thus causing great friction, and tending to stall the motor. The band would not need to overlap more than an eighth of an inch to cause this trouble. By removing the small plate which closes the opening in the top of the transmission cover, the action of the reverse band can be observed, and the band straightened, if necessary. A supplementary gear which attaches to the drive shaft housing, near the rear axle, and furnishes two additional speeds is made by the Woodward Truck Attachment Co., of Los Angeles.

Dependable Electric Trucks.

From A. Jackson Marshall, National Electric Light Association, New York.—A very large number of successful organizations are operating big transportation fleets of electric commercial vehicles. In fact, the total value of electrical truck equipment at the end of 1916 was approximately $36,000,000, brewers, department stores and public service companies alone having an investment of about $15,000,000.

New York City, on February 5, 1917, experienced a very severe blizzard. A fifty-mile gale accompanied the heavy snowfall, and traffic was badly affected throughout the city. The poor horse was literally "snowed under."

The American Express Company, which operates 245 electric trucks and 259 gasoline trucks in the city, on this stormy day had forty-six trouble calls from their motor trucks. The almost absolute dependability of the electric truck puts it foremost in the handling of express, as well as in other businesses requiring dependable transportation facilities. Comparative operating costs have proven the economy and efficiency of the "electric" in delivery work, and these are as great assets as its dependability. The electric commercial vehicle has made rapid strides during the last few years, and is becoming more and more a factor in city transportation.

Electric or Steam.

From Guy C. Booth, Herndon, Iowa.—As the distribution of electric current is placing it within the reach of so many in the country, it seems there is an opportunity for the electric to become the "Farmers's Friend." When we can drive into our garage, shove a charging plug in place and leave our car, knowing the circuit will be broken when the battery is fully charged, it will certainly be some joy. With the battery in proper condition we do not need to fear starter troubles. We will have all of the speed necessary. There will be long life for the driving gear as there is steady torque and no jerking. The electric and the steam car with its ability to eat low grade fuel, may some day get us away from the gasoline bugaboo and its necessary evils.

Not New But Useful.

From N. G. Near, New York.—A friend of mine befriended a Ford owner the other day in a way that I believe is novel. At least I never heard of the method before. My friend, driving along in his massive car, came upon a Ford owner at the bottom of the hill trying to get up. "What's the matter?" asked my friend. "Out of gasoline," said the Ford man. "Have you tried turning around and backing up?" my friend ventured. "There's a garage on the top of the hill and I believe you can make it." Before trying, the gentleman wanted to know what good it would do him to turn around and back up. He had never heard that one can back up without gasoline, he explained. My friend then showed him that there was still some gasoline in the tank, but on account of the inclined position of the car it would flow into the carburetor. "By turning around," said my friend, "you can see that you will still have some gas available." "All right," said the Ford owner, "just help me turn around and I'll give your method a trial." My friend helped him, and in a few minutes the Ford car was rapidly chugging backwards up the hill. It reached the garage all O. K., took on a new supply of gasoline, and thereafter all was well.

Starting on Acetylene.

From H. E. Trekell, Kansas.—I have been reading the Automobile Dealer and Repairer for a year and have gotten several ideas therefrom, and will submit my way of starting a car in cold weather. Mine is an Overland 69 T, without starter. I have a 2-way connection on the searchlight tank. One hollow wire runs to the lights and the other I run to the manifold just above the carburetor. This Searchlight or Presto gas will start a motor on the first turn of the crank, no matter how cold, if you have any spark, and providing your oil is not too heavy. I have run home on it when out of gasoline, but you want to be ready to turn the crank immediately after the gas is turned on, and don't advance the spark too far or you may suffer a broken crank shaft or a broken arm, as the gas is mighty quick and powerful. It has saved me much time and temper on cold mornings. I think it would be a great saver of storage batteries even with the self-starter on the car, and would be good to start tractors too. This 2-way connection for the gas tank is the regular equipment for the 1913 Overland, with the gas starters on the dash, but the starters were not very successful, so I tapped the gas directly in the manifold and turned it on at the tank. Put one on and you won't need any more hot water to pour on the carburetor and can start any time.

Transmission Gears.

From Roy Kirkpatrick, Oregon.—In regard to No. 2044, page 48, of the January number, will advise Mr. Powers of Idaho, to write to Kellenburgs Mfg. Co., 1306 Old National Bank Building, Spokane, Wash. They make an intermediate and extra low gear combined that sells for $30. I hope this may be of use to him.

Will He?

From H. H. Hobbs, New Jersey.—Will Mr. Fred Farrar, of New Hampshire, page 63 of the last issue, tell how he lengthened the wheelbase of a Ford car to 108 inches?

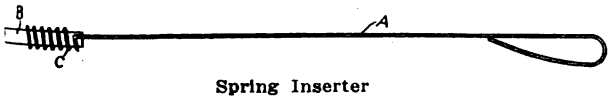
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Electric Lights and Oil Pan.

From H. L. Bartlett, Montana.—There has been a great deal said and written about Ford electric headlights, and I am writing this article as I have found something that I have never heard of before, and it may help others. A party with a Ford car came to my shop with the lights just making a red glow, and speeding up the engine made very little difference in the light. I put in new bulbs and rewired the car two different ways, using new wire and new magneto cable but without any results whatever. A few days later I had occasion to take the engine out of the car for transmission trouble. When I had removed the same, I found that the owner had either hit an object with the oil pan or possibly he had struck a rock with the front wheel, the same coming in contact with such force against the oil pan or transmission case as to dent the same in against one of the magneto coils, breaking the insulation on the coil, and the vibration of the engine caused the coil to rub against the oil pan which was nearly to the bottom of the coils. When the insulation had worn through the coil short circuited through the oil pan and the owner was only getting about one-half the current from the magneto or coil windings. The current was sufficient to run the car but not sufficient for lights. After straightening the oil pan back in place and insulating the magneto coil and putting the engine back, the lights were as good as ever. As trouble may be found where least expected, it would not come amiss for any one having such trouble with their lights to examine their oil pan.

Valve Spring Insertion.

From Walter V. Greenwood, Rhode Island.—In a great many motors it is a patience-trying job to insert valve spring retainers. Getting them out is easy enough, but putting them back is a different



Spring Inserter

matter. The easiest and simplest way, I find, is to take a thin piece of copper wire, A, about 12 inches long, and twist one end around the retaining pin, B, spring fashion, as at C. Raise the valve spring in the usual manner and insert the pin. By carefully twisting the wire it can be drawn off the pin. You can then use the wire to punch the pin to the desired position, then let down the spring.

For a Broken Porcelain.

From E. C. Hall, New Jersey.—Please tell the readers of the Automobile Dealer and Repairer that it is not necessary to discard a spark plug because the porcelain is broken. Draw a line across the break or in some way mark the exposed end so that it can be replaced just as it was before the break, unscrew the top and lift off the loose end; punch a hole through a rubber sheet (an old inner tube or patch) and slip over the center iron down to the break; replace the end taken off and screw down. The rubber when pressed by the screwing makes a joint perfectly insulated. In putting back the part taken off, care should be taken to have it just as it was and that it does not turn in screwing down.

Cracked Spark Plugs.

From A. I. Smith, Colorado.—Referring to No. 2039 in your journal for January, entitled "Cracked Spark Plugs," will say that I have had some experience along this line, with the result that by going into the matter I found the cracked porcelains to be caused by water and moisture in the gasoline. As soon as I drained my gasoline and vacuum tank systems and strained the gasoline through a chamois, I found my trouble ceased. It is very true, as you state in your reply to Mr. Kruse, that the plugs extend into the firing chamber too far sometimes, with the result that the incoming charges of fuel will cool the porcelains so quickly while they are hot, that they become cracked. But I am sure that water in the gasoline is the cause of the greater per cent. of cracked porcelains.

High Prices for Material.

"Back of the increased cost of labor and materials, which has been set forth as the prime reason for many price advances in the last year is a wide and deep sea of real truth in the automobile industry. If for nothing more than prices and material market conditions this year will be phenomenal in motor car history." It is in this way that Don L. Watson, assistant general manager of the Haynes Automobile Company, sums up the motor car manufacturing aspect of the coming year.

"To be specific about material prices," says Mr. Watson, "it is only necessary to mention the open hearth steel, used in automobile drop forgings, which has gone up from 150 per cent. to 300 per cent. Next to open hearth, nickel steel has given itself over to making marked advances in price. This material, which we use extensively in making Haynes chasses, is resting temporarily at marks doubling those of last year.

"The aluminum market has fallen far short of being stationary, with its present quotations tripling those of two years ago. Tires are higher with increased prices for crude rubber and fabric. Leather, top materials, copper tubing, the sheet metal used in making fenders, bonnets and dust pans are from twenty-five to 100 per cent. higher than in previous years. Then with these advances, the labor cost, which is the largest single item in making a motor car, has increased by a generous percentage.

"A number of automobile manufacturers have revised their retail list figures, but with this they are scarcely keeping up with the procession. Prices to the owners in rare cases have been increased more than ten per cent. With basic materials from one to three times as high as they have previously been and no material at a standstill, it looks as if the car buyer will get more for his outlay this year than ever before."

Your valve should be ground in at least every 1,000 miles, although some people let them run to 1,500. At that time they will be found to be so badly pitted that it will be a long job grinding them. Grind one a week or so and it will not seem such a terrible job, unless the head must be removed to take out the valves, when all must be ground at once.

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A. A. HILL, Editor

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK MARCH, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

SPEED LIMIT.

The idea first proposed in this magazine that there should be no fixed speed limit whatever to automobile driving, is rapidly growing. The fact is, whenever a car is being driven at a speed that endangers other users of the highways or streets, it is being driven too fast, and no matter how fast it is being driven, if it does not endanger other users of the highways or streets, it is not being driven too fast except for the car and its occupants, with which the public or the law should have no control.

If a car driver or owner wishes to drive so that he will endanger his own life or his car, let him. In fact, although it has been declared a crime under the law to attempt suicide, we can not see why it should be, contemptible and cowardly, as is the act in most cases. The act itself carries its own punishment, and if a person's life is really worse than useless to himself or any one else, and if it be unbearable because of this, we see no reason why he may not take it; nor do we believe that the Infinite Judge will pass on the act other than mercifully. So much for that.

But punishment for those who are indifferent to the safety of the lives or property of others should be both sure and severe. How can this best be accomplished? Why, by inflicting a penalty for driving at a speed that endangers others, whether that speed be six or sixty miles an hour. Of course, evidence against such an act is often difficult to obtain. But in any case the testimony of the alleged offender should not count much against that of the officer or complaining witnesses. Trumped up testimony is not likely in cases of that sort, and at best a dozen culprits are likely to escape punishment where one innocent person is punished. The important point is that the question of undue speed is a relative one only. A man may be driving at six miles an hour and yet endanger others users of the streets or highways, or he may drive fifty miles and not be likely to harm any one or thing save his own reckless—and often worthless—self.

The best way to safeguard the individual is to safeguard the public.

AS TO FOREIGN MARKETS.

Speaking of foreign trade, an important recent tendency must not be ignored. There is a feeling among all the great nations of Europe that they confine import purchases to such things as can be paid for by other goods and not by cash. Not only will these nations try to export as much as possible, but they will make an equally strong effort to buy abroad absolutely nothing except that for which they can exchange other goods of which they have a surplus.

And, indeed, that is the only kind of foreign trade that is beneficial to both parties engaged in the transactions. Of course, nations that can sell things abroad and get cash for them will thrive like the proverbial "green bay tree," but how about the nations that pay the cash? How about the nations or the individuals that continually buy more than they sell? They will sooner or later become bankrupt and unable to purchase.

The only permanent trade that can exist between nations is an exchange of products, and not the exchange of a product for cash, the representative of a product. It is true that if one can buy an automobile of a given value in England or Germany at a lower price than it can be purchased in his own country, he is likely to do so. He will not be greatly troubled over the fact that if all citizens did so it would bring a blight upon national prosperity. His chief concern over that prosperity is usually of the "let-George-do-it" kind. But doing so he is not a good and loyal citizen, nevertheless. To protect a nation from such acts, the system of leveling duties upon imported products was devised, and it is a splendid economic principle.

On the other hand, we can't "have our cake and eat it, too." If our policy is to patronize home industries and to produce manufactured articles at as low price only as can be done by paying wages in consonance with American ways of living, and to levy tariff duties to keep the cheaper products of other countries out, how can we expect to compete with those other countries for foreign trade? The idea that we can pay big wages and still produce at as low cost as is done in countries where low wages are paid, is simply nonsense. If it were possible, such other countries would soon be obliged to protect their home markets by a tariff.

It is clearly then impossible to have a big export trade of manufactured products and still enjoy a big home market. But as only one can be expected, which is the better? Well, before the European war both England and Germany were conspicuous examples of the economic policy of securing a big foreign trade at the expense of the home market. What was the result? In England at the beginning

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of the war, the few had all the prosperity and the many had none; the rich were few and very rich, and the poor were many and very poor. How about Germany? There the workers not being able to keep body and soul together from their own efforts. that miserable system, workers' pensions and insurance against non-employment was put in force. the funds for such protection being mostly secured by a law compelling the workers to pay over a certain per cent. out of their wages. We will not attempt to decide which economic policy is to be preferred—the impoverishment of the many but still allowing individual freedom, or their impoverishment mitigated by government aid or pure charity.

In this country we have every variety of soil and climate and all the agricultural and mineral products that such soils and climates yield. This nation has the means of ample sustenance from within. We could live and live comfortably if we were to not export or import a dollar's worth. It is true, our prosperity will be increased if we exchange with other nations, but never at the expense of our home markets.

AUTOMOBILE SCHOOLS.

The time is coming when every young man will be as familiar with the principles and construction of an automobile as he is now familiar with the multiplication table.

If manual training be necessary in the public school curriculum it should clearly include automobile training. Only a small portion of the community are carpenters or typewriters, but soon it will be essential that every living human being know how to run an automobile, and to run it he must understand the principles upon which it is constructed—ignition, carburetion, lubrication, electric starting and lighting, and the general principles of its operation.

Until such steps are inaugurated in our public school system, private automobile schools should be encouraged. There is need of them. On another page of this issue will be found something concerning the Y. M. C. A. school of this city, and right here we want to commend a school recently established in Omaha, Neb., the head of which is Charles Leighty, who for some time has been one of our valued contributors in relation to electric equipment. Mr. Leighty is an expert on this particular and most important feature of the modern automobile, and we have learned to place implicit confidence in his expert knowledge.

RESTRAINT OF TRADE

The steel trust, the beef trust, the Standard Oil trust and quite likely some of the other trusts, make inordinate profits and yet they sell their products at lower prices than if there had never been any trusts.

Now the question is, if the public can buy trust products at lower prices than if there were no trusts, should the government step in and fix prices and exercise other control of such organizations? There are two view-points to this question: One is that as it is the duty of the government to legislate only for the promotion of the public welfare, and as the public can purchase these trust products at a lower price than if no trusts existed, why should there be any Federal prosecution of them? The other is that the public welfare cannot be best promoted where monopoly is permitted to make unlimited profits.

Probably the best answer to each of these postulates is that we should have the trusts for they are in the line of progress but that they should be controlled so that the created may not harm their creators. Anything the State creates the State should have the power to control.

The temptation to take advantage of power and privilege is almost impossible to overcome. Where selfishness and greed are the impelling motives, strict adherence to justice is the exception and not the rule. But the trusts should not be overturned without the most cogent and plainly apparent reasons. "The restraint of trade" may be practised so as to promote the general welfare or it may not be. That word "unreasonable" which was read into the Sherman law by the Supreme Court, was an ill-considered one. The word "unjustifiable" would have been a better one.

Take the production of automobiles, for instance. The public could be better served if the entire business were in the hands of a gigantic combination. Economies could be adopted that would plainly be of advantage to all purchasers. But to imagine that such a combination would be of public advantage is quite another matter.

WORM AND CHAIN DRIVES.

It is worthy of note that the worm drive in the case of trucks has made a distinct gain and mostly at the expense of the chain drive. At present, about 67 per cent. of trucks use the worm drive, 11 per cent. the chain drive, 14 per cent. of the internal gear and 7 or 8 per cent. the bevel gear.

It is a fact, however, that other things being equal, the chain drive operates with less loss of power than any other form of drive or power transmission yet devised. Without the application of a load or draft the chain runs no easier than the worm, but when the load is added the friction of the chain increases only in equal proportion, while in the case of the worm drive the friction increases in greater proportion than the increase of the load. In the worm drive there is a rubbing of the parts that of course increases the friction according to the pressing together of these parts.

No doubt a well designed worm driven unloaded car will run about as easy as one that is chain driven, but when the load is put on and it is taken up a steep incline, the worm driven car will pull much harder or the generally recognized principles of friction are all wrong.

To make the illustration clearer, suppose we have two weights one of 500 pounds and one of 1000 pounds. Let them both be dragged upon a smooth surface and it will be found on putting on a dynometer that the 1000 pound weight requires more than twice as much power to thus pull it as it requires to pull the 500 pound weight. With no friction whatever, the pulling force of the heavy weight would be twice as much as that light weight, but the friction being twice as much on the heavy weight as on the light weight, it requires more than twice the amount of force to pull it.

The foregoing, at all events, seems to be correct, but we should be glad to get the opinion of some of our more scientific and experienced readers either for confirmation or refutation.

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PRICE FIXING.

The proposition which allows the Federal Trade Commission to fix the price of newsprint paper will probably be in effect before this issue is published. It is favored by the publishers and the newsprint jobbers, while the manufacturers will have to make the best of it, whether they want to or not.

But the situation is thought-provoking. If those who manufacture newsprint are to have the price they shall sell it for handed to them, so to speak, where is the price-fixing mandate to end? Why not get together and fix the price that sugar, hams, wheat, bread, pop beer and what-not may be sold for? Quite a howl went up when the minimum wage law was passed in some States, and the echoes have not yet subsided. Of course, the law is most short-sighted, aiming at effect as it does instead of removing the cause. But thus far we do not hear a word uttered in opposition to fixing the price of newsprint. And is our privilege of having our morning paper at the breakfast table at the cost of one cent of more consequence than that some unfortunate individual shall earn enough to be able to spread butter on his bread? We trow not.

Although somewhat hackneyed, O tempora! O *mores!*, seems to be in order. If we are to be impaled on either horn of the dilemma, one of paying just what may be asked for things, and the other of paying just what the government says we must —either combination rampant or socialism extant— "Under which king, Benzonian? Speak or die."

WHAT DO YOU THINK?

This magazine could be very much improved if our readers would tell us what articles, departments or views they like and what they do not.

In the present situation, the editor can only work "in the dark," so to speak, and rely upon his own fallible and probably not very correct judgment as to what is most acceptable. Although no effort is spared to make the Automobile Dealer and Repairer just as instructive and interesting as possible to its readers, yet perhaps some of it might be better directed to another channel.

That our readers collectively are like the late master politician, Senator Tom Platt, an "easy boss," we have abundant daily testimony in the friendly letters received. But if possible we would like to do more to merit that feeling, so warming to the heart and so impelling to greater effort.

NO SPRING WHEELS.

After something like one thousand patents have been granted for a substitute for the pneumatic tire, efforts are still being made to solve the problem. Far be it from us to try to discourage the ingenious, but the main difficulty is that they are working upon a false basis.

The inventor of a substitute for the pneumatic tire should first find something that is as light as air, as durable as air, as cheap as air, and as resilient as air. No spring ever made possesses a single one of these qualities. Springs are not permanently durable, they have weight, they cost money, and they absorb shock at the hub of the wheel and not at its periphery, which is a decided disadvantage.

TO INQUIRERS.

Readers should bear in mind that we can give replies by mail to their inquiries only when something is the matter with a car which they wish to remedy. To reply by mail, and "return mail" at that, to a variety of questions involving drawings or sketches and information which cannot be covered except by writing an article, and which pertains to general facts rather than to a specific trouble, must await publication in our magazine.

Moreover, we must again request readers to be as clear and explicit as possible in making their inquiries. If information is not worth that, it is not worth a reply. Often questions are received that are simply "dashed off," so to speak. If we "dashed off" the replies they would not be worth much. Every inquiry should be written and expressed clearly, and to insure this, it should invariably be carefully read over before being mailed.

CARBON DEPOSITS.

How They Are Formed and Some of the Means of Removing Them.

From J. N. Bagley, Nebraska—Ever since the gasoline engine has been in practical use some one has been trying to devise a plan to do away with the carbon deposits, or to make a device or preparation to prevent its forming on the head of the piston and in the combustion space of the cylinder. So far very few satisfactory methods have been found. The carbon deposit on the piston head and in the combustion space affects the running of the engine and reduces its efficiency. It absorbs the particles carried in the mixture, therefore the same amount of gas cannot do the work with the engine full of carbon, that it will in case the carbon is not present.

This carbon deposit becomes dry at times and as soon as the engine is well heated up the particles projecting above the piston becomes heated red hot, and causes what we term premature ignition, that is, the charge of gas is fired nearly as soon as the compression has started. This premature ignition has a bad effect on the working parts of the motor, especially the crank shaft, for the weight of the fly wheel is carrying the shaft very rapidly during the idle stroke and when the ignition takes place early, the pressure on the piston works against the momentum of the fly wheel and the shaft acts as the connecting agent for the two strains pulling against each other. This is not only hard on the crank-shaft, but it tends to loosen the bearings, and once they are loosened they will soon thrash out.

Carbon deposit also injures the valves more than many would imagine. A particle of carbon gets under the valve tappet preventing it from seating and if it remains in this condition for any length of time, with the burning gases passing under it, the valve face becomes burned and pitted, and the only remedy is to remove the valve and regrind it.

Carbon deposit becomes to an extent granulated and works into the rings and find its way under them causing trouble, which can only be remedied by removing the piston and taking the rings from them and cleaning thoroughly. The deposit finds its way under the rings and in a short time they will be crowded to the walls of the cylinder, so that it will finally be necessary to replace them with new. Many times this undue pressure on the walls of the cyl-

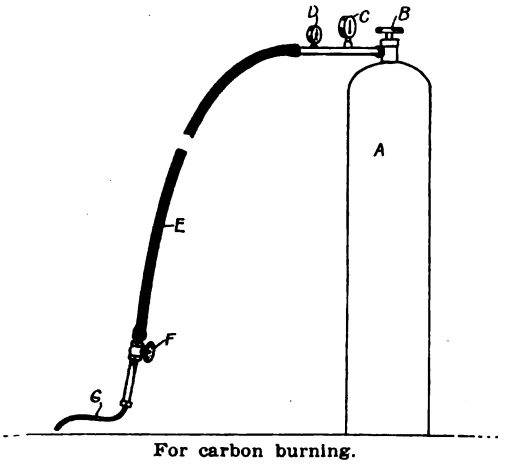
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inder will score the walls of the cylinder until a portion of the compression is forced past the piston into the crank case below, in which case the oil is heated and the lubrication of the engine affected.

One of the things that causes the carbon deposit quicker than all else is a poor grade of cylinder oil. This one thing alone should be guarded against very carefully, for a good grade of lubricating oil is much cheaper than the machinery which goes to make up the engine, and, as a matter of fact, every user must buy one or the other new parts or good oil.

While it cannot be said that an over-rich mixture is a direct cause of the carbon deposits, it has much to do with it. A rich mixture burns very slow and sluggish, and the engine will miss fire more or less, and when it does this the oil will work up around the walls of the cylinder when the piston is making the outward sweep and a sufficient quantity is soon forced up to prevent the plug firing the charge. Consequently, as soon as the firing ceases every stroke of the piston pumps the oil up into the combustion space, and before the oil can be burned the surplus oil begins to form the carbon deposit.

There are many ways of removing this deposit,



For carbon burning.

but some of the methods are more tedious and expensive than others. The writer has in years past tried all of them and has come to the conclusion that among the best methods of removing it, is to take the motor down and scrape it or use the oxygen process. Of course, there are methods that will he'p if taken in time. For instance, in case the carbon deposit is very light a spray of kerosene can be fed into the air intake of the carburetor while the engine is running until the engine is nearly strangled, as we call it, and then hold up until it has gained sufficient speed for another charge of kerosene. This can be repeated until a quart of the liquid has been run through. Some have claimed success by placing the kerosene into the engine cylinders through the spark plug openings and leaving it stand over night. This has a tendency to cut the carbon deposit up until it will be thrown out through the valves when the motor is started. I, for one, do not approve of the method, inasmuch as it has a tendency to dissolve the deposit and it seeps down around the rings and the walls of the cylinders, carrying with it a quantity of the deposit which will work under the rings and have the effect already mentioned.

There has been on the market for some time a small chain which is placed into the cylinder through the spark plug opening and allowed to be churned up and down by the rapid action of the piston. This method, however, has not met with any great success in places where I have seen it tried. Then there are a number of crooked instruments which are used to scrape the carbon from the cylinders through the plug openings in the cylinder head. This is very well, so far as it goes, but it is impossible to get into all parts of the cylinders through a small opening. Of course, where the head of the motor can be removed and the scraping done in a thorough manner, it is a very good plan.

Then we have on the market a number of liquid carbon removers, some of which are to be placed in the gasoline and some directly into the cylinders of the motor. Some users seem to be satisfied with the results they obtain and some do not care to buy the second time. With most of these I personally have not had complete success, but possibly I have expected too much of them.

During the past year there have been a number of carbon removers placed on the market in the form of a tablet placed in the gasoline tank, and thus the carbon deposit would be removed and other deposit prevented forming on the piston head and in the combustion space of the engine. But my own favorite method of removing carbon deposit is to use the oxygen process, which is by no means an expensive method, considering the results and the time taken to do it. The outfit consists of a tank of oxygen gas, which may be purchased from some concern making the oxygen and furnishing it in steel drums, which they loan for a given time, the user paying for the gas in the tank. Then there will be needed a reducing gauge to reduce the pressure from that of the tank to about 50 pounds. A small amount of hose and a carbon burning torch completes the outfit. To use the outfit requires no special skill for the process is very simple. In the first place, it is necessary to shut the gasoline from the supply tank and start the motor, burning out all the gasoline in the carburetor, and letting the engine run down for the want of fuel. This eliminates the danger of fire from the cylinders when the burning is started. Now remove the plugs over the valves and the engine is in shape to be rid of the carbon. Place the tank A, as shown in the illustration, at a convenient place and open the valve B on the tank. Adjust the regulating valve until the gauge C shows about 50 pounds of pressure. Valve D should be a needle valve as the pressure is easier controlled. Have sufficient hose, E, to allow of the torch G being worked in any position that may be desired, and you are ready to begin the operation.

Turn the engine over until the piston is at the top dead center with both valves in a closed position and light a match and lay inside. Turn the valve F open slightly, directing it onto the burning match, and as soon as the carbon begins to burn open the valve F sufficiently to burn the deposit quite rapidly and leave it open until it will burn no longer. As soon as the carbon is removed the sparks will stop circulating about in the combustion space and the cylinder is finished. Two cylinders can be burned out without changing the position of the crank shaft, for two pistons are up at the same time in a four and six cylinder engine.

The price for this work varies in different localities. In some parts of the country 50 cents per cylinder is about the price charged, while in some

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sections $1 per cylinder is asked. However, the latter price is just a little high. In nearly every case after a customer has had the carbon taken from his engine in the manner just described he will have it done every once in a while, for it makes the engine run so much smoother and the fuel consumption is lessened quite a little as compared to running it with the carbon in it.

The cost of the outfit will not exceed in any instance ten to fifteen dollars, unless it is something out of the ordinary. There are a few outfits on the market, however, which may cost a trifle more but they have a special pilot light that is fed from an acetylene tank to keep the burning going on in case it happens to go out. In case the pilot light is used, no other means of lighting the gas will be necessary. It will be necessary to have extra tips for the torch, for many times they will become burned sufficiently to render them useless, and unless an extra one is kept on hand, a delay will result, and it might happen with a motor only partly cleaned.

The tank is quite heavy to handle and can be placed on some sort of a small truck patterned after the flour truck used in the mill. The tank can be made secure and it can be moved about over the shop at the will of the operator. It is also a very good plan to have for all the necessary wrenches a place on the truck and have them kept there. Otherwise there will be a waste of time in looking up the necessary tools to do the job.

A MODEL CAR.

But How About a Motor for This "Ultimate" Automobile?

Some one who has a penchant for such things and who really knows something about automobiles, has laid out what he terms the "all America car," and here follow his specifications. He does not fix a price for the car, but we may say that possibly it could be sold for $2,000.

Motor—Crank balanced against vibration, like Hudson.

Cylinders—(four) Aluminum, steel lined, air cooled, like Franklin-Marmon.

Size—3⅞ by 5 inches, like Studebaker.

Cooling—Air around individual cylinders, like Franklin.

Pistons—Aluminum and cut away; oil ports in each, like Cadillac.

Transmission—Magnetic, no clutch, no gear, like Owen Magnetic.

Frame—Deep side member, Brush system, rust proofed, like Marmon.

Springs—Rear—Long underslung cantilever, flat type; two leaves at eye and lubricating insert, like King. Front—Long, flat, semi-elliptic with rebound leaves and lubricating insert; all springs vanadium steel, rust proofed, like Mitchell.

Wheels—Five twenty-six-inch steel disk or wire; rust proofed, Special.

Tires—Quick detachable style, direct on wheels without heavy demountable rims. All tires cord type, like Racing Cars.

Carburetor—Gasoline-kerosene combination; aluminum made, inclosed in exhaust and hot air fed; no manifold, Special.

Valves—Sixteen valves in head motor, like White-Buick.

Exhaust—Multiple, Moore system, like Lexington.

Feed—Two vacuum tanks under cowl to avoid evaporation, like King.

Tank—Double at rear with two indicators on cowl, Special.

Hood—High arched type with top ventilators, like Fiat. Front narrows down sharply close to radiator, something like Fiat-Velie.

Fan—Gear driven, double blade, high speed suction, like Pitter Type.

Axles—Front—I-beam section with heavy knuckles; rust proofed. Rear—Full floating, with spiral bevel drive; rust proofed casing, Special.

Brakes—Service—Electric and mechanical on transmission. Hand—External contracting on rear wheels, like Owen Magnetic.

Drive—Hotchkiss, through springs, like Franklin.

Radiator—None, but there is shutter over grilled air intake at radiator position, like Hudson.

Horn—Electric, inside hood, button on steering column, Special.

Lamps—Two forward and searchlight on windshield, all aluminum. Forward lights carried on radiator frame with wiring inside same. Nine-inch projectors, fog penetrating glass with no beam above forty inches above ground. Dimmers in top, red and green side lights, double wire system, Special.

Mud Guards and Aprons—Full protection to car from its own splash, front, rear and at sides, aluminum, like Marmon.

Body—Four-passenger foursome, seven-passenger touring, or sedan, Special.

Panels—Aluminum with baked enamel, all metal frame, like Premier-Mitchell.

Doors—Wide, opening forward with full swing and free exit. Double lock and fasteners for swinging open in heat; locked pockets inside frames for tools, like Winton.

Seats—Tonneau seat wide enough for three in comfort, like Packard. Front seats divided with slight side arm to hold occupant. Both reversible, like Studebaker.

Upholstery—Plaited dull leather with aluminum wire trimmings. Deep double set of springs, Marshall system, like King.

Steering Wheel—Tilting, with hand warmers in handle, like Peveco Type.

Cowl Set—Rim winding clock, oil pressure gauge, two ammeters, dash light, Special.

Windshield—Slanting triple rain vision, with all sections capable of being put out horizontal. Weather stripped to fit frame exactly; upper section overlapping lower, like Westcott.

Tire Pump—Engine driven, Special.

Steering Column Set—Controls for lights and ignition on steering column; magnetic gear is its own electric starter and dynamo; wheel and electricity locked by one key, like Overland.

Heaters—Flat exhaust gas heaters in front and rear compartments; multiple exhaust permits of separation of gases, like Franklin.

Toolbox—Locked, under hood, Special.

Folding Seats—In floor or under front seats; side arms, like Studebaker.

Top—One man type, imitation leather, with visor to fit down on windshield; triangular side wings to

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rear curtain. Large square lights of celluloid in side pieces, with door opening device for these, Special.

Lubrication—Force and splash feed, with two gauges, like Cadillac.

Winter Starter—For coldest days, Special.

Carbon Preventer—On motor, Special.

Carburetor—Change from gasoline to kerosene is gradual, not sudden, Special.

Speedometer—"Efficiency," Special.

Pump on Water Cooled Car—Convertible into Thermo Syphon in winter, Special.

BRITISH CRITICISM.

What an English Expert Says About the Faults and Advantages of American Cars.

The number of American cars in which an average-sized driver can sit at the wheel in an easy attitude when wearing a thick coat is almost to be reckoned on the fingers of two hands. There is a strong tendency to crowd the front seat right up against the scuttle and to stretch out the back compartment of the car till the rear seat passengers need a megaphone if they are to be able to speak to anyone in the forward compartment. There has been a great wave of endeavor to make the body better looking from the outside; now it is time to turn to a rearrangement of the interior. That this is commencing is obvious. The cloverleaf body is the logical swing back of the pendulum from the "ballroom" style of tonneau, and it seems likely that the ultimate result will be a happy mean between the two. There were two cloverleaf bodies in New York that were comfortable for four people—and only two.

Detachable Top a Temporary Expedient.

Another body that is extremely disappointing is the detachable top car. Having seen how well this kind of car can be worked out, the ugly, clumsy devices so many manufacturers had the pluck to exhibit were distressing. The detachable top is a good idea; let us not spoil it by lack of proper care in making it. Whether this type of body is to be permanent would be hard to say, but the trouble of storing the top when not in use is likely to militate against its popularity. It needs almost as much space as a second car. What the world really wants, and what nobody yet has been able to offer, is a reasonably inexpensive cabriolet, a car with a detachable top, detachable by sections, so to speak, which will carry those sections about with it all the time.

The cabriolet has developed from the landaulet; it is a landaulet made to shut up, and as the landaulet is a complicated structure, the cabriolet is also complicated. Automobile engineers have taken the vastly complicated chassis of three years ago and made a real motor car of it without very much trouble, so there seems no reason why the cabriolet should not be turned into a real engineering body structure. In other words, the detachable top is just as much a makeshift as is the cabriolet proper a complicated design, and there must be some halfway between the two which is the real ideal.

Seating Position Is Wrong.

It has been asked that this paper should be a criticism, so another comment of a rather adverse nature is going to be ventured. Why is it that it should be considered necessary for the passengers to sit in an absolutely vertical position? Rarely you see a woman and never a man sitting upright in a chair; so why compel both sexes to maintain this position while motoring? It is said that the European style of body, where a seat-back is so sloped that one sits in a car as in a comfortable club armchair, has been tried here and will not sell; but this is not easy to credit. It is only necessary to try a body with low seats and sloping backs over a rough road to realize how much more comfortable it is—with modern springs. It is easy enough to understand the vertical-back seat if you assume that the springs are not doing their work; but today the average of suspension comfort is so good that there is no excuse for bodies in which comfort is not studied just as though it were a bit of household furniture that was being designed.

Before finishing with bodies, let another small grumble be recorded. At the shows there have been many closed bodies—limousines or what not—that looked magnificent; yet on getting into them and sitting down it was found impossible to sit on the rear seat with an ordinary hat without adopting a crouching attitude; not because the roof was low, but because the back was curved forward to make a pretty junction with the roof. You do not find the manufacturer who has been supplying a high-class demand for years guilty of this sort of thing, but it seems to be prevalent among those makers who are trying hard to get into a better class.

Body Workmanship.

Finally, there was exhibited a woeful number of bodies in which, to use a British idiom, the ship was spoilt for a pinch (sic) of tar. The man who will pay $1,500 for a closed car would just as willingly pay $1,550, and $50 will make all the difference in the world between a job that is cheap and looks it and a job that is cheap and does not look it. It is not to be believed that the average man spending $1,500 cares much for a 5 per cent. difference. He is not that poor, or he would not be a buyer; and it seems that there is a great opportunity for really exquisite body workmanship on a small scale. We have plenty of indifferent work on a large scale, and there must be purchasers for both sorts. At present it is only for the man who wants something big and ostentatious that we seem to be catering.

That is enough about bodies; but these few remarks ought not to be concluded without remarking that, despite these criticisms, which have been brought out because they were requested, the average of body design at the shows indicated a great advance.

Having got on the subject of externals, there offers a good opportunity to congratulate engineers upon a thing that has so far almost entirely escaped notice, and this is the much better mudguarding. The domed wing has been made the common type by reason of its better appearance, perhaps; but however this may be, it is far more effective than the old style. The modern automobile keeps clean much better than the car of a little while ago, and this is a real forward step.

If the engine fails to develop full power these cold mornings consider whether it may not be because the cold air keeps the jacket water at too low a temperature. Cover up part of the radiator and note the difference.

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NOW CLEAN YOUR CAR

Importance of Attention at the Opening of the Season of Use.

One of the large automobile companies has sent out the instructions for spring overhaul. The advice applies to motor car owners generally and is:

"To assist both new and old owners we offer the following suggestions for putting the car in the best possible operating condition:

"Tires may be bruised or cut, in which case proper care should be given them before it becomes too late for repairs. The smallest cut will allow water to enter and rot the fabric, and if the cut is into the fabric, sand will work under the rubber and loosen the tread. The edges of small cuts should be smoothed with a sharp knife, then roughed with sandpaper, after which the cut should be thoroughly washed out with gasoline and a patching cement applied. After the cement has dried, the hole should be filled with a compound which the tire companies furnish for this purpose. In case of a large cut or blowout the casing should be vulcanized.

"Rust should not be allowed to accumulate on the rims, and painting with a preserver, such as ordinary stove polish, will prevent that condition.

"The front axle and steering assembly should receive a careful inspection. Excessive play in the front axle assembly can be easily detected by grasping one of the wheels and jerking the axle back and forth. If play has developed in any of the sockets or connections, the turning of the steering wheel will not have immediate effect. If there is play in the radius rods the studs should be tightened and the ball cap filed if necessary.

"If inspection shows that the bushings, which constitute the bearing surfaces of the steering post bracket, spindle arm, spindle bodies, and spring perches, are worn to such an extent that play has developed, it is advisable to replace them. If the steering gear has become loose it can be tightened by disconnecting the two halves of the ball sockets which surround the ball arm at the lower end of the steering post and filing off their surfaces until they fit snugly around the ball. If the ball is badly worn it is best to replace it with a new one. The sockets on the steering gear connecting rod should also be filed down if it is found that the ball has any play in the socket. In replacing the nuts be sure to put back the cotter pins, otherwise the nuts may work off the bolts and cause considerable trouble. It is advisable to go over the chassis frequently in order to see that these adjustments are maintained.

"The wheels should be removed and the balls and cones inspected. If the bearing surfaces of the cones are rough or considerably worn or if any of the balls are chipped they should be replaced, as the cost will be slight compared to the possibility of trouble developing on the road. The old grease should be removed from the hubs and replaced with new. In replacing the wheel see that it has no side play whatsoever and tighten the adjusting cone as much as possible without causing the wheel to bind. This can be determined by spinning the wheel, and if it comes to rest with the tire valves directly underneath the hub it is obvious that the ball bearings are not binding. The rear wheels should be tightened by setting up the lock-nuts on the axle shafts as close as possible without stripping the threads, so that the wheel hubs will be tightly wedged on the tapered ends of the axle shafts. It is advisable to remove the hub caps occasionally throughout the season to see that these adjustments are maintained. If this is not done, play may develop which will in time cause trouble.

"It is well to pry the spring leaves apart near the ends with a screwdriver and force lubricating oil or graphite between them. This has a tendency to make the springs more flexible. The nuts on the spring clips, spring perches, spring tie bolts, spindle arms, and spindle bolts should be tightened and cotter pins put in so that the nuts cannot work loose. In fact, it is a good idea that the entire car be gone over at this season and all bolts and nuts tightened.

"The circulating system should be flushed out by disconnecting the inlet and outlet water connections and allowing water under ordinary pressure to enter the filler neck, flowing down through the tubes into the bottom tank and out of the radiator. The water passages in the cylinder castings may be cleaned out in like manner by a flow of water from the cylinder head to the side inlet connection.

"The carbon should be removed and the valves ground, as after a season's use there is no question but what the efficiency of your engine can be improved by cleaning the carbon and grinding valves.

"The dirty oil should be drained from the crank case and the case cleaned by the following operations: Remove plug and drain off oil. Replace the plug and pour in a gallon of kerosene oil through the breather pipe. Turn the engine over by hand fifteen or twenty times so that the splash from the oil will thoroughly cleanse the engine and transmission parts. Remove the plug and drain off the oil. In order to get all the kerosene out of the depressions in the crank case the car should be pushed up a little incline about the height of an ordinary street curbing. This operation should be repeated approximately every 1,000 miles.

"The spark plugs should be removed and the points cleaned with gasoline. After cleaning, the points should be adjusted so that the gap between them is one-thirty-second of an inch, that is, about the thickness of a smooth dime.

"Examine the commutator and replace the case and fibre assembly if the contacts do not appear in good condition. If the roller is badly worn, that part should also be replaced. If the commutator is dirty, or if there is congealed oil on the parts, it may be cleaned with gasoline.

"The wiring should be carefully inspected to see that insulation is not badly worn and that there are good connections at all the terminals. If the wiring does not appear to be in proper condition it is best to replace it.

"The sediment bulb underneath the gas tank should be drained to remove any water or foreign matter that may have accumulated.

"If the engine is in such condition as to require extensive adjustments it will be advisable that such work be left to an experienced mechanic."

The skilled driver rarely uses his brakes, except for an emergency stop or while going down hill. Learn to judge the distance and let your car coast to the point at which you wish to stop. This will save the brake lining and other parts so that they will not need to be replaced so often.

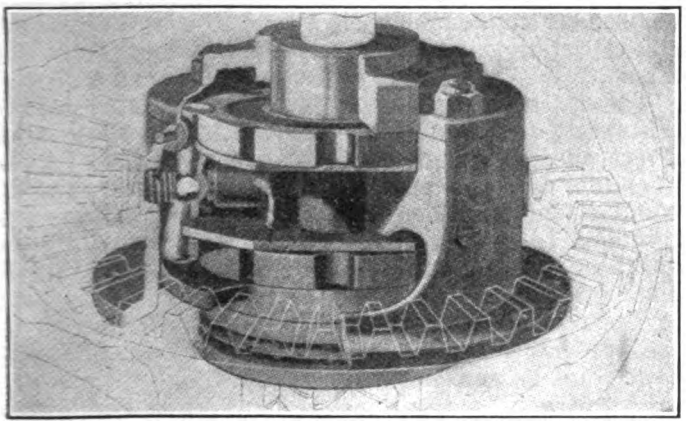
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THE BAILEY DIFFERENTIAL.

Plans for Improvements of Construction and Increased Sales.

The new owners of the Bailey Gearless Differential are preparing for improving and increasing their product. This will not include any radical changes in its construction, and the principle of operation remains precisely the same. The underlying idea is that of the pawl and ratchet, and the results obtained by its application are such as to make the action of the device different in many respects from the action of the conventional gear differential. In fact, it is claimed by the manufacturer that the Bailey differential resembles the conventional mechanism only in that it enables the outside wheel to move faster than the inside wheel when turning a corner.

Under ordinary conditions, with the car moving straight ahead, both wheels are positively driven. When one wheel strikes ground upon which traction cannot be obtained, or bounces into the air as the result of running over an obstruction in the road, the action is the opposite of that of the gear differential, the drive being transferred to the wheel that has traction. One effect of this is to minimize skidding, and another is to reduce tire wear. In the Bailey differential there are two ratchets mounted



Improved Differential.

on the inner ends of the axle shafts. In the peripheries are notches into which the pawls fall. The pawls are steel bars pivoted between the ratchet disks, so that their ends fall naturally into the notches; they are pressed downward so that their tendency is to engage the notches by springs.

The pawls are carried by the housing which rotates with the large bevel gear, and engaging with the notches in the ratchets, transmit the drive to the axle shafts. They are analogous to the pinions of the gear differential and, in fact, take their place. With only these parts the differential would provide only a solid drive with no differential action under any conditions. Just inside the ratchets, however, are mounted "pick-up plates" which are essentially cams, and which come into play when differential action is required. The end of the pawl in the ratchet of the driving shaft connected with the outer-wheel is lifted from its place, and that wheel is allowed to rotate at whatever speed the turn demands, the drive being taken by the inner wheel. Should one wheel lose traction the pawls continue to drive equally to both wheels, but, of course, the only one that absorbs any power is the one that has traction.

The manufacturers consider that the device is particularly adapted to the needs of tractors and trucks, which, without adequate traction, are entirely useless. The slipping from side to side which is so often a feature of the progress of the tractor under a heavy load is said to be entirely eliminated by the Bailey differential.

At present the differential is being manufactured for replacement in a number of popular makes of cars, the details being so worked out that installation is effected with comparatively little difficulty and in a short time.

MOTOR TRUCKS.

Cost Per Ton Mile Is the Main Requirement of Service.

From Henry Farrington, Motor Truck Salesman, in a paper read before the Mid-West Section, Society of Automobile Engineers.—A motor truck is a transportation investment, and therefore the real problem involved in the purchase of one is reduced in its ultimate analysis to the purchase of transportation at so much a ton or a mile, whatever unit of transportation may be chosen. Of course, there are other considerations, but in the main they are usually incidental.

The motor truck is now firmly established. It has passed the period of commercial antagonism and resistance. Business men everywhere accept it without question. It now is in the expansion period of its development, and there is bound to be eventually a reaction to more scientific and suitable methods of purchase and application. The country is being flooded with commercial vehicles of all types and designs. Manufacturers of the lighter and cheaper types of pleasure car are invading the commercial motor field. Several manufacturers of light motor wagons have already taken advantage of the present demand and are manufacturing and selling large quantities of machines designed to carry from 750 to 1,500 pounds. Some of these have been notably successful, and at least one of them has arrived at a quantity production stage.

Another movement which is well under way is the conversion of a certain inexpensive type of touring car into a so-called motor truck by the addition of an improvised rear end assembly to the car, after removing its rear wheels, using the car axle as a jackshaft for a sort of hybrid motor truck. At least a dozen such contrivances have been placed on the market, and many thousands of these trucks have been sold, in consequence, at a price that offers considerable inducement in comparison to the cost of a regular motor truck of the same load-carrying capacity.

Other hybrid constructions include the front-drive motor truck with a rear-end construction adapted from the horse wagon, and the six-wheeled semi-tractor-trailer device. The usual collection of freaks and oddities of all kinds is also apparent in the great motor truck expansion movement which began to gather impetus not long ago. These various "accessories" to the more regular motor truck development may or may not persist, according as they shall be proved out in the race of the survival of the fittest. At any rate, they have a function, and a useful one, of popularizing the motor truck

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idea. They will bring home to thousands of people whom it would otherwise take a long time to reach, the benefits of motor road transportation, and have an appreciable effect in hastening the all-motor era that is rapidly approaching.

Real Motor Truck Success.

The really good business man, who is not sold on promises and does not buy on price, will make a very careful analysis of his transportation needs before investing in motor trucks. It is such men who will lay the real foundations for continued development and success of the motor truck business, by the benefits they themselves will derive from them. And in the final analysis the purchase of a motor truck by men of this class reverts to the purchase of transportation at so much a ton or a mile, and the ability of the machine to do economically and profitably the work in question.

Before a business man buys a motor truck he should convince himself that he is not merely buying a machine. He is buying transportation for the period represented by the useful life of the machine, and when he pays over the money to the salesman or dealer, he is merely paying the first instalment on a big transportation investment. The rest of the investment is paid every day in operating costs during the truck's life.

Buying Transportation.

Take, for example, the service value of two trucks, both of two tons load-carrying capacity, but one costing approximately twice as much as the other. Assuming that in a motor truck, as in most other classes of merchandise, the buyer gets what he pays for, it is fair to make the statement that the materials and workmanship entering into the construction of the higher priced truck will be better than in the other. In this case the effect would be shown in the running costs and useful mileage life of the trucks.

If the higher priced truck averaged 60 miles a day for a total useful life of 2,000 working days, and cost $12.50 a day to operate (including overhead, wages, running expenses and depreciation), the total transportation investment would be $25,000. Based on the writer's experience in a fairly typical case involving the use of a large number of trucks, the cheaper machine might cost $29,480 during the same period, or at the rate of $672 a year more than the other, averaged over the total life of the truck, and this does not take into account the annoyance and expense of the delays due to the greater repair and maintenance problems of the cheaper machine.

Cheap Trucks Aid Development.

It must not be assumed from this that the cheaper truck will be a losing investment. On the contrary, in most cases it will prove to be a very profitable investment as compared with animal transportation. At the present stage of motor truck development there will undoubtedly be sold more trucks of the $1,500 class than of the more expensive types. And the experience gained from the use of these cheaper trucks will pave the way for a more extended use and application of trucks of the better class which in the end prove to be a far more satisfactory and profitable investment. As a matter of fact, there will always be a market for the lower-priced trucks, chiefly from expediency and also, in a lesser degree, on account of the lower first cost. Many low-priced trucks sold to successful business men can be regarded, however, as merely experimental applications of motor transportation, until the use of motor trucks shall have been proven feasible and profitable in given businesses and under stated conditions.

The business man who has made up his mind to adopt commercial motor vehicles for the first time, is confronted with a maze of conflicting practice in engineering, body design, load-carrying capacities and prices. He will meet salesmen who will tell him the worm drive is the only thing. Others will insist that the double side chain drive has never been improved upon. The internal gear drive and the double reduction axle also have their champions. The men who are selling motor trucks with power applied to all four wheels will claim that the rear drive truck is doomed and is already obsolescent. And here and there will pop up another type of final drive differing from any of the others and claimed in all apparent sincerity to be the last word in motor truck design.

The merits and demerits of two, four and six cylinder engines of numerous types will receive their fair share of attention. Clutches, transmissions, differentials, brakes, wheels, tires, governors, radiators, and numerous other details of design will be freely discussed, and the various designs will be praised or condemned, according to the beliefs of the contending salesmen, or their anxiety to make a sale.

The truth of the matter is that these things are absolutely unessential except insofar as they may affect the applicability of the truck to the job in question, and the profit the machine can make in comparison with other modes of transportation it is intended to displace. There is not an automobile engineer in the business who can prove definitely that in efficiency and operating economy, any one of the recognized and approved forms of final drive is appreciably better than any of the others. The best point he can make is to show that the particular type he is advocating is more in accord with the general design of the rest of the machine than any of the others, or cheaper to buy or manufacture, or weighs less, or has more ground clearance, or is easier to obtain under the present conditions, or easier to inspect and repair, or has longer life, or is cheaper to replace, either in whole or in part, when worn out. Some of these things can undoubtedly be proved under many conditions. Others cannot be proved at all. All of the various types have or have had their place, and every one of them is fulfilling or has fulfilled a useful function in the development of motor truck practice.

Selling the Truck to Suit the Job.

Considerations of this kind bring one back to the necessity for selling a motor truck to suit the job in question. The engineering features and design do not make a great deal of difference as long as the truck will do the work in hand profitably and uninterruptedly. If a business man is hauling goods in a territory where all the roads are good all the year round, he has an unrestrained choice of almost all the trucks that may be offered him. The types of engine, final drive and other details are not particularly essential, except as they influence the price, the profit or the perpetuation of investment.

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The purchaser will be wise to check up one truck against another on each of the following points:

1. Actual developed horsepower per pound of total weight carried at given maximum speed.
2. Total weight carried per inch of tire width.
3. Proved gasoline, tire, repair and maintenance costs per mile under given conditions.
4. Accessibility of the various parts of the truck for inspection and repair.
5. The cost of repair parts.
6. The capacity of the dealer or manufacturer for supplying repair parts indefinitely and without loss of time during the probable life of the truck.
7. Workmanship and quality of materials in the units of the truck, considered in regard to the work they have to do.
8. The total weight of the truck chassis to carry a given load, including the body weight allowance.

Price Relatively Unimportant.

The above given items are not necessarily arranged in order of importance, except the last. Unless the amount of money available for the purchase of equipment is limited by financial considerations, the price of the truck should be the last thing to be taken into account. All the other items undoubtedly come before it. It is almost axiomatic in business that you get what you pay for, and there are no bargains in motor trucks any more than in any other classes of standard merchandise. All trucks are good. Some are better than others. The profitableness of a motor truck investment depends less on the price of the truck than on other considerations. Other things being approximately equal, however, the better and more expensive truck will in the long run prove to be the more desirable investment.

Proper Basis for Selling Trucks.

The manufacturers, since the beginning of the industry, have sold their motor trucks on the basis of load-carrying capacity, and unfortunately the buying public has fallen into the habit of regarding a two-ton truck, for example, as a machine that will carry a load of two tons under any and all conditions. and that the load capacity has a certain definite relation to the price of the machine. This form of reasoning is erroneous. In Chicago, where the roads are fairly good and hills simply do not exist, a two-horse team will haul from 3½ to 5 tons day after day, an average daily mileage of anywhere from 15 to 25. Along the dock road in Liverpool, England, one can see Belgian horses pulling lorries carrying loads of from five to seven tons each. In the western part of the United States, out in the mountains, where the roads are poor and the grades steep, it is not uncommon to see a six or eight horse team pulling from one to two tons, and having a hard job doing it. In other words, the amount of load that can be hauled by a given team depends on the grades and the condition of the roads. Then why should a motor truck, rated at two tons, be always considered as a two-ton truck under all kinds of conditions?

Load Capacity Varies With Conditions.

The truth of the matter is that a two-ton truck operating continuously on a level pavement in good condition can safely carry even more than its rated load capacity if the driver is careful in starting and stopping, and in accelerating or retarding the speed of the truck. The same machine operating on a road full of chuck holes cannot carry safely more than one ton of load, and certainly should not be driven at the same rate of speed as on a smooth, level pavement. A two-ton truck with its body and a capacity load may weigh five tons, and if this machine is running at a speed of fourteen miles an hour, it is certainly going to be injured in the long run if it is bounced into and out of chuck holes and over obstacles on a poor road.

Rating by Use.

These considerations lead one to wish that the method of rating a truck by load capacity be abolished in favor of a system of applying each motor truck to the particular job it is called upon to perform. In this case, not only would the road clearance, weight and power of the truck, and the body equipment be taken into consideration, but the load-carrying capacity, the gear ratio, and consequently the speed would be chosen according to the conditions under which it is intended to operate the truck.

CHASSIS TROUBLES.

Their Causes and Suggestions By Which They May Be Remedied.

To attempt to give the causes of ignition or electric troubles, or troubles due to faulty carburetion and their remedy in tabular or other form is impossible. But as to chassis troubles, the situation is different, and the following suggestions prepared by the Vacuum Oil Company, Rochester, N. Y., will be of service to many car owners and drivers. It will be understood that the trouble is first given, and the remedy follows in the same paragraph.

Squeaks.

Body.—Body frame; brackets; dash; doors, hinges and latches; luggage; racks; tire and trunk; seats; top loose in brackets; wind shield loose on dash. Remedy.—All parts assembled should fit perfectly; moving metal parts should be oiled with engine oil; small parts should be replaced if worn and tightened if loose. Keep holding straps soft and flexible with castor oil.

Frame.—Loose rivets, allowing motion between cross-frame members or frame flanges. Remedy.—Cut out worn or loose rivets. Round up holes in members and make up with hot rivets. After riveting, check frame alignment. Should be done by a competent garageman.

Springs.—1—Lack of lubrication between spring leaves. 2—Lack of lubrication of spring and shackle bolts. Remedy.—For 1—Force spring leaves apart. Coat lightly with correct grade of grease. For 2—Supply lubricant to bearings.

Steering Gear.—1—Steering post dry. 2—Worm and sector dry. 3—Drag-rod connections dry. 4—Steering knuckles dry. 5—Tie-rod connections dry. Remedy.—For 1—Oil through top of steering post shell or housing. For 2—Fill housing with correct lubricant. For 3—Fill grease cups or boots with correct grade of grease. For 4—Supply bearings with correct lubricant. For 5—Fill grease cups or boots with correct grade of grease.

Cone Clutch.—Friction surfaces dry. Remedy.—Treat sparingly with neat's-foot oil.

Universal Joints.—Lack of lubrication. Remedy. Apply correct grade of lubricant.

Chain Drive.—Lack of lubrication. Remedy.—Apply lubricant temporarily. At first opportunity

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wash thoroughly with kerosene; wipe with a dry cloth in hot tallow or graphite.

Brakes.—Lack of lubrication or incorrect adjustment of brake operating mechanism. Remedy.—Adjust properly and lubricate with engine oil.

Wood Wheels.—Spoke loose in hub flange. Remedy.—Tighten flange bolts.

Demountable Rim.—Insecurely fastened. Remedy. Tighten bolts.

Rattles.

Body.—Body; brackets, dash; door; door latch; door pocket; contents loose; foot rests; floor boards loose. Hood; hood latches; horns; lamps; license number plate; mud guards; robe rail; racks; tires or trunk; seats; tanks; top loose in brackets; tools loose in box; tires (spare); wheels (spare); windshield; wind shield stay rods loose. Remedy.—All parts assembled should fit perfectly; small parts must be replaced if worn, and tightened if loose. Free parts must be packed and securely fastened.

Springs.—1—Worn shackle and eye bolts and bushings. 2—Spring clips loose. 3—Spring clamps loose on axle. 4—Spring leaf or leaves broken. Remedy.—For 1—Apply lubricant. Renew worn bolts and bushings. For 2—Tighten clamps. For 3—Tighten the spring clamp nuts or renew spring clamps. For 4—In emergency, reweld. Renew at first chance.

Steering Gear.—1—Worn bearings. 2—Steering gear housing loose on bed. 3—Loose steering column tube. 4—Drag-rod end springs broken. Remedy.—For 1—Adjust or renew. For 2—Tighten holding bolts. For 3—Tighten lock nut. For 4—Renew springs.

Clutch.—1—Clutch hub worn. 2—Clutch pedal yoke or shoe worn. 3—Rear clutch bearing worn. 4—Ball bearings defective, cracked ball or ball race. Remedy.—For 1—Renew bearing. For 2—Rebush or renew. For 3—Readjust or renew part. For 4—Replace.

Universal Joints.—Bolts or bushings worn. Remedy.—Renew bolts and rebush if necessary.

Chain Drive.—Chain worn or too loose. Remedy.—Apply a lubricant temporarily. Make proper adjustment for chain length between sprockets. Renew chain if worn; if too long, remove a link.

Snapping.

Chains.—1—Side plates of chain stretched. 2—Sprocket wheels worn. 3—Sprocket wheels out of alignment. Remedy.—For 1—Renew defective parts. For 2—Renew. For 3—Renew.

Universal Joints.—Pins or bushings worn. Remedy.—Renew pins and rebush if necessary.

Grinding.

Transmission.—Lubricant in use too light in body. Remedy.—Use correct grade, carried at proper level.

Brakes.—Dirt working into brake bands. Remedy. Work the brakes until obstruction is removed.

Thumping (Rear Axle).

Radius Rods.—(Note: Worn pins or renew or rebush bushings when traveling rough roads give impression of deflated tire.)

Differential.—Broken tooth in driving pinion or in crown gear of differential. Remedy — Renew gear.

Rear Axle.—Car overloaded or springs weak, resulting in frame striking the axle or bumper, generally experienced at high speeds on rough roads. Remedy.—Avoid overloading car or renew springs if weak.

Back-Lash or Play.

Clutch.—Excess wear of keys or keyways of multiple disc clutch. Remedy.—Repair or replace worn parts.

Transmission.—1—Excessive wear of shaft bearings. 2—Wear of high-speed dog or driving shaft. 3—Excess wear of the transmission gears. Remedy.—For 1—Renew bearings. For 2—Renew worn part. For 3—Replace gears.

Differential.—1—Worn keys or keyways or teeth in differential axle gears. 2—Loose crown gear or driving worm wheel. 3—Excess wear at outer end of axle shaft. Remedy.—For 1—Refit keys or recut keyways and use new keys. Replace worn gears. For 2—Adjust bearings and make fast connections to inner differential gear housing. For 3—Repair or replace worn parts.

Universal Joint.—Wear in bolts or bushings. Remedy.—Renew or rebush.

Abrupt Starting of Car.

Cone Clutch.—1—Leather dry or burned. 2—Clutch face auxiliary springs broken. Remedy.—For 1—If dry, treat with warm neat's-foot oil. Block the clutch to remain disengaged over night. If burned, scrape the surface or leather and treat as above or replace leather. For 2—Replace parts.

Multiple Disc Clutch.—1—Incorrect or insufficient clutch oil. 2—Warped clutch discs. Remedy.—For 1—Fill to proper level with correct grade of oil. For 2—Replace discs.

Clutch.—1—Excessive engine speed at time of engagement. 2—Quick engagement of clutch, due to sudden release of clutch pedal. Remedy.—For 1—Reduce the speed of the engine by throttling. For 2—Release pedal slowly.

Hard Steering.

Steering Gear.—1—Sector bearings worn. 2—Steering post dry. 3—Adjustment of worm and sector gear too tight. 4—Gear and sector not lubricated. 5—Drag-rod ends too tightly adjusted. 6—Drag-rod end springs broken. 7—Drag-rod connections lack lubrication. 8—Front wheels out of alignment, due to incorrect adjustment of cross rod between the steering knuckle arms. Note: Indications are rapid wear of the front tires. 9—Steering knuckles dry. 10—Steering knuckle bolts adjusted too tightly. 11—Driving on the side of a crowned road—uneven distribution of load on wheels. Remedy.—For 1—Adjust or replace. For 2—Apply engine oil at top of steering post, shell or housing. For 3—Readjust to proper mesh. For 4—Fill the steering gear housing with correct grade of grease or heavy oil. For 5—Readjust. For 6—Renew springs. For 7—Remove boot or leather covering and pack with correct grease. For 8—Readjust the length of the cross rod until the wheels are in correct position, slightly toed in. For 9—Apply lubricant. For 10—Readjust. For 11—Keep to center of crowned roads.

Front Axle.—Front axle bent. Remedy.—Remove and straighten. Should be done by a competent garageman.

Radius Rods.—Worn pins or bushings. Note: when traveling rough roads, car gives the impression of deflated tire. Remedy.—Renew pins or rebush.

Tires.—1—Insufficiently inflated. 2—Tire de-

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style on same axle must be inflated equally. For 2—Inflate repair or replace.

Clutch Slippage.

Cone Clutch.—1—Clutch surface worn or burned unevenly. 2—Clutch spring weak. Remedy—For 1—Renew clutch surface. For 2—Adjust or renew.

Leakage of Lubricant.

Transmission.—Wear in bearings, packings or packing gland. Remedy.—Renew bearings or replace packing.

Differential and Rear Axle.—1—Wear of inner or outer axle bearings. 2—Inefficient packing in rear axle housing. 3—Wear of gaskets between valves of axle housing or around differential cover. 4—Driving bevel pinion housing packing worn. Remedy—For 1—Renew bearings. For 2—Replace or renew washers. For 3—Replace gaskets. For 4—Replace gaskets.

Slippage of Brakes.—1—Leakage of lubricant from gear compartment through axle housing to brakes due to: (a) Lubricant too light in body. (b) Level of lubricant too high in gear compartment. (c) Worn axle bearings. (d) Worn or inefficient packing. Remedy.—For 1—Use correct lubricant. For 2—Keep level in gear compartment below level of axle housing. For 3—Renew or refit. 4—Replace packing.

Overheating.

Disc Clutch.—Clutch dry or incorrectly lubricated. Remedy.—Maintain a sufficient quantity of the correct lubricant in disc clutch housing.

Transmission.—1—Insufficient supply of lubricant or incorrect grade. 2—Excessive use of foot brake on long grades when located close to gear box. Remedy.—For 1—See that the transmission case is filled to a proper level with correct lubricant. For 2—Relieve the foot-brake and use the emergency brake temporarily.

Differential and Rear Axle.—1—Insufficient supply of lubricant or incorrect grade. 2—Driving bevel pinion and bevel crown gear meshed too closely; driving worm and worm wheel bearings overheated. Remedy.—For 1—Maintain a sufficient quantity of correct lubricant in differential housing. For 2—Readjust, and if necessary renew bearings.

Brakes.—Improper adjustment. Remedy.—With car jacked up, rear wheels should spin freely, which indicates that breaking surfaces are not in contact.

OMENS OF TROUBLE.

Yet the Modern Up-to-Date Car is a Model of Usefulness and Comfort.

"You may have your self starting 6-, 8- or 12-cylinder cars if you want them, but give me a four-cylinder motor with a crank on the front end for mine. I'll get there ahead of you nine times out of ten."

This was the plaint and boast of the chauffeur of a big car, who called at the Automobile School of West Side, New York, Y. M. C. A., to inquire of Principal H. C. Brokaw about some actions of the motor which he did not understand. His self starter would not start. A few simple tests narrowed the trouble to the self starter control, and it was found in the switch, which had become dirty. From repeated arcing the spring had become heated and had lost its temper and finally no contact was made, or so little that it would not supply current to start the starter. Which shows that it is a good thing to keep the temper, even in a self starter switch spring.

"This," said Mr. Brokaw, "is only one instance where added conveniences have brought new troubles to the motorist. The self starter has made it possible for many, notably women, to drive cars, who before could not because they were not able to crank the engine. Adding cylinders has made smoother riding cars, which drive easier, as well. The greater number of cylinders permits of a much quicker getaway in traffic. It allows the motor to be run at a much lower speed without shifting the gears. The motor has more power and the cars are better hill climbers; there is a better distribution of the same amount of power.

"But this has made more work and worry for chauffeur and mechanic, in that, instead of having eight valves to grind in, he may have as many as 24, and if the double valve idea is carried far enough he might have as many as 48. In arranging the cylinders to procure a more even torque, in some instances it has been found necessary to locate the valves in positions where they are not readily accessible. In some types it is necessary to almost dismantle the engine, and in others the valves may be reached to remove them only by removing the mudguard.

"The self starter, while undoubtedly a great convenience, has made it incumbent to take care of the battery regularly, and to keep the generator and motor commutators in condition; has multiplied the wiring—has added hundreds of wires to the car—and its numerous regulators and other instruments are bound to need adjusting occasionally. The extra care and the unusual troubles give the chauffeurs a lot more to worry about.

"The electric lights are undoubtedly brighter and better than kerosene or acetylene installation, but they will occasionally give trouble and the average man understands more about filling a lamp with oil than he does about locating troubles in electric circuits. Then there are electric warmers, electric heaters, for passenger and driver, electric cigar lighter, limousine lights, electric horns, which make additional wires until the traditional Philadelphia lawyer would be totally inadequate to unravel the tangle.

"Suppose the ignition goes wrong and the battery seems to be all right and no cause of trouble can be found in the magneto and its wires and the chauffeur is in a pickle. Along comes Mr. Man-Who-Knows and finds that the trouble is a short circuit in a lighting installation, which impaired the ignition so that the cylinders would not fire, or fired irregularly.

"The old cars did not have generators and motors; but the chauffeur now must know how to sandpaper commutators and undercut the insulation of commutators, which is an electrical engineer's job; and he must be wise enough to know that these things are necessary, because there is a sparking at the commutator, and the generator is not charging the battery as it should and the motor is not starting the engine as it should. This, of course, is because the brushes are overriding the commutators when the insulation is not undercut and the contact period is shortened and perhaps some of the contacts are skipped altogether because the high speed carries the brushes over without touching the commutator.

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"Then, he must know, for instance, that when the lights dim when the engine is going at low speed, is because the reverse current cut out is out of adjustment and it requires a considerable discharge from the battery into the generator in order to make the cutout operate, when the lights will become bright again.

"Also, he must know that when the volt or ammeter needle becomes erratic, sometimes showing a big charge, or a little charge, or no charge at all, and then comes to normal again, that he has a loose connection somewhere, or the voltage regulator is not working properly.

"When he presses the button of the electric horn and it does not sound, but does work right after he has kicked or pounded it, he ought to know why his rage started it working. It was simply that the brush stuck upon a dead contact point of the commutator, due to a dead armature coil and when he jammed the horn it moved the commutator until a live contact point was against the brush and the motor started to work.

"There was a time when the manufacturer pointed with pride to the fact that there were no complications on his car. There was nothing on the dash but the ignition switch, with one wire leading to the magneto. This followed a period when the dash had been filled up gradually with all sorts of devices. Ways were found to do away with them.

"Now there are hundreds of wires and pipes tacked on to the dash and the other side of the dash fronting the driver is filled with dials and gauges and switches almost without number. These all add to the comfort of the motorist, but in the same proportion they add to the worries of the chauffeur. He pays the price of the comforts in added worries.

"These things have been sending a larger number of students than usual to the school. The owners find that these added conveniences have given demand for added technical knowledge."

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Attributed to "Road-Hog."—Owing to the selfishness of a truck driver at Tacoma, Wash., a man was compelled to drive his car off the road into a deep ditch. The car ended its flight in about 20 feet against a telephone pole, badly wrecking his car. The man received a fractured skull and it is reported that he will probably die. The driver of the truck disappeared.

While Opening Garage Door.—A man was opening the door of a garage, at West Roxbury, Mass., to permit a driver to drive out a car when he was struck by the car and fell unconscious to the floor. When a physician arrived he was pronounced dead.

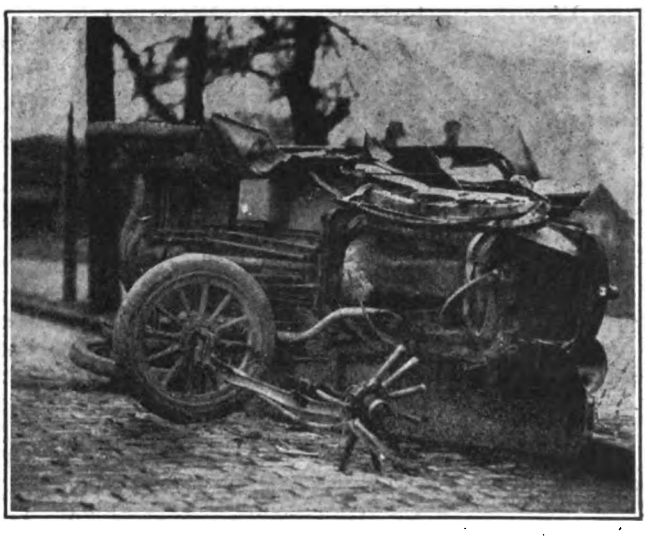
Steering Gear Became Unmanageable.—Two men and a woman urged their driver to go faster and faster, and after killing a dog the car smashed into a light auto truck, skidded twenty feet and crashed into a drug store, smashing two large plate glass windows. The car stopped by the occupants came flying out through the jagged windows into the store. The three men and women were taken to the hospital. The owner of the car stated that he was out for the air when the steering gear became unmanageable.

Sixty to Seventy Miles An Hour.—An automobile travelling at a killing rate crashed into a crew of laborers at San Francisco, Calif., killing two and injuring one. After bowling over the three men the chauffeur put on added speed, turned off the tail light to escape pursuit, and disappeared.

Speeding With No Lights.—A woman was run down and killed at Detroit, Mich., when an automobile going at a high rate of speed bore down upon her, knocking her down and fracturing her skull. Her woman companion was slightly injured. It is stated that the lights were out and the car never stopped after the accident occurred.

Skidded on Icy Roadway.—A machine was thrown off the roadway through skidding near Apponaug, R. I., and after striking a telegraph pole it moved on and struck another pole a short distance beyond. The force of the crash was so great that the machine was broken completely in two. Two men and a bulldog occupied the back seat and were instantly killed. Two others in the machine were only slightly injured.

Cause and Effect.



The trees and the telegraph post withstood the shock due to a careless driver; the automobile did not.

Car Somersaulted on Sharp Bend.—While speeding to the bedside of his dying wife a man was killed and his companions seriously injured when the car in which they were riding struck a sharp bend at the top of a hill, and when the machine bore down on it the driver could not keep the car in the road, and in an attempt to swerve the machine, lost control of it. The machine double-somersaulted and threw one man 30 feet, fracturing his skull and killing him instantly.

While Rounding a Curve.—A car went over a 75-foot embankment at Taft, Cal., and instantly killed the occupant. It is stated that the accident occurred while the driver was rounding a curve at the top of a ridge of hills which he had to cross to reach his destination.

Backed Down Hill.—At San Francisco, Cal., a little boy was sitting on the back of a furniture delivery car, waiting for the driver, when a runaway machine backed down hill, struck one car and then the car in which the boy was sitting and was turned completely around. The boy's head was crushed and his body badly mangled. The driver of the runawy car states that he put on the emergency brake, but it did not make his car secure.

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While Adjusting His Machine.—A driver of a truck near Brownsville, Pa., noted something was out of order and climbed out to examine it. The truck started backward, pushed him down, ran over and killed him.

Drove on Track Despite Warning Bell.—But for the fact that the train was slowing down to stop at the next station, a fatal accident would have undoubtedly occurred at Englewood, N. J. The occupants of the car were in an animated conversation and paid no attention to the warning bell in the engine. A rear wheel was caught by the engine and the machine smashed up against the crossing sign.

Did Not See Approaching Engine.—A man was killed near Wheatland, Ind., and another seriously injured when a switch engine struck the car in which they were riding. The driver says that he did not see the approaching engine.

Killed Two and Fled.—A driver having a full view of the street upon which he was driving and going at an excessive rate of speed ran over and killed two boys and seriously injured another. The three brothers were coasting on separate sleds. As soon as the boys were dragged free of the heavy machine the driver put on full speed and escaped.

Thrown Away from the Wheel.—A woman was thrown out and killed at Bryn Mawr, Pa., when a collision occurred between the car in which the woman was riding, a light touring car, and a coupe. The point where the impact occurred is regarded as dangerous because of the peculiar angle of the intersection. Witnesses state that the driver was thrown away from his wheel and the car, freed from control, shot across the corner; there the left rear wheel was snapped off and the car whirled around a small tree, throwing the woman out and fracturing her skull.

Swerved Car to Avoid Horse.—A man's car was upset at Hackensack, N. J., when he swerved it to one side in order to avoid hitting a horse that was directly in his path. The man's skull was fractured and he died while being taken to the hospital.

ELECTRICAL TROUBLES.

The Starting and Lighting System Will Repay Attention.

From Murray Fahnestock, Pennsylvania. — Prevention is far easier than the cure of electrical troubles, and while electric starting and lighting systems are fairly simple, they will well repay the slight amount of care necessary to keep them in good operating condition.

As the generator runs whenever the engine runs, the bearings should receive careful oiling. A little and often is much better than a larger quantity less frequently. Great care should be taken not to put too much oil in the bearing next to the commutator. Oil on the commutator acts as an insulator and causes sparking. This sparking burns the copper commutator and also the brushes, so that they do not make proper contact with each other, thus cutting down the current supplied to the storage battery. No grease or oil should be placed on the commutator, a slight touch with a cloth saturated with vaseline being quite sufficient. If the commutator is rough, it can be smoothed down by placing a strip of fine sandpaper between one of the brushes and the commutator and running the engine. Care should be taken to remove all the particles of sand from the brushes, after doing this, otherwise continual cutting of the commutator may result.

The care of the starting motor is essentially the same as that of the generator; that is, lubricating the bearings and keeping the parts clean. The electric wires should be kept free from oil, as oil has a tendency to rot the insulation and cause short-circuits.

The wiring of the car should be examined from time to time for places where the insulation has been rubbed off. These places can be repaired with tire tape, although it is really better to install new wires to replace those damaged.

The insulation is most apt to be worn or chafed where the wire makes a sharp bend, or where the wire enters a conduit. Sometimes one of the strands of wire becomes loose from the terminal to which it is soldered and makes an occasional contact with some metallic part of the car, thus causing a short-circuit which will blow out one fuse after another and yet be difficult to locate.

It is always well to carry several extra fuses, so that when one fuse is blown a new fuse can be quickly installed. It is never safe to replace a fuse with a piece of copper wire, because the fuses are the safety valves of the electrical system. When fuses are not used, the electric dynamo, or some part of the wiring may be burned out in a location that is difficult and expensive to repair.

As the sockets of the electric lamps are rather small, a loose wire or a short-circuit sometimes occurs at these points. If the stranded wires are soldered together, before attaching the wires to the sockets, but little trouble will be encountered at these points.

A storage battery is rather expensive and is not very durable, but if filled with distilled water, and not permitted to stand discharged, it will give good service. No water should be left on the top of the battery box, as it will tend to cause leakage of the current. The battery should be firmly clamped in position, so that no unnecessary vibration will tend to loosen the plates. If the battery is allowed to remain discharged, a white sulphate is formed, that greatly cuts down the capacity of the battery and eventually ruins the plates.

THE LEGAL ASPECT.

It Will Pay Every One Interested in the Automobile to Read This.

A chauffeur who is suddenly put in peril by the negligent approach of a railroad train to a highway crossing is excusable if he made an unwise decision as to what he should do. So the Circuit Court of Appeals, Second Circuit, holds in Lehigh Valley Ry. Co. v. Wilmer, 231 Fed. 628. The action was one by the chauffeur of an automobile for injuries caused by its being struck by a locomotive drawing a passenger train. The three passengers in the car were also injured, two fatally. The court held that it was what the chauffeur did or did not do before he got upon the track which was of the greatest importance, in determining whether he was negligent. He knew for a distance of half a mile south of the crossing that he was approaching it. When he was about 825 feet from it he shut off the power and let his automobile coast to a point in the vicinity of the hitching block at the Swarthout crossing,

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near Valois, New York, where he brought his car, as he testified, to a full stop. This was at a point 146 feet from the first rail of the westbound track. He then looked both days along the tracks, and seeing no sign of a train, started towards the crossing and saw the engine approaching him from about 200 feet away. He heard no sound of the engine before he saw it. At that time his seat in the automobile was right over the first track. He then opened up the throttle of his machine just as wide as he dared to in an effort to get across ahead of the train, because, he said, he knew he couldn't stop to clear it. The locomotive hit the rear end of the automobile and threw it from the track, smashing it pretty well to pieces. The court held that the evidence did not show, as matter of law, that the chauffeur was contributorily negligent. A chauffeur, approaching a highway crossing, who stopped and looked for an approaching train, is not negligent, as matter of law, because he did not stop and look at the precise time and place when and where looking would have been of most advantage.

In another case arising out of the same facts, the same court held that a woman riding in the back seat of an automobile, with her husband, an experienced chauffeur, on the front seat, who stopped 146 feet from a railroad crossing to look, but failed to discover the approach of a train which sounded no signals, is not contributorily negligent as matter of law because she did not insist that her husband and the chauffeur had been held not contributorily negligent as matter of law.

In both cases judgment for the plaintiff was affirmed.

No Liability for Injuries Caused by Boys Starting an Unguarded Automobile.—Action was brought for damages to merchandise in the window of the plaintiff's place of business by the defendant's automobile truck. The complaint did not set forth that a servant of the defendant negligently started the machine, but, on the contrary, set forth that the negligence of the defendant consisted in leaving the vehicle "unguarded and unprotected." At the trial it appeared undisputed that the automobile stopped in front of the plaintiff's place of business. A helper left the truck to deliver some goods. While the helper was delivering the goods, the chauffeur left his seat and busied himself in the rear of the car with the goods in the car. From that position he could not see the driver's seat. While doing this work he felt the car start. He then jumped off the truck, ran to the front, and jumped on again, and backed the truck out. At that time two little boys were on the driver's seat. It appeared that these boys were playing on the street, and had jumped on the truck and started it by pulling the controller and the brake.

The court held that the plaintiff had neither pleaded nor proven any cause of action. The automobile was started by the willful act of the boys, and concededly the defendant was not responsible for their act. The only negligence which the plaintiff attempted to plead or prove was negligence in leaving the automobile in a situation where the boys could reach the lever without being seen or stopped. Such an act does not constitute negligence. The defendant was not bound to provide against the act of willful wrongdoers, even though the wrongdoers were small boys. Exactly similar situations existed in the cases of Berman v. Schultz, 40 Misc. Rep. 212, 81 N. Y. Supp. 647, Vincent v. Crandall Godley pany, 131 App. Div. 200, 115 N. Y. Supp. 60 Keber v. Central Brewing Company (Sup.), Y. Supp. 986, and in all those cases it was hel there was no negligence on the part of the cha —Frashella v. Taylor, New York Appellate Di 157 N. Y. Supp. 882.

False Representations by Seller of Auto Must Be Proved.—The New York Appellate D holds that the plaintiff, in an action for dama false and fraudulent representations in th of a second-hand automobile, was bound to lish false representations as to matters of known to be false, and his reliance thereon damage. A statement of the seller of an a bile that if the buyer was not satisfied he wo fund the money was in the nature of a pr and not a representation of fact, which coul ground of recovery for fraudulent represent —McAvoy v. Maxwell, 158 N. Y. Supp. 844.

Where Pedestrian's Contributory Negligence tion for Jury.—A boy 15 years old, before st to cross a street on roller skates at a regular ing provided for pedestrians, looked for ve and saw an automobile express wagon about block away. He proceeded to cross without l further, and was struck by the wagon when l gone only three or four feet from the curb. action for his injuries the New York Appellat sion held that his negligence was a question f jury, since, while it is contributory negligenc matter of law to walk blindly in front of a n vehicle without looking to see if a safe passa be made, or using any care to avoid injury, a who looks when he starts to cross a street as a matter of law bound to look again, nor t until an approaching wagon passes, unless it i upon him.—Curro v. Barrett, 156 N. Y. Supp

Collision With Street Car.—The New York of Appeals holds, in an action for damage to a mobile whose engine stalled while it was clos street car track and which was struck by a c fore the driver had time to crank it up, an in tion that if, in the exercise of reasonable car proper lookout, the motorman was convince the automobile was far enough away from the so that he could run by without hitting it, h not negligent, was erroneous as making th of negligence whether the particular motorma convinced, not whether a reasonably prudent m man would have been. In such an action, i error to refuse a requested charge that, i motorman saw the automobile in time to sto took the risk of trying to run by without a col he was negligent, where the evidence warran inference that the motorman was not convince it was safe to pass, but took a chance. The r of such charge, in connection with the previo roneous charge, was prejudicial to plaintiff, it permitted the jury to infer that if the mot was merely convinced, without the exercise c care on his part, that he could pass the auton he was not negligent.—Mertz v. Connecticut C N. E. 166.

Ownership of Trade-Name of Garage.—Th prietor of a tavern known as the "Blairstown H had a garage, which apparently was no more an adjunct to the tavern. He rented this g to another, who conducted it for two years

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independent business under the name "Blairstown Garage." A sign was put up by the tenant bearing that name. The tenant was notified to vacate. Thereafter, he filed with the county clerk a certificate that he intended to carry on business under the name of "Blairstown Garage." When his tenancy expired, he took with him the sign and moved to another part of the town where he has since conducted business under that trade-name. The proprietor of the tavern rented his garage to a new tenant, who conducted business there under the name "Blairstown Garage." The right to this trade-name was claimed by both the old and the new tenant. The Supreme Court of New Jersey holds, Huff v. Wallace, 97 Atl. 45, that the duty of an innkeeper to provide "provender and stabling" for the animals of his guest does not extend to providing a garage for their automobiles, so that he cannot claim ownership of the trade-name of an attached garage merely because he is an innkeeper. Even if it were held that an innkeeper, by the mere fact that a garage was attached to the inn, was the owner of the trade-name of the garage, yet if he leased it to another he thereby parted with such ownership, and the other might remove from the garage and use the trade-name at another place.

The Doble Steam Car.

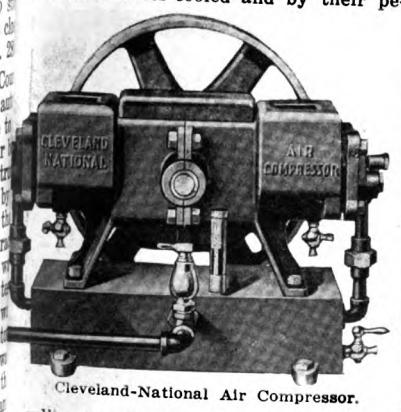
The Doble Steam Car is to sell for $2,500, both the touring car and the roadster. The touring car will be very similar to the one shown in New York, Detroit and Chicago. The wheelbase will be increased, but the power plant will remain unchanged; the body, although slightly different from that of the show car, will contain equally fine coach work.

C. D. Lewis, president, promises that, when deliveries are begun in the fall, the standard cars will be found as complete and perfect in every detail of exterior design as any car on the market. The mechanical design of the car as a whole will be the best work, of Abner Doble and the entire corps of engineers with which he has surrounded himself during the past year. A complete announcement will be made in the near future.

NEW AND INTERESTING THINGS IN MOTORDOM

The Cleveland-National Air Compressor.

A very good air compressor has just been put on the market and is illustrated herewith. This compressor is made for service. It has double cylinders, opposed type, with 2-inch bore by 2½-inch stroke. Both pistons and yoke are cast in one piece and specially designed piston rings are used. The workmanship and materials used are the very best. The cylinders are water-cooled and by their peculiar construction there is no danger from freezing. The air is pumped direct into the auxiliary base-tank. This tank contains a series of baffle plates, which separate every particle of oil and moisture from the air, so that only pure air can be pumped into the tires. This compressor is manufactured and guaranteed by the National Motor Supply Co., Painesville, Ohio, to whom all inquiries should be addressed.



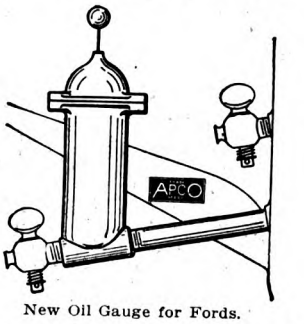
Cleveland-National Air Compressor.

Reboring Cylinders.

The reboring of engine cylinders has become an important feature of repair shops, and there would be much more of it if car owners were given to understand its importance. Poor compression is the cause of more trouble, save ignition faults, than anything else in the running of a car, and it is responsible for a good deal of ignition trouble itself. No piston can be leak proof no matter how good the ring may be, if a cylinder is scored or out of true, and cylinders will get that way after continued use. Now that machines have been devised that will rebore them accurately, quickly and at little cost, every repair man should have one. He will find it one of the most profitable tools or machines in his shop. Storm & O'Hair Company, Thompson, Iowa, make a reboring machine that will rebore all kinds of cylinders, it being adjustable. It can be used by any mechanic, and has been thoroughly tested. Repair men will eventually be obliged to get a cylinder reborer, and there is no better time than now, so that they can reap the profits of this work at once. Better make an examination of every car that comes to your shop, and if you find the cylinders scored, or out of true, or if you find the compression not what it should be, suggest to the owner that he have the cylinders rebored. It will repay both him and yourself.

Another New "Apco" Specialty.

A new oil gauge for the Ford car, one eliminating glass and leaky gaskets, has been brought out by the Auto Parts Company, Providence, R. I., maker of the Apco line of specialties. It is a compact metal construction, a chamber carrying a float to which is attached a rod. Secured to the rod and outside of the chamber is a white ball, and the distance between this ball and the top of the chamber indicates the supply of oil in the crankcase of the engine. Being white, the ball is easily seen. The gauge replaces the lower petcock, which is screwed into the gauge, serving as a drain cock. The gauge is finished in black enamel and retails at 50 cents. Several States have passed laws requiring the use of rear view mirrors which prevent accidents and rear end collisions. The Apco mirror is of the true reducing type, is 5½ inches in diameter and the glass is spun into the frame. The mirror is not clamped to the frame but is attached by means of one of the screws of the supporting bracket to the bracket. It has a wide range of adjustment and is high grade in every respect. It comes finished in black enamel and lists at $1.



New Oil Gauge for Fords.

Another new Apco offering is a tow chain which is not only rust proof but weighs but four pounds. It is very compact when stored in its canvas bag and has been tested to 2,900 pounds without breaking. This is 150 per cent. in excess of the weight of the Ford car. The tow chain retails at $2.50.

Springs for All Cars.

The Jenkins (Vulcan) Spring Co., St. Louis, Mo., announce that their business for 1916 was quadrupled over that of the previous year. The company is now engaged in negotiations for a new plant, increasing their floor space about four times. The company carry in stock in their warerooms, for immediate shipment, five hundred and eighty-eight different types of automobile springs, for practically ninety-five per cent. of all cars in use. Repairmen can be certain that any type of spring desired for replacement can be had from this company without unnecessary delay.

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JOHNSON'S CARBON REMOVER

Will eliminate 80% of your engine trouble. Your motor will run like it did the first five hundred miles — quietly and full of "pep". Your gasoline consumption will drop from 12% to 25%, a great saving indeed. You can remove all carbon deposits from your motor and save from $3.00 to $5.00 over any other method. No loss of time and with very much better results.



You Can Take the Hills on High Without a Knock

if you will keep your motor free from carbon with

JOHNSON'S CARBON REMOVER

That knocking in your engine—difficulty you have climbing hills — poor pick-up — pre-ignition and lack of power will all be overcome.

You Can Do It Yourself

For 25c—five minutes' time—and with no labor, you, yourself, can remove all carbon deposits. Pour an ounce of Johnson's Guaranteed Carbon Remover into each cylinder—allow it to remain two to twelve hours, then drive your car 10 or 15 miles. Results will surprise you.

Use It Every 1,000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will eliminate most valve trouble and your engine will always be at its highest efficiency.

If your dealer cannot supply you with Johnson's Carbon Remover, use attached coupon.

— — — — — *$1.00 Special Offer, $1.00* — — — — —

S. C. JOHNSON & SON, Dept. AD3, Racine, Wis.

I enclose $1.00 for which please send me by prepaid express enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four-cylinder motor four times.

NAME .....

ADDRESS .....

CITY & STATE .....

MY DEALER IS .....

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JOHNSON'S STOP-SQUEAK OIL

Is a simple but effective remedy for hard riding motor cars. Johnson's Stop-Squeak Oil is easy to apply. You, yourself, can keep your springs lubricated perfectly, with no labor whatever. It has the remarkable property of seeping rapidly between the spring leaves and wonderfully improves the ease of riding.
Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

WHY be annoyed with a squeaky car? You can remove squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc., with

JOHNSON'S STOP-SQUEAK OIL

The application is simple. You need not even soil your hands.

Demonstrate to Yourself

the penetrating powers of Johnson's Stop-Squeak Oil. Applied to the sides of the springs, it will immediately seep between the spring leaves — driving the rust before it — leaving a thin layer of lubricant between the spring leaves.

Improves Riding Qualities

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. Instead of bumping over the road, you will fairly float along if your springs are lubricated so that you have good spring action. If spring leaves are rusted together, you might as well be riding on a solid piece of steel. Johnson's Stop-Squeak Oil reduces liability of spring breakage.

If your dealer cannot supply you with Johnson's Stop-Squeak Oil, use attached coupon.

$1.00 Special Offer, $1.00

S. C. JOHNSON & SON, Dept. AD3, Racine, Wis.

Enclosed please find $1.00 for which please send me by prepaid express, a quart of Johnson's Stop-Squeak Oil—enough for a season's use.

NAME.....
ADDRESS.....
CITY & STATE.....
MY DEALER IS.....



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Reduce Automobile Depreciation.

It isn't fair to yourself or your car to run it two or three years without any attention and then sell it at a big loss. With but very little effort, you, yourself, can keep your car in such condition that



the depreciation will be very slight. S. C. Johnson & Son, Racine, Wis., manufacture a line of automobile products particularly for this purpose. No experience is necessary for the use of these preparations. They can all be applied by the novice with perfect satisfaction.

The finish of your car is what meets the eye of the public first and there is no reason why the finish should not be kept in its original, beautiful condition. Don't allow the finish of your car to get unsightly with road-oil, stains, grease, tar, alkali, etc. After you wash your car go over it with Johnson's Cleaner to remove stains of this kind. It contains no



grit or acid and will not scratch or injure the finest finish—simply cleans it and puts it in a condition for the wax polish.

The finish on your car is a fine, expensive job and should be given some consideration. An occasional application of Johnson's Prepared Wax will preserve the varnish and protect it from the weather adding years to its life and beauty. The Wax acts as a protecting coat between the varnish and the elements. It prevents checking and cracking—sheds water—and is absolutely dustproof. Johnson's Prepared Wax is made in both Paste and Liquid form. The Liquid Wax polishes easier than the Paste and is consequently more popular with motorists.

The tops and side curtains particularly get hard wear. They are subject to the hot rays of the sun, the dust, water, and soon get gray, dusty looking and leaky. One coat of Johnson's Black-Lac will give them a rich, black, waterproof finish—just like new. It goes on easily and quickly without a lap or streak and does not rub off on the hands or clothing. Johnson's Black-Lac is unequaled for blackening fenders, tire rims, running boards, hoods, radiators, guards, lamps, and in fact all worn metal parts. Pre-



vents rust and keeps your car in a high state of repair.

Don't let your springs get dry and squeaky. This is what causes broken springs and hard, riding cars. You, yourself, can easily keep your springs thoroughly lubricated at all times, all you need is Johnson's Stop-Squeak Oil. You wont need a tool of any kind, you don't even need to jack up the car.

Johnson's Stop-Squeak Oil has the remarkable property of seeping rapidly



between the spring leaves and to the furthermost wearing points, and it there becomes a heavy-bodied lubricant, allowing perfect spring action. It will remove squeaks of all kinds in springs, shackle bolts, body, fenders, top, etc.

After all, the real test of an automobile is the engine. No matter how beautifully polished and finished it may be, if it hasn't power and speed, the beau-



tiful exterior is but little satisfaction to the owner.

Johnson's Carbon Remover cures 80 per cent. of engine trouble. That knocking sound, the difficulty you have climbing hills, poor pick-up, lack of power, preignition, noisy motor, etc., are all caused by carbon. A dose of Johnson's Carbon Remover, the engine laxative, will easily, quickly and inexpensively remove all carbon deposits and your engine will run like it did the first 500 miles—quietly and full of "pep."

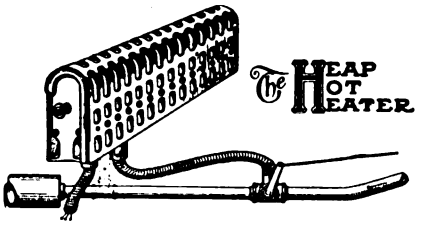
Johnson's Carbon Remover is very easy to use—five minutes' time and no labor required. Simply lift the hood and pour an ounce into each cylinder through the petcocks or spark plug openings. Allow it to remain there from 2 to 12 hours, then start the engine and drive for 10 or 15 miles. You will be surprised at the wonderful improvement.

If you will use Johnson's Carbon Remover at regular intervals giving carbon no chance to accumulate, you will automatically eliminate most valve trouble and your engine will always be at its highest efficiency.

For further information write to S. C. Johnson & Son, Dept. ADR, Racine, Wis.

Heap Hot Heater.

A new type of exhaust heater for automobiles and motor boats is being marketed this season by the Heap Hot Heater Co., Dallas, Texas. The heat enters the heater and is so directed that all sides of the drum are equally heated.



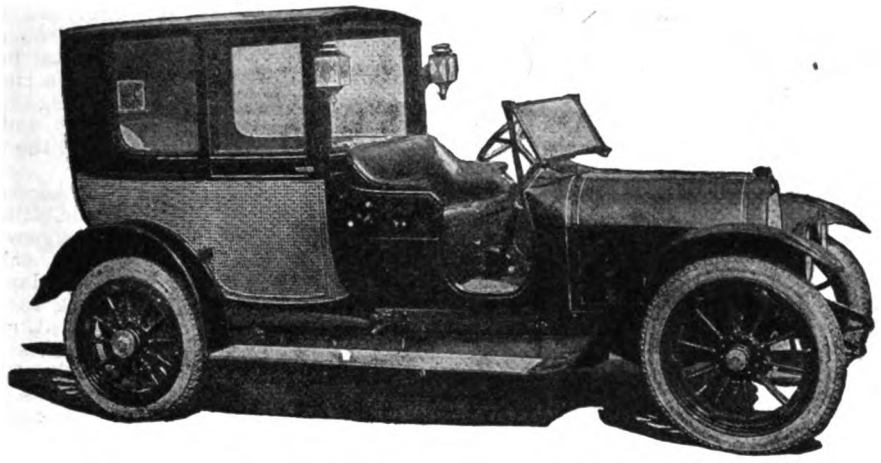
It is claimed that the volume of heat is large and the car is rapidly and thoroughly heated. Each heater is regulated individually.

Price for Ford's, $12.50, other cars, $15, with attachments.

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The BREWSTER BODY

Acme of Refinement and Luxury



BROUGHAM—BREWSTER CHASSIS

Painted and Varnished With Valentine's Materials

In the old carriage days, when the name Brewster was supreme, the house of Brewster used nothing in its painting department except Valentine's.

Luxury- and refinement-loving America still turns to Brewster when it wishes the superlative in body-making, and the Brewsters, in securing the superb finish of their work, still use nothing but Valentine's undercoats, colors and varnishes.

One hundred and seven years of body-building have taught them that this is the best and surest way to secure perfection. The Brewsters attribute their success in part to their use of Valentine's materials.

There is a lesson here to the paint shop that wants to attain sure results in the way of good work and consequent *profit*.

Send for our book, "*Automobile Painting Systems.*"

VALENTINE & COMPANY

ESTABLISHED 1832

Manufacturers of High-grade Varnishes and Colors

456 Fourth Avenue **New York**

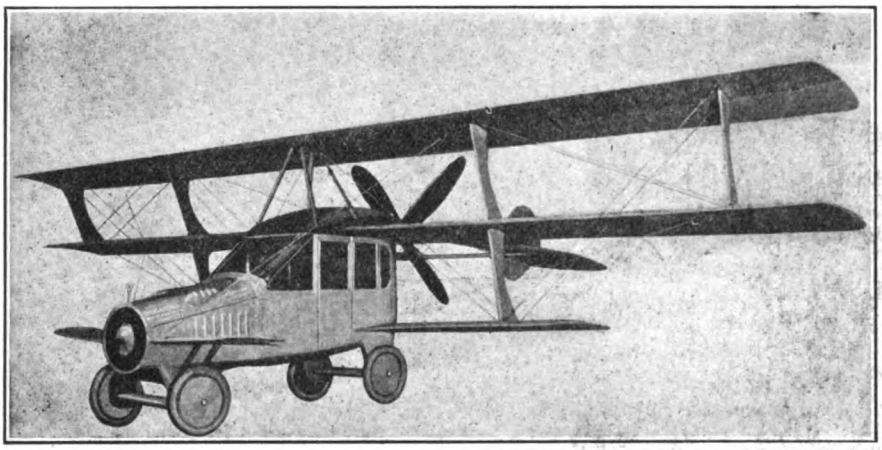
343 So. Dearborn Street, CHICAGO **74 Pearl Street, BOSTON**

VALENTINE'S VARNISHES

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The Curtiss "Autoplane."

A new use sprang into use for U. S. L. Storage Batteries at the recent Aeronautical Show, held at Grand Central Palace, New York, when a special U. S. L. Storage Battery was adopted by the Curtiss Company to light the interior of their new Curtiss Autoplane, a unique combination of automobile and aeroplane—in fact, an "Aerial Limousine." The autoplane will not only run over the ground but will, at approximately 45 miles per hour, leave the surface of the earth and fly away like the magic chariots of old. Entirely different in its construction from any aeroplane heretofore produced, this latest creation of Glenn H. Curtiss's brain is decidedly "a step in advance." Unveiled at the opening of the Aero Show, in the presence of the Governor and other New York State officials, it created a big sensation. The main body of this strange craft, for it can hardly be classed as a stock aeroplane, bears a marked resemblance to an automobile. But it is fitted with three wings, attached just back of the side doors, which allow entrance to the interior. These wings vary in size; the largest at the top, the smallest at the bottom. The machine rests on four wheels, the two front ones being capable of being turned in the same manner as these on a motor car. The interior very much resembles a modern sedan or small limousine, and is beautifully upholstered in the finest tapestry. It is completely wired and lighted by a U. S. L. Storage Battery. The control mechanism, conveniently located in front of the single pilot's seat, includes all the rudder, aileron and elevator controls usually found in an aeroplane, as well as a set of instruments for recording speeds, elevations and other data of interest to the aviator. Just back of the pilot's seat are two passenger seats, luxuriously upholstered and provided with those usual creature-comforts with which a de Luxe Sedan is equipped. The machine is powered with an eight-cylinder 100 H. P. Curtiss motor, which will drive the "Autoplane" at a maximum speed of 70 miles per hour through the air. The wing spread is 40 ft., the length overall 27 ft. and its vertical height is slightly over 10 ft.



The Aeroplane Car.

A New Firm.

A. H. Ackerman, formerly Vice-President and General Manager of the U. S. Light & Heat Corporation, and C. C. Bradford, formerly Sales Manager of the same Company, announce the formation of the Bradford-Ackerman Corporation with offices in the Forty-Second Street Building, New York City, to represent manufacturers of automobile accessories, etc., for domestic and export trade. Correspondence with reliable manufacturers is invited.

Piston Ring Problems and Solutions.

Much has been said about piston rings, and each designer gives facts to bear out his own ideas. If one reads them all he becomes confused. The old design, plain, smooth face ring, is still the standard. Individually cast, concentric rings are most largely used. For the most part, they give satisfaction, last longer and are cheaper than most patented rings. It is a fact, however, unless sufficient oil is used to form the seal, gas will escape. When sufficient oil is used to get maximum power (such as the splash system), it gets up into the firing chamber, fouls the plugs and chokes the motor with carbon. The motor and its component parts are often unjustly condemned for troubles which should be charged to carbonization. Poor gasoline is making this question one of constantly increasing importance. The refuse of poor gasoline (coal oil) will not vaporize,

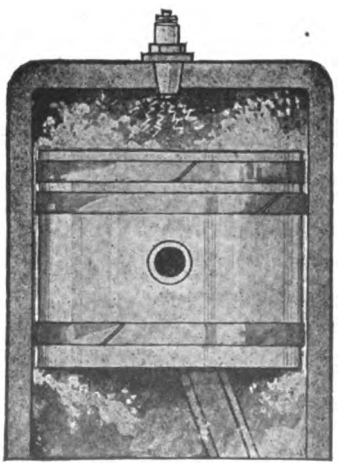


Fig. 1. No-Leak-O Piston Ring.

it works down into the oil pit, cutting up the oil, destroying lubrication. Many builders have advised their customers to dump the oil from the oil pit every few thousand miles, putting in fresh oil in order to overcome this trouble and save the motor bearings. One of the most serious mechanical defects contributing to the immediate carbonization of any motor is piston-ring leakage. If gas escapes past the piston-ring on the compression stroke, when exploded, fire will follow the escaping gas, burning up the oil. See Fig. 1. Carbon will form, black spots will appear on the rings and the piston and for want of lubrication they will wear very fast. The loss of gas and friction, for the want of oil, will cause lack of power; the motor will run sluggish and knock on a hard pull, causing injury to all vital parts of motor transmission, etc. No ring will hold compression without oil. It is the combination of the close fit and resiliency afforded by the ring and the seal of oil that holds compression.

Automobile Accessories Co., 816 West North Avenue, Baltimore, Md., have brought out a new design piston-ring, known as "No-Leak-O." This ring is made concentric, lap joint, with a groove cut around the face of the ring. The groove is cut at right angle with the face of the ring, sloping downward. On the down stroke the square edge will gather the surplus oil from the cylinder wall and pull it towards the oil pit. On

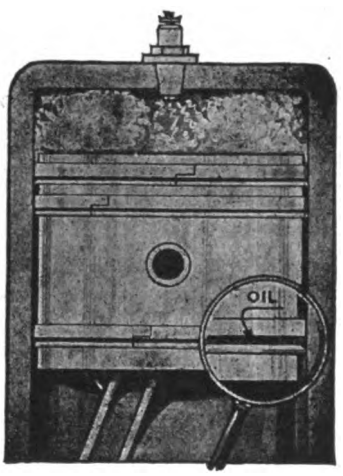


Fig. 2. No-Leak-O Piston Ring.

the up stroke the oil will be distributed on the cylinder wall again, from the sloping face of the groove. It is claimed the volume of oil in this groove will form a perfect seal, preventing the escape of gas, preventing the oil working up, also preventing the refuse of gasoline (coal oil) working down into the oil pit, thereby eliminating to a large extent the most serious troubles with the automobile and truck motor.

Many motor builders have adopted the rings. They are made by old and reliable builders, insuring the material, workmanship and finish.

Fisher "Rim-Grip" Sub-Casing

The Fisher Manufacturing Company, 1706 Payne Avenue, Cleveland, Ohio, are manufacturers of the Fisher "rim-grip" sub-casings, which provide at a small expense a remedy for blowouts and other tire troubles, giving the tires additional strength to withstand almost any amount of strain which may be thrown upon them and greatly increasing the mileage of any tires. Readers who are interested should write for prices and full particulars direct to the manufacturers.

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Over 40,000 Sold in January!

How's that for a record on sales? Over 40,000 "Perry" Locks ordered by our dealers during January alone. And all indications are that February will prove to be a far bigger month for our dealers.

Nothing succeeds like success! And nothing builds sales so fast as the right goods at the right price. The "Perry" has proven such a record-breaking success that January meant no less than

$250,000 for Perry Dealers!

Did you get your share of this new business? Are you lined up to take advantage of our big advertising campaign and the greatest selling automobile lock ever put on the market?

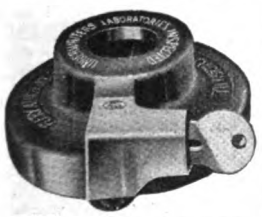
A Thief-Proof Lock For Every Car



For cars other than Fords.

The **"Perry"** fits every make of car. Can be installed by any mechanic in 15 minutes. Does not interfere with or change any of standard parts of steering gear. Absolutely safe to drive when unlocked. And no one can drive or tow a car when "Perry Locked."

For Fords—$5.00



Fastest selling Ford specialty the trade has ever seen. Greer Automobile Co. sold 95 of the first 100 inquiries. Lock replaces standard Ford cap on *planetary* housing below steering wheel. *Liberal* profit to you. Write today for prices.

Write us quick if you have not already secured an agency for the **"Perry."** You will find that every car owner in your town, regardless of present equipment, is a sure prospect for the

"PERRY"

The Only Lock That Thieves Can't Beat

Just turn the key and the steering wheel is disconnected. No possible way to steer the car. It cannot be driven or towed away. Approved by insurance experts as *the only lock that thieves can't beat.* 40% reduction on insurance for cars that are "Perry Locked." The lock is positive—and cannot be broken, picked or got around. The car is always *there* when you come back.

Write for Dealers' Terms!

Our proposition is a big money-maker for live dealers. A few fine territories still open. Write quick for terms and inside prices. Make all the installations possible before the spring season opens up.

The Perry Auto Lock Company
Dept. A-5
1238 Michigan Blvd.,
CHICAGO

Mail the Coupon

"Tell Me About It"

Perry Auto Lock Company
Dept. A-5, 1238 Michigan Blvd., Chicago, Ill.

Gentlemen: I have read your description of your "Perry" Auto Lock and would like to know about your special proposition to dealers.

I sell..... *cars*

Name.....

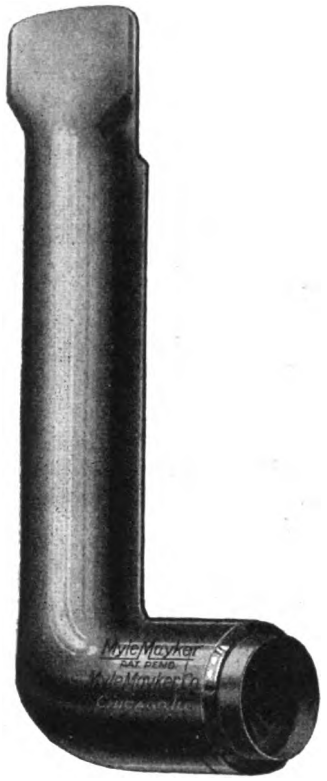
Address.....

Town..... State.....

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New Model Myle Mayker Makes Debut.

The Myle Mayker Co. which made its bow to the motoring public last fall and put its attachment for Ford carburetors on thousands of Fords is announcing a new model. The new Myle Mayker is placed in the car in exactly the same manner as the standard Ford carburetor hot air pipe it is designed to replace. The action of the ingenious flutter valve,



The New Myle-Mayker.

suspended in the pipe, is controlled by gravity and the suction of the motor the same as in the old model. The new Myle Mayker is even easier to install than the old two-piece device. The ease and quickness with which laymen as well as mechanics can put on a Myle Mayker has been the source of considerable comment, not to say argument. At the Chicago automobile show several dealers were going over the Myle Mayker display. One mentioned his skepticism regarding ease of attachment. They thought the representative exaggerated the facts in his claims. To prove to these men that there was no unfounded boast in Myle Mayker claims, a test case was arranged.

A mechanic who had never before seen the Myle Mayker was given the device, simply told it replaced the hot air pipe and told to install it. He did not even know he was being timed as he set to work. It took him just fifteen seconds to attach the Myle Mayker and adjust the carburetor.

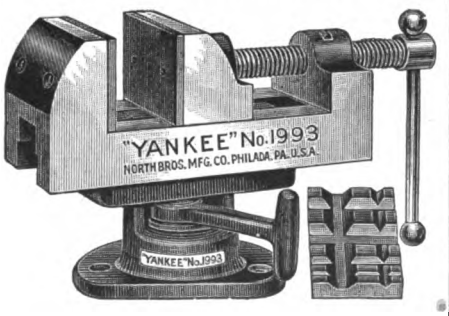
The steady growth of the Myle Mayker Company has recently forced them to seek larger and more pretentious quarters. They have given up their old Thirty-third Street offices and are now fitted out in more extensive quarters at 56 East Randolph Street, Chicago. Besides changing their location they have found it necessary to double their output. In order to catch up with the orders already on hand their production has been increased from five hundred a day to a thousand. Several new distribution centers have also been established in an effort to take care of this increasing demand. To keep on their toes the traveling salesmen of the various wholesalers and distributors handling the Myle Mayker, the company has started a unique and original contest. It is conducted on monthly basis, there being a cash prize for the salesmen selling the greatest number of Myle Maykers for the preceding month. All reports must be in on the tenth of the month for the prior month's business and all reports must be signed by the sales manager of the respective companies.

Grus Oilers Move Ahead.

The Grus Leaf Spring Oiler Co., which has been located for some time at 1536 Michigan Avenue, Chicago, has moved to 625 W. Jackson Boulevard in the same city. In these new and larger quarters, where they have every manufacturing facility, they will be able to meet more promptly the unprecedented demand for this spring oiler, the first of its kind and the only one covered by U. S. Patents, as well as those in foreign countries. The Grus Company also makes the patented Grus Quick Change Chain, and has several other valuable automobile accessories which will be brought out shortly. More and more the Grus Company have found that people demand oil and oil only for spring lubrication and believe that in no long time no car will leave its factory without its proper equipment of spring oilers.

An Excellent Bench Vise.

The name "Yankee" on a tool is an unquestionable guarantee first, of perfection in construction and second, of efficiency. If there is a difficult job to do, if there is an unusual tool requirement to be met, if there is a better or more accurate method of doing a job, the North Bros. Mfg. Company, Philadelphia, Pa., sees that a "Yankee" tool is produced that handles the job with speed and accuracy. There's not a garage or repair shop that doesn't have a bench vise and sometimes several. No matter how many bench vises in the plant there is a definite need in the vise line that can only be satisfactorily filled with the "Yankee" Bench Vise No. 1993. It has a

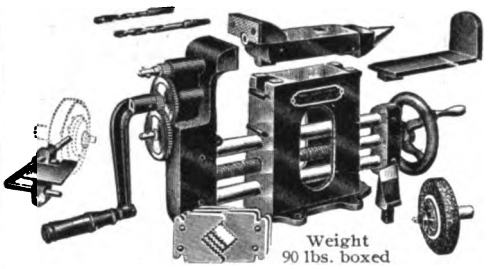


broad field of operation with every metal worker or in every establishment where speed and accuracy are ideals sought for. And these ideals are the secret of financial success, as well as of successful mechanical production. This vise is strong, sturdy, durable and well proportioned, designed for securing the strongest kind of a grip on the job. It is built in two parts, first, a swivel base which is permanently attached to the bench. This swivel base is controlled by a short movement of a cam-throw lever which locks or releases the vise when adjusting it to convenient working position on the bench. The upper part is quickly and easily removed from the base by releasing a small set screw.

The first thing we observe in regard to the top part of the "Yankee" Vise is the fact that it is carefully machined on bottom, end and sides. These machined faces are at absolute right angles with each other. And here's where the "Yankee" Bench Vise evidences its greatest usefulness. Round or irregularly shaped work can be set in the vise, center marked, centered punched, taken to drill press and carried through all of many jobs of shaping and machining without ever being removed from the vise. Having once been set, work can be handled through many processes merely by placing the vise on one side or the other or upon the end and accuracy can be maintained in the work without the usual loss of time and expenditure of care in resetting the work after each operation. A specially grooved steel plate comes with this vise and is used to hold round or irregularly shaped work securely in position, at any angle.

The Stewart Handy Worker.

This is a wonderful combination repair outfit, suitable for use in any garage, public or private. This tool has



Stewart Handy Worker.

been described as in itself a complete, compact work shop. It consists of a strong, practical anvil, powerful vise up to 4½ inches, width of jaw 4 inches, a sure-grip steel pipe vise which will take pipe up to 1½ inches, a Corundum grinding wheel 5 inches by 1 inch, a two-speed drill press with two drills, a metal cutting wedge and driving mechanism of three speeds—direct 4 to 1 and 16 to 1—these speed mechanisms being easily regulated by changing the handle grip. This mechanism operates a grinding wheel, buffing wheel, and many other similar tools. With the Stewart Handy Worker, any car owner can do repair work, blacksmith work, make plumbing repairs, and keep knives and other tools sharp and in good condition. Notwithstanding the wonderful variety of tools furnished by the Stewart Handy Worker, it is sold complete for only $14 and it would be impossible to get separate tools to do the same work for less than $25. Interested readers should write for prices and full particulars or send their orders direct to the Chicago Flexible Shaft Co., 620 North LaSalle St., Chicago, Ill.

Personal Mention.

John O. Heinze, recently with the John O. Heinze Company of Springfield, Ohio, and formerly with General Motors Company, has associated himself with the Simms Magneto Company of East Orange, N. J., as their engineer and production manager.

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The BIGGEST Manufacturer in the Motor Truck Industry—the GREATEST Sales Possibilities —the BROADEST Dealer Co-operation

One Every Four Minutes

Deliveries Guaranteed

13,500 Already Delivered

Smith Form-a-Truck

$350

f. o. b. Chicago

THE huge Smith Form-a-Truck factory is now turning out one Smith Form-a-Truck every four minutes. Work is being rushed to complete a second factory to double even this tremendous output. Over 1,600 Smith Form-a-Trucks were sold in January. February exceeded January by a large percentage.

13,500 Smith Form-a-Trucks are now in service in all parts of the country, in over 500 lines of business.

The Smith Form-a-Truck dealer organization is the third largest selling either pleasure cars or motor trucks.

Smith Form-a-Truck has already sold more than all other truck attachments combined or any other motor truck in a given time.

The Smith Form-a-Truck advertising and selling campaign is the biggest by far ever back of any dealer in motor trucks.

At the New York Automobile Show—at the Chicago Automobile Show—and all the big shows throughout the country, Smith Form-a-Truck was the one selling sensation. Dealer contracts—orders from purchasers—were stupendous. Smith Form-a-Trucks are being bought by users up to fleet equipment totalling several hundred on single orders.

Smith Form-a-Truck is your big opportunity if your territory is not already gone. If it is open, a wire from you is absolutely necessary to insure your consideration. Territory is being taken up so fast that we cannot promise anything to anyone.

Materials are on hand for 30,000 Smith Form-a-Trucks and we are anticipating demands for future big production a year in advance. You can get deliveries to satisfy your customers in any quantity. This we guarantee you. It is the only way you can do a successful business.

Tie up with Smith Form-a-Truck now, if it is not too late. Find out for yourself whether your territory is closed. Get in on the biggest selling success of the automobile or motor truck industry.

Smith Motor Truck Corporation

Manufacturers of Smith Form-a-Trucks

Executive Offices and Salesroom, Suite 912, Smith Form-a-Truck Building

1470 Michigan Blvd., Chicago

Eastern Branch 1875 Broadway, New York

Kansas City Branch 1808 Grand Avenue

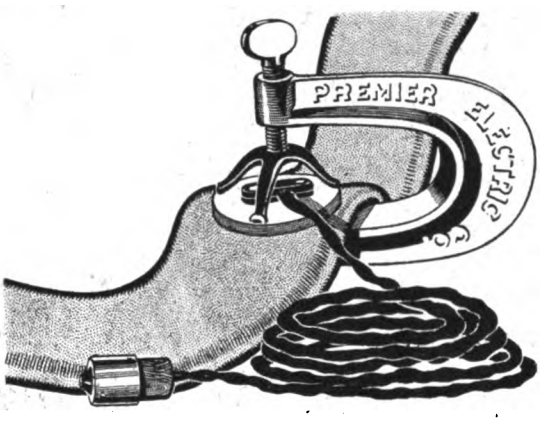
Pacific Coast Branch Pico and Hill Sts., Los Angeles

Southern Branch 120 Mariette St., Atlanta

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A Reliable and Handy Vulcanizer.

We illustrate an extremely practical new vulcanizer, which is manufactured by the Premier Electric Company, 4033 Ravenswood Avenue, Chicago. The illustration will give some idea of the appearance of this device. It is guaranteed by the manufacturers to give a perfect vulcanization in 10 minutes without matches, gasoline or danger. The source of heat is electrical and is obtained by inserting the plug in the ordinary electric lamp socket. The ease of application is remarkable, and the vulcanizer is always ready for instant use. It is only necessary to insert the plug in any light socket, place the patch in position, screw down the clamp, switch on the current, leave on for ten minutes, take off, and the job is done and done properly. The heat is absolutely uniform and dependable; there are no variations under any weather conditions. No shielding from draughts is necessary. The device is as effective as it is amazingly simple. There is nothing to tinker with and nothing to get out of order. This is a great seller, and dealers as well as car owners should get in touch with the manufacturers, who will be glad to furnish prices and full particulars.



A New Vulcanizer.

How to Measure Screw Threads.

The above is the title of a useful bulletin which has just been brought out by the Greenfield Tap and Die Corporation, of Greenfield, Mass. This bulletin is a pamphlet of fifteen pages, which contains a fund of useful information in regard to the measurements of screw threads. We understand that this book will be sent free of charge to any repairman or machinist who will take the trouble to write for it, and it should have a place in every well regulated shop.

Electrify Your Ford.

An electric light outfit for the Ford car has been brought out by The Warner Lamp Company, of Davenport, Iowa. They state that by means of this outfit you can electrify your Ford car from head to tail in thirty minutes and the cost of the outfit complete is only $24. If a headlight outfit is wanted separately the price would be $7.50; or a side and tail light outfit separately for $17.50. In this equipment there are two special nitrogen lamps for headlights, dimmer switch on steering post and all necessary wire and material to make outfit complete. The side and tail outfit separately consists of 50 ampere storage battery and "Fodrecfier" to keep the battery charged from the magneto, three special battery lamps and adapters to electrify side and tail lamps, steering post switch and all necessary wire and material to complete the job. A great many of our readers who own Ford cars will certainly be interested in this new electrical outfit, and inquiries and orders should be addressed direct to the manufacturers at Davenport, Iowa.

Data Sheets on Rims.

The Universal Rim Company, of Chicago, manufacturers of the Baker demountable rims, have brought out a set of data sheets covering the demountable rim constructions which are covered by the patents owned by this company. These sheets are put out for the purpose of co-operating with motor car manufacturers and assisting them to install and operate machinery for making their demountable rim equipment. This arrangement has been found very satisfactory by the larger manufacturers, because it assures them of a positive source of supply of this important motor car part, as well as a fixed cost of production. Manufacturers are charged a royalty of twenty-five cents per car by the Universal Rim Company, but the motor car makers can profitably make their own rims, especially when manufacturing is conducted on a large scale. Some motor car manufacturers are preparing to manufacture their own rims under the Universal patents for this and next season's output, and this is done with the co-operation of the Universal Rim Company.

Ideal Junior Seat.

The Ideal Brass Works of Indianapolis announce a Junior Auxiliary Seat which will fit any make of automobile now on the market. This seat is substantially made and finished and when in place becomes a part of the automobile, still if desirable can be lifted out and placed under seat or in tool box. This seat measures 12 inches high when in place and seat bottom is 9¼ inches square. A bracket is fastened to floor board with three bolts and always remains in car. Is so designed that it is inconspicuous and entirely out of the way. This bracket has a tapered hole for receiving upright seat support, the end of which is also tapered to fit bracket. Similar arrangement has been made in bracket fastened to underside of seat. This feature makes it a simple matter to detach seat from car and in turn detach upright support from seat bottom and thus store away in a very small space and yet when seat is in use the tapered socket does not permit seat to turn or swing around, making it appear as though the whole arrangement was made of one piece. The upright support is offset so that seat can be adjusted from side to side or front to back six inches when desirable. The seat board is trimmed and padded; metal parts are enameled black making the appearance harmonize with the finish of the highest price automobiles. These seats are packed in individual cartons suitable for mailing complete with necessary bolts for attaching.

The King Anti-Rattler for Fords.

Many of our readers will undoubtedly be interested in the King spindle joint anti-rattler for Ford cars. This device is designed to silence the spindles and stop dangerous wear. It also stops the hammering, keeps out the dirt, reduces wear and saves repair bills. It is a simple device and can be applied by any one. Readers who are interested should write for full particulars direct to the manufacturers, the King Manufacturing Co., Inc., Brookline, Mass.

Patent Granted for Brown Spring Oiler.

The United States Patent Office has recently issued Patent No. 1,215,904 to William H. Brown, of Cleveland, Ohio, this being on the Brown Spring Lubricator. This article has been successfully advertised for some time in this and other trade publications and is favorably known to a great many of our readers.

C E Z Celluloid Cleanser.

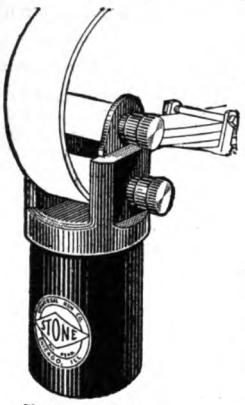
This is a compound made for the special purpose of removing dirt, scratches and discolorations from automobile curtain windows. It will not dissolve, scratch, abraise or discolor the celluloid, but will repolish the surface and prevent cracking, frosting and ageing of the material. This compound is endorsed by many automobile manufacturers, dealers, supply, garage and repair men; also auto top makers and car owners. The compound is packed in a neat box and makes a very attractive proposition for the trade. The illustration will show how the cleanser is packed for the market. It is a ready seller to automobile owners and ought to be carried in stock by all dealers who are readers of this magazine. For full particulars write direct to the manufacturers, the Celluloid Cleanser Co., Department B, Tower Bldg., Chicago, Ill.



Celluloid Cleanser as Packed for Dealers.

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DEALERS



Showing Application to Ordinary Type of Spring.

Advise Your Customers to Add to the Life of Their Cars

By Equipping Them with

STONE



Showing Application to Semi-Elliptic Type of Spring

SHOCK ABSORBERS

No springs are elastic enough in themselves to entirely stop the force of heavy jolts and jars. Those that escape are what start squeaky bodies, loose bolts and rattles. That's why the body of a car is almost invariably worn out long before the engine even shows signs of wear.

Stone Shock Absorbers take all the snap out of the jolts. They eliminate all worry about bumps, for they smooth the heaviest jolts into smooth, pleasant undulations. *They take the edge off riding.*

A Sensational Seller

Dealers and jobbers everywhere are reporting an ever increasing demand for this wonderful shock absorber. Thousands have read our advertisements in the leading motor publications and have already equipped their cars with Stone's. Many more thousands will be convinced of the need for absorbers for their cars and of the superiorities of Stone Shock Absorbers. And don't forget that there is a good margin of profit for you in them.

They Sell For

$12

A PAIR

Means New Friends

Motor car owners who have equipped their cars with these shock absorbers are enthusiastically endorsing them.

Tell your customers that you handle them. They will be so pleased with the wonderful riding improvement of their car once they get a set of Stone's that not only will they tell their friends, but they will come to you for all the other accessories they need.

Increase the volume of your business all along the line by becoming a Stone dealer.

Write to your jobber today for full particulars.

Act quickly. Don't let someone else get the business that is rightfully yours.

Made and Guaranteed by **UNIVERSAL RIM COMPANY** *Makers of the Baker Rim*

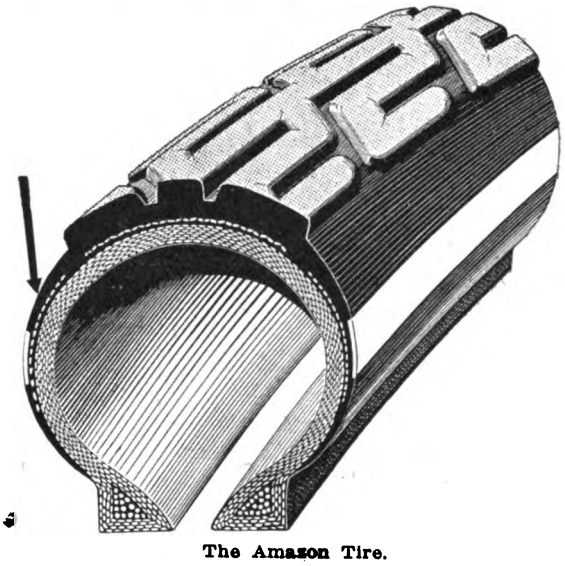
Dept. 96, 1502 Michigan Avenue, Chicago, Ill.

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New Tire on the Market.

A new tire that is said to be proof against blowouts is being manufactured by the Amazon Tire & Rubber Company, Akron, Ohio. The anti-blowout feature is a simple yet ingenious improvement—an extra fabric reinforcement, or breaker strip, is built into the side walls of the tire—the place where the traction wave

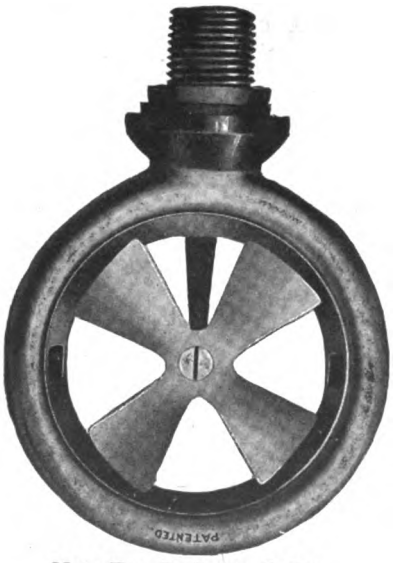


The Amazon Tire.

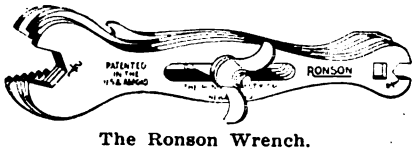
is generated—where all the bending, straining, twisting action is taken. This side-wall breaker strip encircling the tire, binds it into an inseparable unit, prevents the side walls from bulging—over-stretching—and detracts from its resiliency not in the least. It absorbs and distributes bumps and shocks taken on the side-walls, the same as the regulation breaker strip on the face of the tire, with the result that the tire is enabled to stand very brutal treatment and deliver unusually long mileage. The tire has a very handsome and distinctive appearance, the jet-black body has a one-inch snow-white stripe on the sides. The tire is hand made, constructed throughout of the highest grade materials, and is made in the nonskid style only.

Two Live Auto Specialties.

We illustrate herewith two particularly useful automobile specialties which have recently been brought out by The Art Metal Works, 9-15 Mulberry St., Newark, N. J. One of these specialties is the new Moto-Fan Radiator Cooler. This is a high-grade instrument, as shown in the illustration, constructed on scientific principles and designed to be attached to the radiator cap of any automobile, and by its action to exhaust from inside the radiator, steam and abnormally heated air as they are formed and at the same time to pump into the radiator cool, clean air. The effect of this double action is to keep the cooling fluid in the radiator always at a normal operating temperature. Obviously a great advantage. The same company also manufactures the Ronson wrench, a wonderfully handy tool which combines eight different sizes of wrench in one. The mechanic can slip it in his pocket and have all eight sizes ready at any time. This size will fit practically every nut on the automobile. It is made of drawn, tempered steel in nickel finish; weighs one-half pound; is only six inches long and one-half inch thick, and each wrench comes carefully packed in an attractive box. This is a great seller and should be carried in stock by every automobile supply house. For prices and particulars in regard to both these specialties write direct to the manufacturers at Newark, N. J.



Moto-Fan Radiator Cooler.



The Ronson Wrench.

Vacuum Oil Protects Mariners.

The Steamship "Gargoyle" has sailed from New York bound for a European port. The Gargoyle is owned by the Vacuum Oil Company, of 61 Broadway, New York City, and is carrying a cargo of bulk oil through the danger zone of submarine activity. The directors of this company have decided to give to the licensed officers of its vessels engaged in trading to the war zone life insurance for the benefit of their families in case of death by disaster at sea. This voluntary act of the directors of the Vacuum Oil Company is in recognition of the unusual conditions and is the first instance of an American steamship owner taking out insurance of this kind.

A Useful Catalogue.

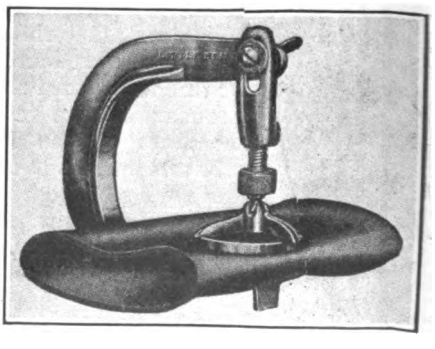
The Campbell Iron Company, 817 Cass Avenue, St. Louis, Mo., has just brought out a new catalogue, listing a large assortment of equipment and tools for garages and auto repair shops, and we understand that this catalogue will be sent free to any of our readers who may be actually in the automobile business and who will write for this catalogue, using their regular business letter head. It is a valuable reference book for any dealer, repair man or garage owner.

Little Ben Puncture Clamp.

This is a clever device, as shown in the two illustrations, for repairing tire punctures. Whether you use cold patches, chemical patches or vulcanizing patches, the Little Ben will do the work easily, quickly and well. This handy little clamp is portable and stands upright on its own feet. It is small enough for the use of any car owner and can be carried in the pocket or packed conveniently in the tool box, yet it is sturdy enough to do the work thoroughly and effectively. The method of heating is peculiar. A round cardboard disc, mechanically treated, which is called a fusee, furnishes just the right amount of heat to make a perfectly vulcanized patch. These fusees are ignited with a match or lighted cigar or cigarette stub and burn in the same manner as fusees on the fire crackers which every boy has used in celebrating the Fourth of July.



Ready for Use.



In Use.

One hundred thousand of these tire vulcanizers have already been sold. The Little Ben is manufactured by the Arsenal Varnish Company, 2501 Fourth Avenue, Rock Island, Ill., to whom all inquiries should be addressed.

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AMAZON TIRES

At last—a "different" tire!

Not a freak or fancy, but a high quality pneumatic tire of superior merit, reinforced for greater strength and protection against blowouts by extra fabric "breaker strips" on the side walls.

Built by Akron's most experienced tire engineers, from choice materials, and incorporating "year-in-advance" improvements, they stand forth as the last word – the ultimate, in tire building.

For the dealer who is seeking a worthy tire to handle on a profit-building basis, the Amazon Tire and Proposition represent a connection that has no equal.

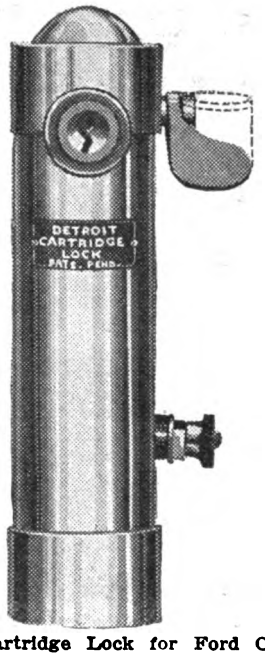
NOW is the time to select YOUR territory for exclusive selling rights. Write us.



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Cartridge Lock for Fords.

The Detroit Motor Lock Company have just concluded arrangements with the Wallace C. Hood Service Bureau, Dime Bank Building, Detroit, whereby the Hood Bureau will have the supervision of distribution for the entire United States of the Detroit Cartridge Lock for



Detroit Cartridge Lock for Ford Cars.

Ford cars, as manufactured by them. The Detroit Cartridge Lock is a magneto locking device, and absolutely locks Ford cars by shutting off the Ford Electrical System at its source. The unusual design and location of the magneto in Ford construction, lends itself ideally to circuit breaker locking device such as this one. It absolutely complies with all police regulations, municipal ordinances and insurance requirements. Extreme simplicity, both in construction and operation are marked characteristics of this latest locking device.

It is a magneto circuit breaker enclosed in a case hardened steel tube covering the magneto connection plug and extending up above the floor line of the car. In order to securely lock the car, simply push down the foot lever near the top of the lock which automatically shuts off the motor. The car can then only be unlocked by a serially numbered key carried by the owner. The Detroit Cartridge Lock has been put to every conceivable test and is thief proof. When the Ford is locked it is impossible to make new connection with magneto. To force the lock from its base would destroy magneto connections and put the car out of commission. There is still some very desirable territory available for distributors and dealers which can be obtained by promptly addressing the Wallace C. Hood Service Bureau, Detroit, Mich.

Improved Emergency Brake for Fords.

A new emergency brake for Ford cars has been placed on the market by L. A. Leathers Co., Brookville, Pa. This is a large external brake, lined with the best of lining, fitting the drum neatly, and it is guaranteed to lock the wheels instantly and hold the load on any hill. This brake is simple to install, light in weight, and each set is packed in a separate carton, making a neat shelf package and weighing less than 15 pounds. The retail price of this brake is $10.00 installed, with a liberal profit to dealers. The manufacturers co-operate with dealers in such a way that a large sale is practically assured. Those wishing to become agents for this article should communicate directly with the manufacturers as soon as possible.

New Home for Empire Tires.

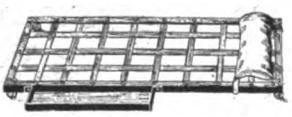
The Empire Rubber and Tire Co., of Trenton, N. J., have leased a large four-story and basement building at 810 North Broad Street, Philadelphia, for their growing business in that territory. They will have, when completed, one of the finest tire salesrooms in the country, including every facility for the quick handling of their large business, and their storeroom will have accommodations for at least ten thousand tires. The growth of their business in the Pennsylvania territory has been indeed notable.

National Motor Supply Co.

This company, formerly located at Cleveland, has moved into its new factory at Painesville, Ohio, where, with greatly increased facilities, it can keep pace with its steadily growing business. This expansion was made the more imperative by the unusually strong demand of gas stations, service garages, etc. for its new air compressor together with unmistakable indications of a splendid business on other products such as their garage vulcanizer, spring oiler, gasoline gauge, gas saver, small vulcanizers, etc. The company, backed by ample capital, will conduct an aggressive sales campaign which the quality of their goods justifies.

The Kumfy-Kreeper.

This is a device for making repairs under the car. It eliminates the necessity of lying in oil and dirt on the floor. The Kumfy-Kreeper fits the body perfectly; supports the head, preventing all strain on the neck; has a tray on the sides to hold tools, and requires little effort to move about in any desired posi-



Kumfy-Kreeper.

tion. This creeper is strong, clean and comfortable. It is finished in bright black enamel; not easily scratched, and which will not flake. Pillow is of oil-proof enamel duck. The accompanying illustration will give some idea of the appearance of this device, which retails for $3.50 and will be found an excellent seller. Correspondence is invited from dealers as well as car owners, and inquiries should be addressed to the Kumfy Kreeper Mfg. Co., Terre Haute, Ind.

Retlaw Taken Over by New Corporation.

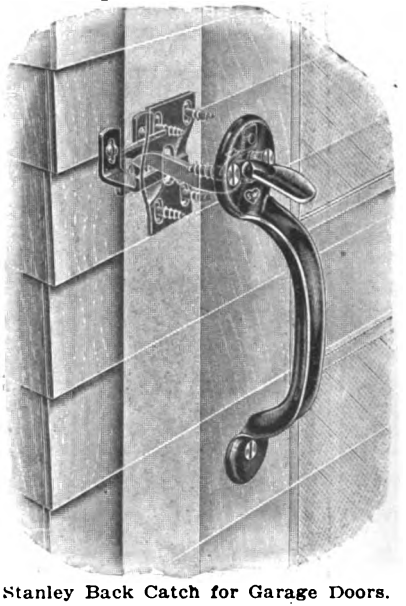
The Detroit Gauge and Metal Stamping Company of Detroit, has been granted articles of incorporation from Lansing. The amount of the capital stock is $50,000. The officers are: O. S. Kelly, President; E. C. Lewis, Vice-President; Seabourn Livingstone, Secretary and Treasurer. The following are named as Directors of the company: E. S. Kelly and Wm. Livingstone. The latter is widely known in Detroit financial circles as president of the Dime Savings Bank and as president of the Lake Carriers' Association. The former is a retired capitalist having been at one time founder and general manager of the Kelly Springfield Tire Company, and president of the Kelly Springfield Motor Truck Company.

The new corporation have assumed the entire business of the Retlaw Manufactuirng Company, manufacturers of Gasoline Gauges at 812 Woodbridge Street, East, and will continue operations in the present plant, but adding much additional equipment and enlarging the factory space.

The company will continue the manufacture of gasoline gauges for automobile manufacturers and also metal stampings. The former Retlaw Manufacturing Company, have been specializing in the manufacture of gasoline gauges for ten years past, furnishing gauge requirements for many of the leading automobile companies as standard equipment on their cars. They recently marketed a gasoline gauge for Ford cars, which has had a very wide sale through the country.

Wrought Steel Back Catch.

Garage owners and builders will be interested and pleased to hear that the Stanley Works of New Britain, Conn., have added to their line of garage hardware a wrought steel back catch for 1¾ inch garage and barn doors. This company states that the back catch holds the door firmly when swung open against the side of the building. Opening the door forces the stout hook over the catch plate, in which position it is securely held down by the double leaf steel spring. To unlock the hook, press lightly on the thumb piece. The handle is used as a pull to close the door. The



Stanley Back Catch for Garage Doors.

escutcheon plate is struck up to act as a bumper against the catch plate, thus taking off of the hook the shock of the sudden stopping of the door's motion. By means of the slotted screw holes the catch plate may be adjusted to meet the bumper squarely. These are packed one set in a box with screws, and can be furnished in Stanley japan and sherardized finishes. For further information, prices, etc., write to the Stanley Works, New Britain, Conn.

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$1150 F. o. b. Racine
Mitchell Junior—a 40-h. p. Six
120-inch Wheelbase

Mitchell SIXES

$1460 F. o. b. Racine
7-Passenger—48 Horsepower
127-inch Wheelbase

Now An $1150 Model

The Mitchell Junior—our smaller Six—opens up an entirely new field for the Mitchell.

To cover that field we are this year doubling the number of Mitchell dealers. And we are building 25,000 cars.

We have also increased our advertising from last year's $700,000 to $1,000,000 for this year.

These facts make the Mitchell line, more than ever before, a dominant factor in Motordom.

Other Advances

This year we start to build all Mitchell bodies, open and enclosed. Our new body plant covers 14 city blocks.

Now more of the Mitchell is built in one plant than of any other quality car.

Out of this new saving we add 24 per cent to the cost of our finish, upholstery and trimming. This makes the Mitchell the handsomest car, the daintiest car in its class.

Now, for the first time, we announce 100 per cent over-strength in every Mitchell part. We have spent three years in thus doubling our margins of safety.

And the Mitchell of this year embodies 31 extra features. That is, attractions which other cars omit. Things like a power tire pump, reversible headlights, a dashboard engine primer, a light in the tonneau, etc.

Never-Broken Springs

One result of this over-strength shows in Bate cantilever springs. In two years' use, on thousands of cars, not one of these springs has broken.

Another result shows in record endurance. Seven Mitchell cars have averaged over 175,000 miles apiece. The Mitchell of today is a lifetime car.

John W. Bate's Car

All the Mitchell advantages are due to John W. Bate, the efficiency engineer. This entire plant, covering 45 acres, was built and equipped by him. It is now the model plant of all Motordom.

TWO SIZES

Mitchell—a roomy, 7-passenger Six, with 127-inch wheelbase. A high-speed, economical, 48-horsepower motor. Disappearing extra seats and 31 extra features included.

Price $1460, f. o. b. Racine

Mitchell Junior a 5-passenger Six on similar lines with 120-inch wheelbase. A 40-horsepower motor—¼-inch smaller bore than larger Mitchell.

Price $1150, f. o. b. Racine

Also all styles of enclosed and convertible bodies. Also demountable tops.

Nowhere else could a car like the be built at anywhere near our c

That accounts for all the extras. They are paid for by savings.

Mr. Bate has made the car masterpiece of engineering. C parts are built of toughened st parts which get a major strain of Chrome-Vanadium. Vital p oversize.

He has made it by far the car in its class. And this witho ing it costly. The added lux the added strength, is paid for tory savings.

He has made it the best-equi on the market. No other car h than four of what we call extra

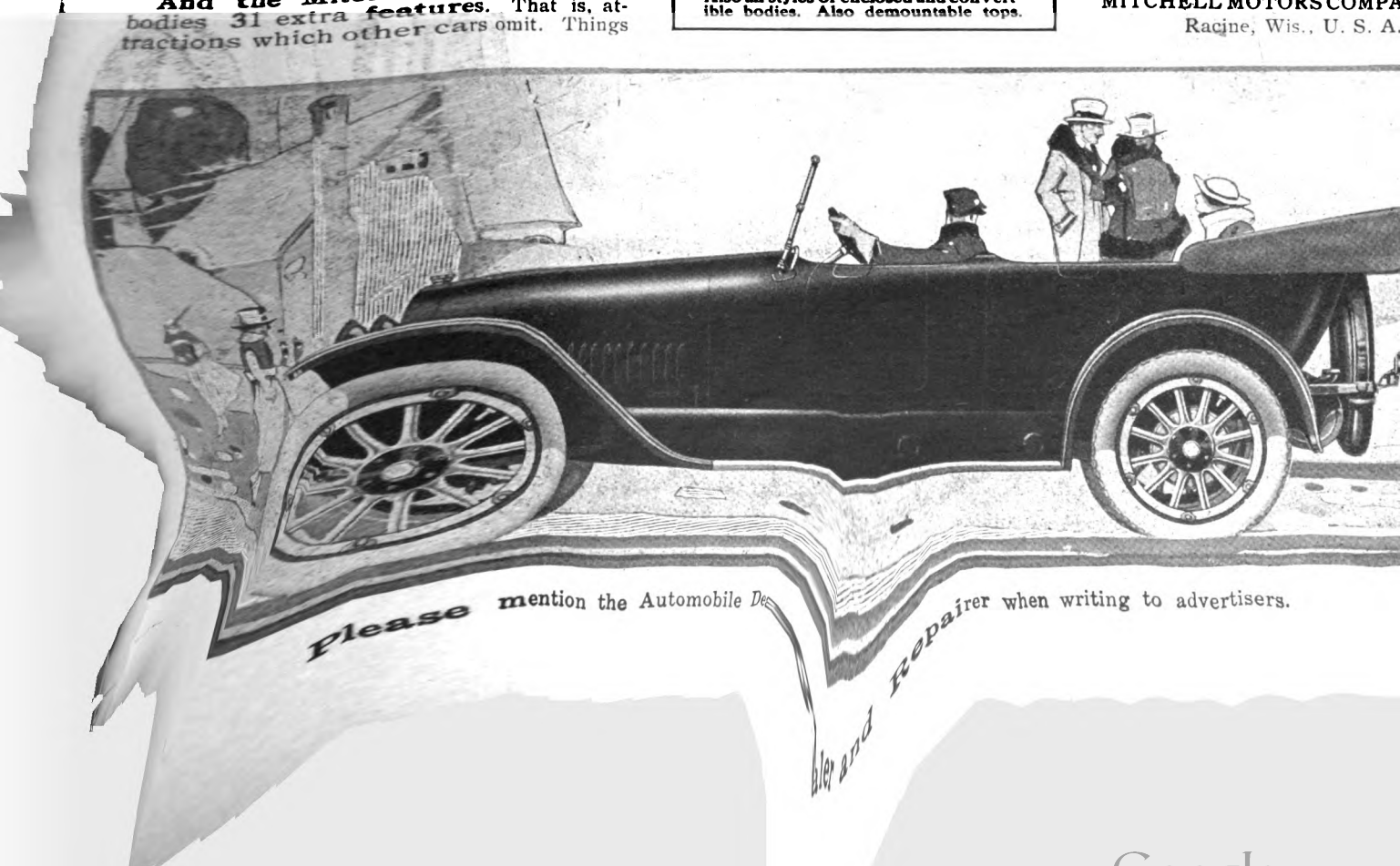
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The time has come when e counts for much. It shows uously in the extra values.

Probably no other class car be able to compete with the Mi this. John W. Bate has spent in attaining this Mitchell efficie built and equipped this mamm with that one end in view. F years he has worked to attain it Mitchell part. He is workin 15 hours a day—to retain this lea

If you believe in efficiency factory and the car—investig wonderful example.

MITCHELL MOTORS COMPA
Racine, Wis., U. S. A.



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The "Badger" Tripod Radius Rod.

This is a new article to replace the regular radius rod on Ford cars without any mechanical changes. The original Ford radius rod is made of tubing, and the constant strain from the axle sometimes buckles the tubing, causing the rods to break. The "Badger" Tripod radius rod is made from solid cold rolled



Tripod Radius Rod.

steel, and in addition to this feature it has the center rod, which greatly reinforces the side rods, as it takes the force directly in the center. Furthermore, in clamping this rod to the bottom of the axle, the clamps are adjusted by threads, so as to hold and place the axle in the proper alignment. With this reinforcing center rod no auxiliary rods or other devices are necessary to give the proper support to the front axle. This rod sells at a reasonable price, and it is manufactured by the Auto Parts Mfg. Co., 528 Broadway, Milwaukee, Wis., to whom all inquiries should be addressed.

Two Good Specialties for Fords.

Every Ford driver is aware of the difficulty of securing a powerful driving light at low engine speeds. The New York Coil Company of 338 Pearl Street are putting out their "Senior" Light Regulator in a reconstructed form. In this new form both lights always remain



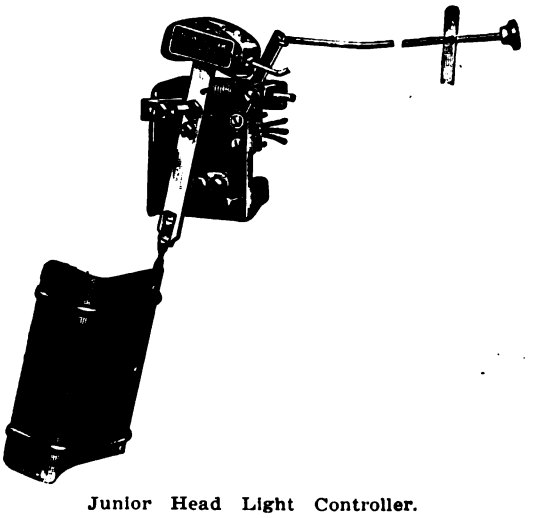
New York Security Switch Lock for Fords.

burning, but at speeds of less than 18 miles per hour 80 per cent. of the current is automatically transferred to the left hand lamp, and at speeds above eighteen miles per hour, both lamps burn to full brilliancy. This operation is accomplished automatically by the variation in the air draught from the fan.

A dimmer is also incorporated, which is operated by a rod running through dash—a slight push of the rod dims both lights at all speeds for use in passing other cars. This dimmer also complies with city traffic regulations. The price of the instrument complete is $5.00. Anyone can successfully install in a few minutes, as the same wiring, bulbs and switch are employed.

They also put out the "Junior" model, which does not have the dimming attachment. In this model all of the current is transferred to the left-hand lamp at low speeds. The price is $1.75.

Another specialty made by the same company is equally interesting. Thousands of Ford cars are being stolen. In fact, this menace has become so acute that in some cities the authorities are contemplating advisability to make it compulsory to lock cars when left standing. The New York "Security" Switch Lock is installed in three minutes on the regular Ford switch by simply removing the regular nameplate and attaching with three screws. A non-pickable barrel lock is so arranged that a turn of the key not only turns on the ignition, but causes three metal bars to extend outward, covering the screw heads in such a manner that it is impossible for a thief to remove the switch, short-circuit the wires or resort to any means that will allow the car to be operated. As the regular Ford switch is employed, the owner has no difficulty in installing, as no wires or connections are changed. The manufacturers advise that, due to these features, their switch is meeting with very marked success among the trade. The price is $3.00.



Junior Head Light Controller.

The Quick-Ezy Tire Tool.

This is a new tool for changing tires, which has been recently placed upon the market by the H. L. Hurst Mfg. Co., 2183 North Street, Canton, Ohio. This tool, with its powerful screw, will pull any old rusty split rim apart in a jiffy. It grips the rim at three points and will not bend or slip. It is handy in every garage and gives quick service to tire customers and saves time and money. It is also extremely handy for a motorist, enabling him to meet emergencies on the road. Readers who are interested should write for prices and full informa tion direct to the manufacturers at th above address.

A Spoonful of Sugar.

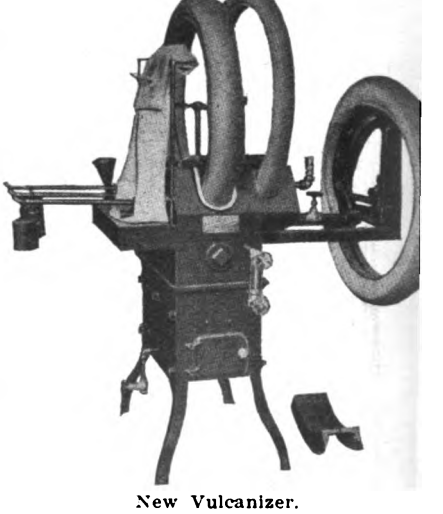
This is the title of a little story of th sweetening of a motor. It has alread gone into a second large edition, and th narrative is so absorbing and well to that the reader forgets it really co cerns the achievements of the Rayfie carburetor. It deals with love and ac venture and contains some vivid descri tive matter. Every one who has ev used or owned a carburetor or who co templates doing so should get a cop It can probably be had for the askin by addressing Findeisen & Kopf Mf Co., 2125 Rockwell Street, Chicago. W should be glad to quote from it excep that it is copyrighted, and that a gen inely good thing should not be serv in fragments. The book is appropriat ly and artistically illustrated.

The Kor-Ker Puncture Cure.

This is a compound for sealing ti punctures, and the manufacturers sta that this compound has made good und the most severe tests. When a tire h been treated with this compound, it claimed that punctures are automatical sealed and the compound will also ferr out and stop slow leaks. This materi is not in any way injurious to the ru ber; on the contrary, it is claimed th it is an actual preservative and is gua anteed not to injure tires, but on t contrary, to give them longer life. Th compound is manufactured by the A cemo Mfg. Company, Newark, N. J., whom all inquiries should be addresse

A New Tire Repair Outfit.

The Akron Rubber Mold & Machi Company, 917 Sweitzer Avenue, Akro Ohio, builders of Tip-Top Tir-Re-Pa Equipment, are bringing out a new ou fit for tire repair men this year—a co plete outfit with a wide range of ada tability and high efficiency for $125. T equipment consists of two caviti



New Vulcanizer.

2½-3 and 4½-5; reducing shell for 4½-5; inside patch, 3½-4, on which sizes of inside work can be done; 2½ 3½-4, 4½-5 bead molds, in either Q. or straight side, furnished with out This outfit will meet all ordinary requi ments and occupies little room in shop.

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Hi-Comps are distributed by jobbers and accessory dealers everywhere.

SEND FOR OUR UNIQUE ORDER AND SPECIFICATION BOOK

MANUFACTURED ONLY BY

CONTINENTAL PISTON RING CO.

MEMPHIS, TENN.

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Counter Display for Affa Specialties.

The illustration will give our readers a fair idea of the new counter display carton for showing the well-known Affa specialties, which has just been brought out by the manufacturer of these specialties, W. S. Graffam, of Northampton, Mass. The carton, as shown, holds 24 sets of clevis silencers, brake rod silencers or spark and throttle rod silencers for Ford cars, or 12 sets of steering spindle adjusters. The cartons, in fact, may be filled with any combinations of Affa specialties suggested by jobbers or dealers, and it must be admitted that the carton makes a very neat display on the dealer's counter and also affords protection of the goods while in stock, thus preventing them from getting dirty and shop worn. Dealers who are interested should write direct to the manufacturer.



Concrete Garage for Sale.

An excellent opportunity is offered to some enterprising man at Lake Placid, New York, the well-known Adirondack Summer resort. A new concrete garage, 50 x 100, located on the main street in the village of Lake Placid, is for sale. This garage has an established trade. It is equipped with all the latest appliances, including an electric elevator, stationary gasoline, oil and compressed air tanks, and a full machine shop equipped with lathes, shaper, forge, etc., all electrically driven; also a stock of supplies and accessories valued at over $10,000 will be sold with the building at the actual net cost, if so desired by the purchaser. Any of our readers who may be interested should write for price and full particulars to T. B. Cotter, Attorney, Plattsburgh, N. Y.

Mend It With Solderall.

In every repair shop a great deal of soldering is done, and for this purpose Solderall is highly recommended. It mends all metals and is furnished in very convenient form in a collapsible tube, ready for quick repairs. A tube of Solderall, with a practical soldering torch, packed in a handsome box, will be sent prepaid for $1.25. Solderall is a quick seller and dealers, car owners, and public or private garage owners should write for prices direct to the manufacturers, The Solderall Company, 131 Sussex Avenue, Newark, N. J.

Good Automobile Coverings.

All prudent motorists protect the seats and upholstery of their touring cars by means of dust covers. The New York Auto Equipment Company, Inc., 351-55 West 52d Street, New York, manufactures a line of dust covers of excellent quality. They make seat covers to fit all American made cars; also auto tops for all cars, auto fabrics of all kinds, curtain fasteners, snap fasteners, celluloid specialties. Ford One-Man tops, Ford jiffy curtains, tire covers, wash aprons, back cushions, wind shields, radiator covers and everything in the fabric line for the automobile. Readers who are interested should write for their latest catalogue and prices, which will be sent free and postpaid on application.

Dodd Gets Important Account.

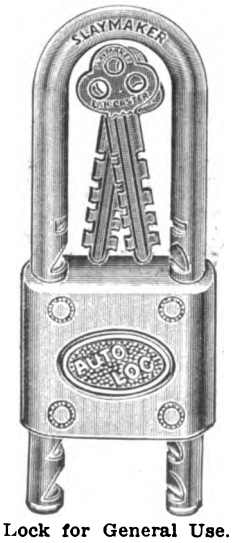
A. M. Dodd, Ellsworth Building, Chicago, Ill., the well-known advertising agent, is again handling the advertising account of the American Bureau of Engineering.

Novel Advertising Copy.

The Brunner Manufacturing Company of Utica, N. Y., manufacturers of air compressors for garage service, have launched an advertising campaign which is absolutely unique, owing to the striking and highly original character of the copy used. The first instalment of this series of advertisements will be found in this issue of our magazine, occupying three half pages, and no doubt a number of our readers will scan this copy with much interest; and many of the garages in this country will undoubtedly be "Brunnerized" as a result of this campaign.

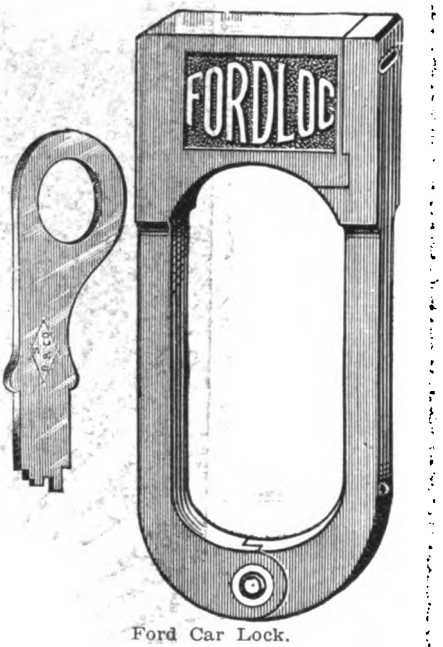
Lock Your Car.

There are hundreds of thousands of dollars worth of cars stolen every year in this country. In fact, automobile stealing has become a regular and well organized business. Yet it is no more trouble or expense to lock a car than it was to hitch a horse when that animal was so widely used for driving some years ago. A simple way is to use a secret plug switch, where it will not be seen to open the ignition circuit, although this will not prevent towing the car away if the chance is offered. One of the best methods of locking the car. Another method is to close a padlock on the spark and throttle lever, to lock it to the web of the steering wheel, although this is open to the same objection.



Lock for General Use.

In our opinion, one of the best locks is to simply lock the wheels so they will not turn, and use a chain so hard and strong that it cannot be easily cut. The only objection to this is that in case of fire in a big city the fire department may find it necessary to move it, and they would find it just as difficult as if they were burglars. The Slaymaker Lock Mfg. Co., Lancaster, Pa., make a variety of strong locks that will answer for almost any purpose, illustrations of two being given herewith, one with an adjustable shackle that will allow it to be used for almost any purpose, and the other for locking the spark and gas levers of a Ford car.



Ford Car Lock.

The Esta Water Auxiliator.

The device bearing the above title is a gas economizer and carbon remover. It is simple in construction and efficient in operation. The engine suction causes a vacuum in the container, drawing numerous currents of pure filtered and completely humidified air (containing 88 per cent. oxygen) into the intake manifold, combining with and completely vaporizing the gasoline, forming a perfect mixture. This mixture is then drawn into the combustion chambers, there being converted into live steam. Automatic decomposition and elimination of carbon is insured, causing a complete combustion and a more powerful and sustained power stroke. This device has been officially tested by expert engineers connected with the Pratt Institute of Brooklyn, N. Y., and the report made as a result of this test was extremely favorable. The Esta Water Auxiliator is manufactured by the Esta Water Auxiliator Company, 1916 Broadway, New York City, to whom all inquiries should be addressed.

Removal of Well-Known Agency.

The C. Ironmonger Advertising Agency, which has been located for many years in the Evening Post Building, Vesey Street, New York City, has removed to more centrally located offices at 95 Madison Avenue, corner 29th Street, New York City. This agency handles several important automobile accounts.

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Written for You

Just Write Us Today for Your Copy

The Booklet Tells:

Why springs break—and why 75 out of every 100 break at the center.
How springs can be kept from breaking—and how Tuthill Titanics are used for more replacements than all other makes put together. They're guaranteed *forever* against center breakage and for one year against breakage at any point.

Springs are important. Your car is no stronger, no safer than its springs. The book tells how to dodge danger, annoyance, expense. Get it. Read it.

TUTHILL Lubricated TITANIC SPRINGS

No Center Bolt which practically cuts the spring in two at the very point where greatest strain comes.

No Center Nib where the weakening center hole in the short leaf spring is even larger than in the center bolt type.

No Center Breakage for the Arch *strengthens* the spring at the center, and Titanic Springs are guaranteed forever against center breakage.

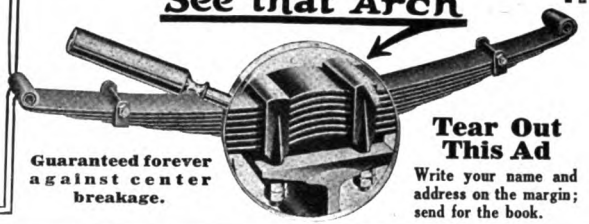
Tuthill Spring Co., 760 Polk Street, Chicago

Finest Possible Delivery Service

The Tuthill Spring Co. is known as favorably for its deliveries and service as the quality of its springs. Sixty distributors. Your distributor always is ready to make immediate shipment. His orders to us are filled the same day received. OUR NEW 1917 PRICE LIST is the most complete price list of springs ever published.

Send for your copy of the booklet today

See that Arch



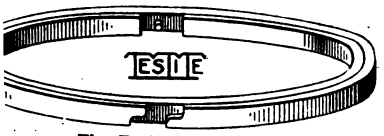
Guaranteed forever against center breakage.

Tear Out This Ad

Write your name and address on the margin; send for the book.

Tes-Tite Piston Rings.

A new piston ring has just been placed on the market which is called the Tes-Tite, and to anyone acquainted with the mechanical details of an automobile, the accompanying cut of this piston ring will be self-explanatory. Tes-Tite piston rings, being constructed of two eccentric rings, that form a concentric, or ring, of equal thickness, exert an equal pressure on the walls of a cylinder, and in cases where cylinders have worn, they conform to every curve and cause smooth, powerful action. While this ring has many good features, this is one of the essential points which will recommend it to the purchaser. It is also claimed that these piston rings save gas by utilizing the entire fuel charge in the production of power, without any waste whatever. These rings are made of rough, specially processed, gray iron of the best grade, and owing to their great elasticity can be readily fitted to any piston. They are packed separately in neat paper box, with directions for installation printed on each bag, and for the trade these bags are packed in a neat box, containing twelve piston rings. All who have tried the piston rings are most enthusiastic in their praise, and interested readers should write for prices and full particulars direct to the Stevens Piston Ring Co., Inc., Freeport, N. Y.



The Testite Piston Ring.

Toliver Puncture Proof Tubes.

The Toliver Puncture Proof Tubes are manufactured by the Toliver Tube and Tire Company, 523-F Foster Building, Denver, Colo. These tubes are guaranteed to give 5,000 miles of service without losing air through a puncture, and this guarantee is so strong that the tubes command a ready sale among car owners. Good salesmen and agents are wanted for this specialty throughout the country. The same company also manufactures an ordinary plain inner tube, which is not puncture proof, but is guaranteed to be the highest quality. Readers who are interested should write for prices and full particulars direct to the manufacturers at the main office in Denver.

Cork Insert Transmission Linings for Fords.

We wish to direct the special attention of our readers to the Advance Cork Insert Ford Transmission Linings which have just been brought out by the Advance Automobile Accessories Corporation, 56 East Randolph Street, Chicago, Ill. With this transmission lining the mechanism never loses its grip and the jar and vibration are also killed. The Advance Cork Insert Transmission Lining cannot slip. The cork surface takes hold instantly and engages smoothly and evenly. Just the slightest pressure gets results, yet no matter how hard you press the pedal, you cannot make the car jump or vibrate. There is a continuous, positive, steady engagement of the transmission. The advantages will be obvious to any person who has ever driven a Ford car. This is a quick seller for live dealers, and they, as well as car owners, should write direct to the manufacturers for prices and full particulars.

In Repainting, Use Quality Materials.

Many of our readers who are in the repair business will repaint cars for their customers this Spring. The only way to give complete satisfaction on this work is to use none but the best material. Valentine & Company, manufacturers of high grade varnishes and colors, with main offices at 456 Fourth Avenue, New York City, have made varnish and colors of the highest quality for more than half a century, and many of the fine cars turned out by great American factories are painted and varnished with Valentine materials. Every reader who does any repainting should send to this company for their free book, entitled "Automobile Painting Systems," which contains extremely valuable information in regard to painting and varnishing automobiles, new or old.

Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.

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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

General Speedometer Repair Company

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Repairs and Repair Parts
For ALL Makes
SPEEDOMETERS
HORNS
CLOCKS

Official Service Station
KLAXON HORNS
VAN SICKLEN SPEED
CORBIN BROWN SPEED
American Electric Co.

Ford Book *Free*

Get this New Free Catalog to-day. No other book printed offers such extraordinary values. Every item will save you money. Every order leaves our packing division in just 3 hours. And we'll return your money if you're not absolutely satisfied. Your copy is waiting. Ask for Catalog DR.

General Automobile Supply Company
1671-1673 Broadway **New York City**

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

FORD RACERS UNDERSLUNG SEVEN INCHES.
Easy Method. Parts and Drawing $15.00.
INTERSTATE RUBBER CO.
259 N. 15th Street Philadelphia, Pa.

Carburetors

SHIP THAT TROUBLESOME CARBURETOR

By Parcel Post. We rebuild and install new parts. Largest and most fully equipped carburetor testing plant in the East. Factory appointed service station for all the leading companies. Also a stock of used rebuilt carburetors, $5.00 up. All work guaranteed.

JOHN WILLS, Carburetor Specialist,
284 Halsey St., Newark, N. J.

Auto Accessories

SPECIAL SALE

Closing Out Accessory Lines

subject to prior sale, the following:

800	Wondertone Hand Horns, all guaranteed	lots of 12	$1.50
	lots of 50 1.40	lots of 100	1.35
650	Jandorf Vibrator Horns, complete with switch and wire	each	.60
35	Warner Steering Gears, complete, with gears and levers	each	7.50
550	See Bright Spotlights with mirror and wire, black and nickel finish	lots of 12	2.75
	lots of 50 2.50	lots of 100	2.40
288	Quart cans Wondermist, doz. quarts, each		.76
600	Single Action Foot Pumps (Cox Brass Co.)	lots of 12	.75
	lots of 50 .67	lots of 100	.63
200	12-oz. Ball Pien Hammers		.23
250	18-oz. Ball Pien Hammers		.27
200	28-oz. Ball Pien Hammers		.35
75	Standard Tool Boxes, Ford 22 inch		1.15
220	Sets of Gas Head Lamps, Oil side tail, Cochrane Victor Co., set of 5		6.00
700	Champion ⅞ in. Spark Plugs each		.25
600	Miller Metric Spark Plugs, 1 to a box		.12
900	Boxes Red Rubber Cementless patches	box	.10
500	Cast Pliers, per 100, $8.50—per doz.		1.10
200	Moeller Battery Hydrometers	each	.45
80	Johns-Manville Fire Ext.	each	5.50
150	Cans Lubro Radiator Cement	each	.25
60	Cans U. S. Metal Polish, quarts		.15
500	Assorted Brass Pet Cocks		.12
60	Cans Tire Doh	per doz.	3.60
72	Cans Rex Anti Slip Brake Wafers	doz.	2.40
200	Sight Feed Oilers Dash Board, doz.		6.00
75	54-in. x 72-in. Glengary Robes, each		5.25
200	Flexible Metal Hose Connection, 18 inches long	per doz.	.60
200	Pairs Gas Headlights	per pair	3.50
200	Oil Side Lamps for Trucks, per pair		2.00
200	Oil Tail Lamps	each	1.20

Samples at Quantity Prices.

JANDORF AUTOMOBILE CO., Inc.
1763 Broadway, Dept. A.D. **New York**

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For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

W. S. GRAFFAM.
498W Carleton St., Newton, Mass.

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PRICE WRECKER No. 18, listing 3,000 automobile supplies and accessories. Just off the press. Thousands of motorists save 25% annually with this as a guide. It's free. Send for one.

TIMES SQUARE AUTO SUPPLY CO.
World's Largest Dealers
56th Street and Broadway, New York — 1210 Michigan Ave., Chicago

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BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Auto Accessories

Dealers & Repairmen

We offer subject to prior sale:

Few boxes, assorted, bolts, nuts, set Screws, Washers, Machine Screws, etc.:

50 lb. Boxes $3.10
100 lb. Boxes 5.25

MONEY BACK IF NOT SATISFIED.

1,500 ft. 2½x3-16 Brake Lining:
50 ft. lots $11.50
100 ft. lots 22.00

10,000 5/16 x ½ in. long U. S. Standard Cap Screws.

5,000 A.L.A.M. Cap Screws:
½x4-4⅜-4¾-4⅞-5 in.
70%-10% Discount from List.

4,000 5/16x1 in. Carriage Bolts....50c 100

CORK, COMPOSITION SHEET PACKING
12 in. x 36 in.

1/16 thick ..... 30c. sheet
3/32 thick ..... 45c. sheet
⅛ thick ..... 60c. sheet
Lots 50 sheets, 20% Discount.

Highest grade Felt, ⅛-¼-⅜ in. thick..$1.35 lb

MAGNETO BALL JOINTS
12 Different Sizes.

50 assorted $3.50
100 assorted 6.00

WHITNEY KEYS

100 assorted $1.75

PISTON RINGS

We carry 50 sizes. Ask for prices.

CARBON REMOVER

French Compression Fluid, ½ gallon, 60c.

We also carry Johnson's Carbon Remover.

Send us list Cap Screws for quotations.

We carry Cotter Pins, Lock Washers, Ignition Cable, Radiator Hose (all sizes), Fuses, Shackle Bolts, Bowen Grease Cups, Priming Cups, Air Cocks, Belt, Pliers, Grease. In fact, almost everything needed by repair men. Get our prices before placing spring orders.

Westchester Accessories Co., Inc.
1777 Broadway **New York City**

Magnetos and Batteries

Hecht's Magneto Exchange

INCORPORATED

Dealers in Magnetos of all Makes.
Lighting Systems and Self Starters.

Expert Repairing of All Makes.

Express your Magneto, Starter and Generator to us. Same will be repaired and returned same day as received.

Distributors and Service Station for
MICHIGAN AND NATIONAL MAGNETOS
— Also —
Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos

230 WEST 49th STREET NEW YORK CITY

MAGNETOS

Expert repairing on all makes of Magnetos, Coils, Self-Starters and Generators. Armature winding a specialty. Parts for all makes carried in stock.

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1779 Broadway, Suite 229, New York City

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HERCULES TIRES
GUARANTEED 4,000 MILES

If a tire fails to run 4,000 miles, we will replace with another tire for one-half of below price.

Size	Plain	Non-Skid	Tube	Size	Plain	Non-Skid	Tube
28x3	$5.95	$6.95		35x4	$13.45	$14.95	$3.30
30x3	6.50	7.50	$1.90	36x4	13.95	15.50	3.35
30x3½	7.95	8.95	2.15	34x4½	16.95	18.95	4.00
32x3½	8.95	9.90	2.25	35x4½	17.45	19.45	4.10
34x3½	9.50	10.45	2.35	36x4½	17.95	19.95	4.15
31x4	11.45	12.60	2.95	37x4½	18.45	20.45	4.25
32x4	11.95	12.95	3.05	35x5	19.45	21.95	4.90
33x4	12.45	13.50	3.10	36x5	20.45	22.95	4.95
34x4	12 95	13.95	3.20	37x5	21.25	23.25	5.05

WE SHIP C. O. D. — MAIL ORDERS PROMPTLY FILLED
WE PAY ALL EXPRESS CHARGES — WE CARRY A LARGE STOCK

Special Propositions to Good, Live Dealers

HERCULES TIRE CO.
612-14 N. BROAD STREET — PHILADELPHIA, PA.
Phones: Poplar 5169—Race 6019-D

FRESH STOCK

Ball Bearing Tread Tires

GUARANTEED 4,000 MILES
NON-SKID

We have a tremendous stock of the Endurance Ball Bearing Tread and Hamilton Cable Cord Tires in factory blemished on hand, at the following prices:

Size	Price	Size	Price
30x3	$6.50	34x4	$15.00
30x3½	8.50	34x4½	18.75
32x3½	9.75	35x4½	19.50
32x4	13.50	36x4½	20.00
33x4	14.25	37x5	23.50

Mail orders promptly attended to and sent subject to examination. No deposit required. Send your order to-day.

LEON JAFFESS, Inc.
252 West 55th St. New York City — 6106 Euclid Ave. Cleveland, Ohio

References: Bank of U. S., New York City. First National Bank, Cleveland, Ohio.

DOUBLE TREAD TIRES
AT 75% SAVING

Size	Plain	Non-Skid
30x3½	$6.00	$6.50
33x4	8.00	8.75
35x4	8.00	8.75

All Other Sizes in Proportion

These Tires Are Absolutely Puncture-Proof

Terms. C. O. D. 10% Deposit

BERGEN & ZAAGER
243a West 56th Street — NEW YORK

CHEAP DOUBLE TREAD
NEW AND SECOND HAND
Tires and Tubes
Write for Prices

JAFFE BROTHERS
260 West 54th Street — NEW YORK CITY

McCLURG & COLUMBA TIRES
Hand Made. 5000 Mile Guarantee. Discounts to Agents. Send for List.
STAR RUBBER CO., 1781 Broadway, New York

DOUBLE TREAD TIRES
GUARANTEED

for big, low cost mileage. They save you 65%. We build splendid double thickness tires by special process, giving you the unusual strength and resistance qualities so essential for heavy work in the country.

Sizes	Tires Plain	Red 9 Ply Tube*
30x3	$4.50	$3.00
30x3½	6.00	3.60
32x3½	6.25	3.65
34x4	7.75	5.00

All sizes from 28x3 to 38x5¼ in stock. Special Prices.

Tires, Pink, Red and Gray Tops. 2nd's.

Three years ago we introduced DOUBLE TREAD TIRES to the farmer. Square dealing, honest values and prompt delivery have built the largest retreaded tire business in America around our "*Doutre*" trade mark. Compare these prices on tires and tubes. Send for booklet and detailed lists.

Sizes	Tires Plain	Red 9 Ply Tubes
34x4½	$9.50	$6.60
34x5½	10.00	6.75
36x4½	10.00	6.90
37x5	12.00	8,20

75 cents additional added on all non-skid tires.

20% Deposit Required on C. O. D.

DOUBLE TREAD TIRE CO., Inc.
104 WEST 32nd STREET — NEW YORK CITY

Auto Tires Guarante

At last, we have perfected th
Double Tread Tire.

Send us a trial order and forget
tire troubles.

PRICE LIST

Size.	Plain.	Tubes	Size.	Plain. T
28x3	$4.00	$1.75	35x4	$9.00
30x3	4.50	1.85	36x4	9.00
30x3½	6.00	2.15	34x4½	9.50
32x3½	6.50	2.25	35x4½	9.50
34x3½	7.50	2.50	36x4½	10.00
30x4	7.00	2.75	37x4½	10.50
32x4	8.00	2.75	35x5	11.00
33x4	8.50	2.90	36x5	11.50
34x4	8.50	2.90	37x5	12.00

For (Non-Skid) sizes up to 30x4, 50c
All other sizes $1.00 Extra.

Examine your worn tires when taking off, and if the bead is not cut ship them We will remake them into a GOOD D Tread Tire at 60% of the above prices.

When ordering be sure to state what tire is required. Whether Q.D. Clinch Straight Side.

10% deposit required on C. O. D. ord

SPECIAL Offer to Agen

Write for Catalogue

Get our special price on **new** ti
Biggest offer ever made.

M. Liben & Co.
205A West 48th St. — New York

The Junk Man Won't Pay What Say Old Tires Double Tread Are Worth

Two of your worn tires double tread the McDaniel process make the che known new tire. Doubles strength thickness. Puncture and blow-out pro thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We fu Both Ca
28x3	$2.00	$3.00	$3.
30x3	2.50	3.50	4.
30x3½	3.00	5.00	5.
32x3½	3.25	5.25	6.
34x3½	3.50	5.50	6.
31x4	3.25	6.25	7.
32x4	3.25	6.25	7.
33x4	3.75	6.75	7.
34x4	4.00	7.00	8.
36x4	4.25	7.25	8.
36x4½	4.50	8.50	10.
37x4½	4.50	8.50	10.
37x5	5.00	9.00	12.

Ship Your Old Tires by Prepaid Expr
McDANIEL RUBBER CO.
613 Ohio Street — Cair

Don't Be Misled By Fictitious Mileage Guar

Our Tires Guarante

ALL FRESH FACTORY BLEMISHE NOT MADE OVER OR RECOVERE

Size	Plain	Skid	Size	Plain
28x3	$5.55	$6.32	34x4	$12.00
30x3	5.88	6.71	35x4	12.50
30x3½	7.70	8.63	36x4	12.50
32x3½	9.50	10.67	35x4½	16.00
34x3½	9.60	10.85	36x4½	17.25
33x4	11.50	12.50	37x5	18.75

All Other Size Tires Carried in Stoc

THESE PRICES ARE SUBJECT CHANGE WITHOUT NOTICE.

Any Order Sent C. O. D. on Approva

TIRE SALES CO.
1338 Arch Street — Philadelphia

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SPECIAL SPRING OFFER

—ON—

DOUBLE TREAD TIRES

AT A SAVING OF 75%

A Special Discount of 5% When Cash Accompanies Order. We Also Give Special Discount to Dealers.

The following are our net prices on Double Tread Tires and New Tubes of Standard Makes kept on stock:

Size	Plain	Tubes	Size	Plain	Tubes
28x3	$3.50	$1.95	35x4	$8.50	$3.70
30x3	4.50	2.05	36x4	8.50	3.80
30x3½	5.50	2.40	34x4½	9.50	4.40
32x3½	6.50	2.55	35x4½	9.50	4.50
34x3½	6.50	2.70	36x4½	9.50	4.60
30x4	6.50	3.15	37x4½	9.50	4.75
32x4	6.50	3.35	35x5	10.50	5.35
33x4	7.50	3.45	36x5	10.50	5.45
34x4	8.50	3.60	37x5	10.50	5.55

Non-Skid, $1.00 Extra on All Sizes

For retreading your old tires, we charge you 40 per cent off above prices.

Make sure when ordering tires to state whether Q. D., Straight bead or Clincher type.

We carry a full line of New First and New Second Tires at a big saving. Write for prices mentioning sizes. Prices upon request.

TERMS: 10% DEPOSIT, BALANCE C. O. D.

I JAFFESS Two Stores, 1319A Fifth Ave., 241 West 54th St., NEW YORK CITY

HERCULES TIRES

GUARANTEED 4,000 MILES

If a tire fails to run 4,000 miles, we will replace it with another tire for one-half regular price.

We Ship C. O. D.
Large Stock.
No Double Treads.

PRICE LIST

Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3	$5.95	$6.85	$1.80	34x4	$12.95	$13.95	$3.20
30x3	6.50	7.50	1.90	35x4	13.45	14.95	3.30
30x3½	7.95	8.95	2.15	36x4	13.95	15.50	3.35
31x3½	8.35	9.40	2.20	37x4	14.90	15.95	3.45
32x3½	8.95	9.90	2.25	34x4½	16.95	18.95	4.00
34x3½	9.60	10.45	2.35	35x4½	17.45	19.45	4.10
36x3½	10.45	11.85	2.50	36x4½	17.95	19.95	4.15
30x4	11.20	12.10	2.85	37x4½	18.45	20.45	4.25
31x4	11.45	12.60	2.95	35x5	19.45	21.95	4.90
32x4	11.95	12.95	3.05	36x5	20.45	22.95	4.95
33x4	12.45	13.50	3.10	37x5	21.25	23.25	5.05

Special Propositions to Good, Live Dealers

HERCULES TIRE CO.

2128 S. Michigan Ave.
Chicago, Ill.

612 N. Broad Street
Philadelphia, Pa.

SPRING REDUCTION ON

DOUBLE TREAD TIRES AND TUBES

GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90	30x4	7.00	2.50	37x4½	9.00	3.10
30x3	4.50	1.75	32x4½	9.00	2.75	32x4	8.00	2.75	34x5	9.50	3.25
30x3½	6.00	2.10	34x4½	9.00	3.00	33x4	8.00	2.75	35x5	10.00	3.25
32x3½	6.50	2.15	35x4½	9.00	3.00	34x4	8.00	2.75	36x5	11.00	4.00
34x3½	7.50	2.25	36x4½	9.00	3.10	35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.

B. LIBEN & COMPANY

261-A West 54th Street NEW YORK CITY 112-A East 110th St.

THE HOME OF DOUBLE TREAD TIRES

Double Service Tires

AT 25 CENTS

ON THE DOLLAR

A Saving of 75% to you, and all tires guaranteed.

CAN YOU BEAT OUR PRICES?

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	35x4	$9.00	$10.00
30x3	5.00	5.50	36x4	9.00	10.00
30x3½	6.00	6.50	34x4½	9.50	10.50
31x3½	6.25	6.75	35x4½	9.50	10.50
32x3½	6.50	7.00	36x4½	9.50	10.50
34x3½	7.50	8.00	37x4½	9.50	10.50
30x4	7.00	7.50	34x5	9.75	10.75
31x4	7.00	7.50	35x5	10.50	11.50
32x4	8.00	8.50	36x5	10.50	11.50
33x4	8.00	9.00	37x5	11.00	12.00
34x4	8.00	9.00			

These tires are absolutely puncture proof and guaranteed 100 per cent. for your money.

A deposit of 10 per cent. required on all orders and payment in full will save you C. O. D. charges.

HARTFORD TIRE CO., Inc.

Established for Years

149 West 51st Street New York City

References from All Commercial Agencies

AT LAST!

Double Tread Puncture-Proof Tires at a Saving of 75 Per Cent.

Size	Plain	Size	Plain
28x3	$3.95	35x4	$ 9.00
30x3	4.40	36x4	9.00
30x3½	5.75	34x4½	9.00
32x3½	6.40	35x4½	9.00
34x3½	7.00	36x4½	9.75
30x4	7.00	37x4½	9.75
32x4	7.75	35x5	10.50
33x4	8.00	36x5	10.50
34x4	8.00	37x5	11.00

*Non-Skid $1.00 extra on all sizes. Good used tubes, all sizes from $1.00 up. A deposit of 10 per cent required on all C. O. D. orders. Any other size you need ask for.

Five per cent discount on all cash orders. Be sure to state the bead, whether QD., straight or clincher.

SIMONS AUTO SUPPLY CO.

133 West 145th St., NEW YORK CITY

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$4.00	35x4	$8.00
30x3½	4.50	36x4	8.50
32x3½	5.50	36x4½	9.00
32x4	6.00	36x4½	9.00
33x4	6.50	36x5	9.00
34x4	7.00	37x4½	9.00
34x4½	7.50	37x5	9.50

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.

236 WEST 48th STREET, NEW YORK

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Tires

PRICE WRECKERS

All goods bought before the January increase in price sold at 1916 prices.

Blemished New Tires		Double Tread	
30x3	$6.50	39x3	$5.00
30x3½	8.00	30x3½	6.00
34x4	13.00	34x4	8.00

Guaranteed

$1.00 Less for Re-covering

Give Us a Trial, We'll Both Benefit By It

ROYAL TIRE EXCHANGE

282 Halsey Street Newark, N. J.

GRIPWELL TIRES

CARRY 3,500 MILE GUARANTEE

MR. DEALER WRITE FOR OUR PRICES, WHICH ARE RIGHT.

UNIVERSAL RUBBER CO.

BROAD AND WOOD STREETS, PHILA., PA.

AUTO TIRE PRICES HIGHER. Sell Insyde (Armour) Tyres. They double tire mileage, prevent punctures, blow-outs, etc. Great profitable seller. Free details. American Accessories Co., Dept. AD-2. Cincinnati, O.

GET A 99%

Puncture-Proof Tire

AT 75% LESS PRICE

A Double Fabric or Double Service Tire made from Standard Make.

Look at These Prices!

	TIRES	TUBES
30x3 Plain	$4.50	$1.75
30x3½ "	6.00	2.00
32x3½ "	6.50	2.25
33x4 "	8.00	2.50
34x4 "	8.00	2.50
36x4½ "	10.00	3.00

For Non-Skid, 50c extra.

Write Today for Circular

HARRY N. DOLKART

249 W. 49th St., New York

Auto Bodies

Auto Body and Metal Manufacturers

ATTENTION!

Over Stock of Terne Plate for sale at a sacrifice.

Write for Particulars

JANDORF AUTO CO.

1761 BROADWAY NEW YORK

Bearings

BALL BEARINGS

All Makes and sizes in Stock

E. E. BRENNAN 1824 Broadway, New York City

BALL BEARINGS REPAIRED

Repaired Annular Bearings, made to order, all sizes for AU BALL BEARING W'KS. St., Boston, Mass.

Bearings

BEARINGS

(DIE CAST)

TO FIT

	Each Net
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Conn. Rod 40—07*-08-09 (Half)	$1.00
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Conn. Rod 36—12-13-14 (Half)	.70
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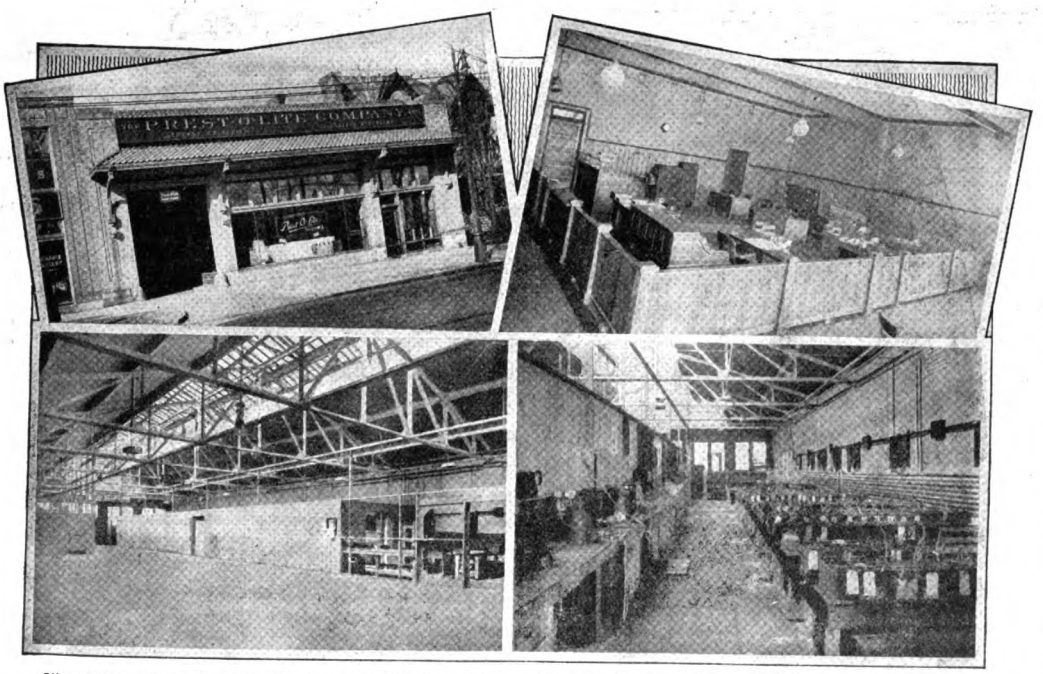
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Prest-O-Lite SERVICE in DETROIT



Illustrations above show, (top) front view of Prest-O-Lite Factory Branch at 1239 Woodward Ave., Detroit; (below) the large space devoted to battery inspection and service.

Views above show, (top) commodious office space of the Detroit Branch; (below) large quarters occupied by the battery charging and repair department.

IN Detroit, fifth city of America, the automobile metropolis of the world, where the influence of the motor car is far-reaching and SERVICE is a paramount issue—there you will find a big Prest-O-Lite Factory Branch, with a live, hustling organization giving real *factory* service to manufacturers, dealers and car owners in Detroit and Eastern Michigan.

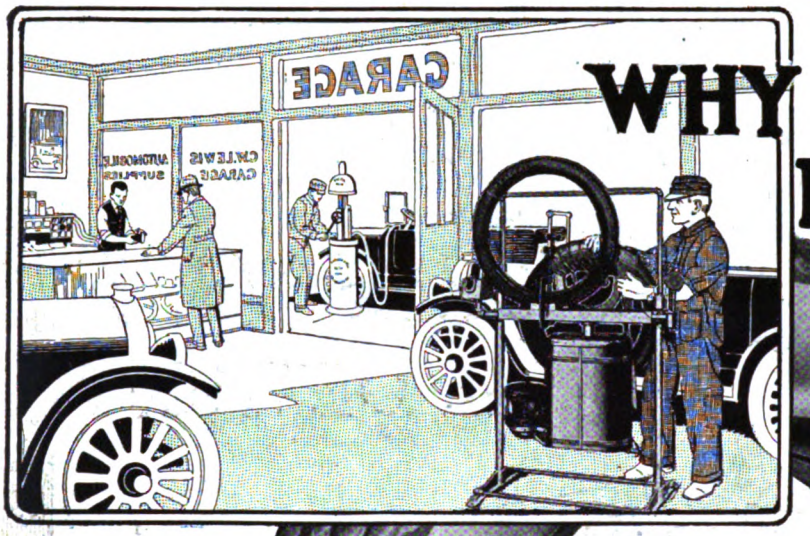
Detroit is but one link in the great chain of Prest-O-Lite Direct Factory Branches and Service Stations. The Prest-O-Lite network of service literally covers the country, insuring full satisfaction and hearty co-operation to owners, dealers and manufacturers in the use of Prest-O-Lite products.

Thousands of dealers are finding the Prest-O-Lite Battery proposition a source of substantial profit. Write today for details.

The Prest-O-Lite Co., Inc., U. S. Main Office and Factory, 906 Speedway, Indianapolis, Indiana
Canadian Main Office and Factory, Merritton, Ontario, Canada

The Prest-O-Lite battery is a better battery--backed by a better service

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WHY NOT TIRE-REPAIRING TOO?

For busy garage men—garages crowded for space, and yet seeking additional money-making avenues, here is our message

Every customer of your garage is a prospect for tire repairing, along with other service you can give. They know it is tire economy to take care of every little cut—every little bruise, at the earliest opportunity. It adds ¼ to ½ more mileage to their tires. The few cents they spend saves many dollars. Spent with you it has made many friends for life—customers you can depend upon—who will stick with you—who will let you supply complete service both on their cars and tires.

We have just invented a very compact machine requiring almost no room. It will go into any corner—any little spot out of the way. You can even move it about from place to place if preferred. It will do tire repairing of almost any kind—on casings and tubes, without muss, fuss or trouble. It is fast and certain and a big money getter.

Send for complete information. Write today—it will make your business very profitable. Read our literature, whether you buy or not. It will help you. Don't delay—send this coupon today.

HAYWOOD'S Model D.B. VULCANIZING PLANTS

Truly Wonderful Machines

Built according to the Haywood standard—a standard set from the experience of years manufacturing tire repair equipment It repairs tires quickly and permits of exceptional profits. It is simple to operate. No special training is necessary. You can turn a boy on the job. Complete instructions with each machine enables most anyone with a little practice to operate it.

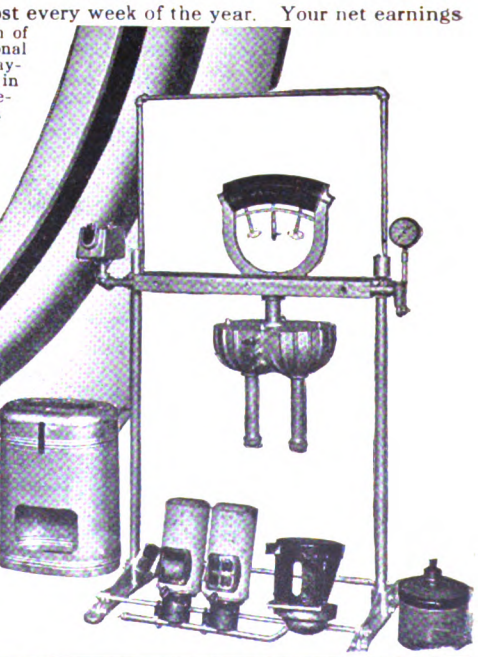
An Unusual Price—Only $45

You can make a Haywood machine earn its cost every week of the year. Your net earnings depend solely upon the time you can give to this branch of your business. We help you in every way. We are national advertisers. Have been at it for years, advertising Haywood's Service of tire repairing. Now you can cash in on this prestige. You can get your share of the tremendous demand already created for Haywood Tire Repair Service.

Your Jobber Can Supply You.

Ask him to show you the Haywood D-B. If he is not supplied ask him to send for a sample machine. Let us send you complete details anyway. Send a postcard or mail the coupon today.

The Haywood Tire & Equipment Co.
528 N. Capitol Ave.,
INDIANAPOLIS,
IND.



A BUSINESS OPPORTUNITY COUPON

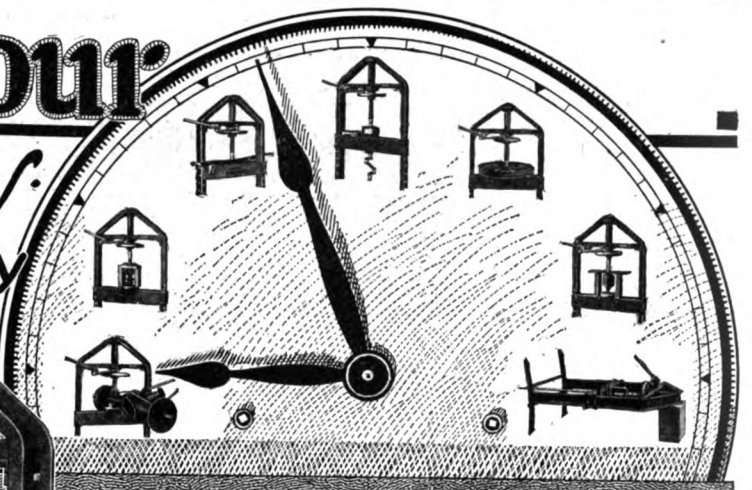
MR. M. HAYWOOD, Personal:
528 N. Capitol Ave., Indianapolis, Ind.
Dear Sir: Please send me full details how I may start a Haywood Sundry Supply Store and Tire Repair Shop in this locality.

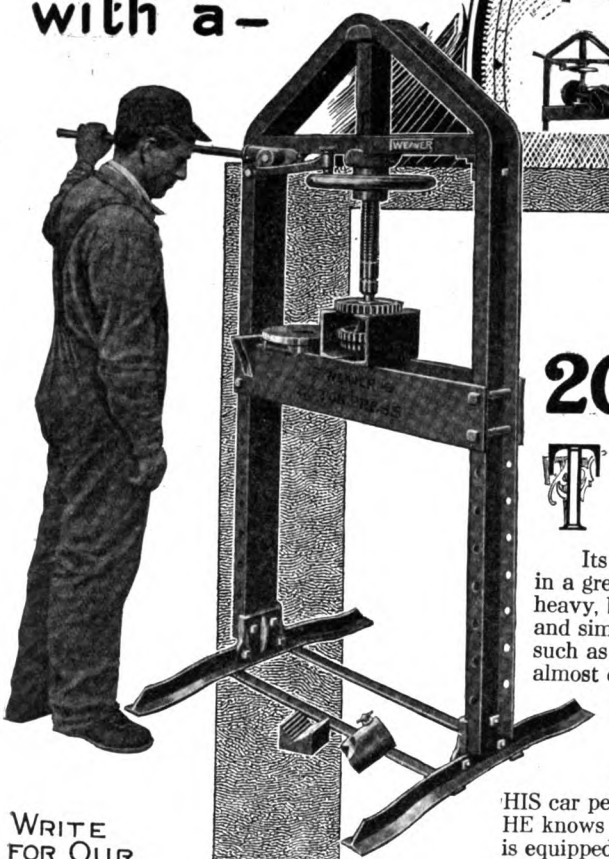
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Address .....

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Every Hour of the day will save money with a—





WEAVER 20-TON PRESS

THIS PRESS—specially designed for Garage work—can be used to great advantage to perform dozens of operations in your shop other than simply pressing off gears, straightening axles, etc.

Its wide, clean, open construction permits it to be used in a great many ways which are impossible with the ordinary, heavy, bulky type of press. From straightening frames, axles, and similar heavy work down to the most delicate operations such as pressing the pinions off of generators, etc.—there is almost constant opportunity to save money and labor and to perform your work more efficiently.

It Will Attract Trade

Every car owner would prefer to have the work on HIS car performed with a Press instead of with a sledge hammer. HE knows what it means and he will patronize the shop which is equipped to handle work in a mechanical manner.

Enormous Strength and Leverage

Notice that the frame of the Weaver Press is made of ONE PIECE of NINE pound, five inch channel steel—no bolted joints or corners to weaken its construction.

This Press is listed at 20-Ton capacity, but we know of cases where OVER THIRTY TONS PRESSURE have been developed on it, and without any injury whatsoever to the Press.

THE LEVERAGE adjustment for ordinary service is 1500 to 1, but a convenient adjustment is provided which will DOUBLE this leverage when necessary.

Width of frame, 32 inches; perpendicular capacity, 48 inches; BALL BEARING WHEEL for quick adjustment; bronze thrust bearings; 2 inch mill cut screw.

Furnished complete with vise attachment, face plate and special blocking.

WRITE FOR OUR COMPLETE CATALOG

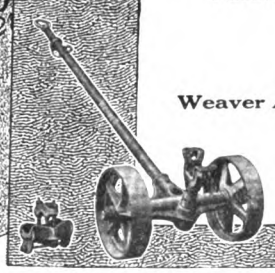


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SPRINGFIELD, ILLINOIS

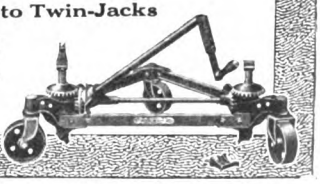
Weaver Auto Ambulance

for towing disabled cars. TELESCOPING steel tongue; roller bearing steel wheels; will attach to either axle of the car.



Weaver Auto Twin-Jacks

A combination of screw hoist lifting jacks and turn table. Ball and roller bearing throughout.



7780

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ADVANCE

CORK INSERT

TRADE MARK REG.

FORD TRANSMISSION LININGS

Never loses its grip Kills jar and vibration

Outlasts 3 sets of ordinary linings

NOW for the first time the planetary transmission is perfected. It's a bully good system — really the best of all. Most positive, simplest, quickest to respond. Its only weakness has been ineffective lining.

When a Ford car jars, jumps, jerks — when it rattles and clatters under the brake, it is not the fault of the car or the maker of the car. It couldn't be made better. Neither could the transmission itself be made any better.

ALL THIS NOISE, THE JUMPING, JARRING AND JERKING IS DUE TO POOR TRANSMISSION LININGS.

After very little use, the ordinary lining becomes hard-surfaced and glassy from the pressure, friction and constant bath in oil. It loses all of its gripping properties and becomes as hard as metal. When the brake pedal is pressed, the lining can't hold. It grips and loses the grip. It's that grip and slip, that terrific vibration, that sets the car to quivering from radiator to tail light — that causes the awful jar and jerking vibration — that racks the heart out of the Ford, loosens nuts and bolts, spreads joints, causes rattles.

Advance Cork Insert Transmission Linings Can't Slip

The cork surfaces take hold instantly — engage smoothly and evenly. Just the slightest pressure gets results. But no matter how hard you press the pedal you can't make the car jump or vibrate. There's a continuous, positive, steady engagement.

Outwear Three Sets of the Ordinary Lining

50,000 miles — 45,000 miles — 18 months' driving on one set. These kind of reports are coming in to us all of the time. Affidavits in our offices prove the accuracy of these claims. Think what that means. Instead of having linings put in every three months or so, here are linings that last for years, and at the end of that time are still giving the same satisfaction as when they were first installed.

You Never Heard of Any Lining Standing Up Like This, Did You?

No! You bet you didn't. Without advertising, without a salesman on the road, this lining has achieved a big sale *on its merits*. Think what will happen now with REAL PUSHING back of it.

Something better for a great big need

Big advertising, strong selling helps

HERE is a staple article — something every car has to have — something that is not a luxury but a necessity — something you can honestly recommend to your pet customer because it is *right* — and get something with all the punch of a *new specialty*. Think of it! Specialty originality, specialty profits on necessity volume of sales.

It Has Performed

ADVANCE CORK INSERT LININGS is new in that it has never been advertised. But in performance it is not new. It has been tested in actual service for two years. In a Ford jitney it has lasted 50,000 miles. The biggest jobbers in the country are handling it now. They are cataloging it. You as a Dealer know that an article must be right before they buy it.

It Has a Popular Appeal

Every Ford owner knows that big cars use cork to make the multiple disc and cone clutches work smoothly. He is ready to try it! And if he trys it, he's sold clear up to his eyes in the first five minutes. He knows you have done him a big favor and he knows he's made a good buy.

Powerful Advertising

The most powerful sort of advertising campaign is behind ADVANCE CORK INSERT TRANSMISSION LININGS. FIVE FULL PAGE ADS start in the SATURDAY EVENING POST with April 21st issue. Live dealer helps will focus this demand locally on your plan of business.

Direct to Owner Campaign

In addition to window displays and signs — counter cards and circulars — a direct to owner campaign will refer the people of your neighborhood to YOU as the place to buy this wonderful lining.

ORDER NOW your first set of ADVANCE CORK INSERT TRANSMISSION LININGS. It lists at three dollars — you'll be allowed the regular discount. GET A SET QUICK — KNOW "EACH INSERT" — HOW IT ACTS AND WHAT IT DOES — GET READY TO SELL A BUNCH OF THIS LINING THIS SEASON.

If you want to order through your jobber mention his name and if a Ford owner orders direct we will allow you credit. Write today.

Advance Automobile Accessories Corp.

56 East Randolph Street, Chicago

They Make a Great Car Greater

ADVANCE

CORK INSERT

TRADE MARK RE

FORD TRANSMISSION LININGS

A Live Profit Maker for Live Dealers

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All over the Country



in First Ninety Days

Some record for sales! 67,500 sold! Right in the face of the winter months! The Myle-Mayker has the goods. ***It fills a need!*** It has hit a popular chord with the public. **IT'S THE LIVEST ACCESSORY EVER PUT ON THE MARKET FOR FORD CARS.** Backed by the biggest advertising campaign ever put behind any one motor car accessory.

The Myle-Mayker is a ready seller ***this minute.*** We know it, because we ***see the repeat orders coming in.*** It has sold all winter. Forders would be buying THE MYLE-MAYKER *RIGHT NOW*, OF *YOU*, IF YOU HAD IT FOR SALE.

What it is and how it works

The **Myle-Mayker** is a gravity operated auxiliary air control for the Ford carburetor—a control such as every high priced carburetor has. Nothing to regulate—nothing to get out of order—put on in a minute's time. Replaces the standard hot air pipe—no service—no adjustments.



What It Does for a Ford

1. Easier starting.
2. Quieter and cooler running.
3. Less carbon.
4. More flexible.
5. 3 to 10 miles more per gallon of gasoline.

We'll Advertise You Locally

WE ARE GOING TO CARRY THE MESSAGE OF THE MYLE-MAYKER **TO EVERY FORD OWNER OF *YOUR* TERRITORY, *RIGHT IN* THEIR OWN HOMES.** Strong folders, circulars, letters, will tell them ***THAT YOU ARE THE MAN*** who handles the Myle-Mayker. They'll hear from us, not once or twice, but time and time again. That's the kind of co-operation that ***makes sales.***

Your Profit Is All Profit

No installation, service or anything else. You get the **exclusive sale.** Some proposition! Don't let the man down the street beat you to it. Get in the game now. Use the coupon. Pin it to your letterhead. With your first order we'll send our Silent Salesman. It's a great window card that will sell Myle-Maykers for you. Send right now for the Myle-Maker and get a sure winner. Use the coupon.

MyleMayker Co.
Dept. 5, 56 E. Randolph St., Chicago, Ill.

Myle-Mayker Co.
Dept. 5
56 E. Randolph St.
Chicago, Ill.

Please send me one Myle-Mayker, which I want to test out with the idea of ordering a dozen or more if satisfactory. Enclosed is $3.50 (regular dealer's price). I agree not to sell at less than $5.00 retail.

Name _____

R. F. D. or St. No. _____

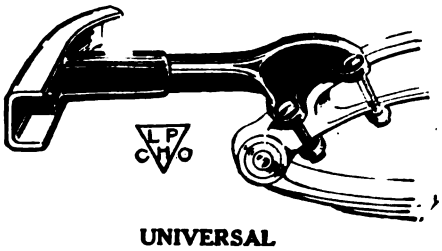
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HALLADAY BUMPERS

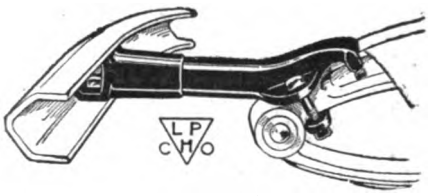
The Most Complete Line of Bumpers in the Market.



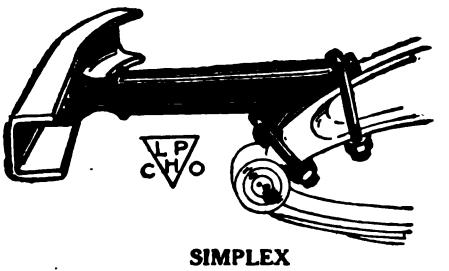
UNIVERSAL

Front and Rear Bumpers to Fit All Standard Cars.

SOME LEADING PATTERNS

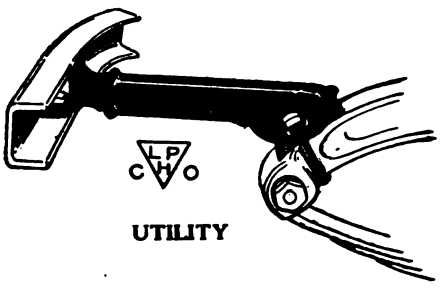


SPECIAL



SIMPLEX

A Front Bumper protects your car from collisions you may have a chance to avoid by quick action.



UTILITY

A Rear Bumper protects you from the disaster of which you have no warning and cannot avoid.

We offer the most complete line of bumpers on the market, including the above standard patterns and special designs for front and rear of all cars, the construction of which require bumpers of specialized design.

Bar equipment includes Light, Medium and Heavy Channel, Diamond Channel, Full Diamond, Round and Spring bars.

Finish hard baked black japan with nickeled or japanned bars.

Our new catalog covers the full line, write for it today.

Halladay Bumpers Sell Quickly and Stay Sold with Satisfaction to the Buyer and Satisfactory Profits to the Dealer.



HALLADAY CAN TIPPER

Indispensable equipment for every private garage or anyone handling oil in standard five gallon cans.

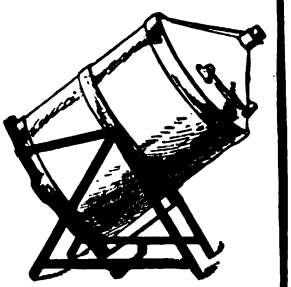
Takes up no additional floor space and saves Clothing, Time and Trouble.

Made entirely of steel and will last a lifetime.

The price is so small and the convenience so great that it appeals to everyone.

Price Each $1.75

Our new catalog shows many other conveniences and quick sellers. Write for it today.



L. P. HALLADAY COMPANY

Department D **STREATOR, ILLINOIS**

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The Greatest and Handiest Tool for the Repair Shop

JOBBERS - Is this page in your catalogue? If not, you are losing good, profitable trade. We will supply special full page sheets for your salesmen, free of charge. Help you get more business.

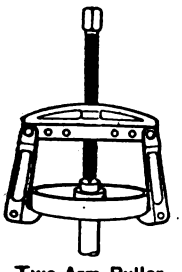
REPAIRMEN - Is your shop equipped with this labor-saving, money-making tool? If not—send for full particulars today. See your jobber and don't forget the NEW FEATURES.

CRANE'S NEW MODEL WHEEL AND GEAR PULLER

The most practical device for safely removing fly wheels, auto wheels, gears, cams, sprockets, collars, couplings, commutators, propellers, etc.; bending pipe, straightening shaft and removing universal joints.

The screw has a flat end with inserted tempered tool steel point, that will not spread centers. Makes its own center on work that has none. The strain is taken on the flat end of the screw. Grease to keep from cutting. The screws are made of high carbon steel and case-hardened all over.

All Pullers are furnished with two sets of the new combination hook and extension arms unless otherwise ordered.



Two Arm Puller Removing Work Near End of Shaft

DESCRIPTION

Both **No. 2** and **No. 3** Pullers are made in 2 and 3 Arm styles.

No. 2 Puller—Beam, 5 inch radius. Combination arms are 6 inches from center to center of holes. Reaches work 11 inches from end of shaft and 16 inches in diameter. Stands a strain of six tons. This size is particularly adapted for the average garage and repair shop.

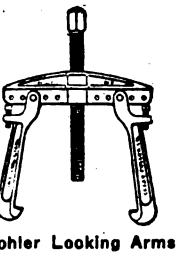
Prices—with 2 sets combination and hook extension arms.

Two Arm Style, Weight 17 lbs.....Each, $8.00
Three Arm Style, Weight 41 lbs..... " 10.50

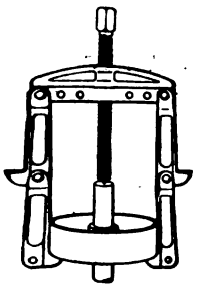
No. 3 Puller—Beam, 7 inch radius. Combination arms are 7 inches from center to center of holes. Reaches work 13 inches from end of shaft and 20 inches in diameter. Stands a strain of ten tons. This size will meet the requirements of work of all kinds.

Prices—with 2 sets combination and hook extension arms.

Two Arm Style, Weight 28 lbs.....Each, $10.00
Three Arm Style, Weight 41 lbs..... " 13.00



Kohler Locking Arms



Two Arm Puller with Extension Arms for Work Beyond Reach of one Set of Arms

NEW CRANE PULLER FEATURES

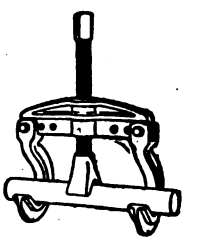
Makes this popular device more practical and valuable than ever. Every garage and repair-man will appreciate these new attachments.

Kohler Locking Arm for Nos. 2 and 3 Pullers

A most valuable feature—prevents the arms from slipping off the work. A great trouble saver when the hub or sprocket is slanting where the hooks take hold. It holds the jaws so they cannot slide off. It is easy to place the Puller on the work as the arms are held by the set screw and stay where placed.

No. 2 Locking Arm—9 inches long, fits either two or three arm style of the No. 2 Puller, Weight 2¼ lbs.....Each, $1.00

No. 3 Locking Arm—10 inches long, fits either two or three arm style of the No. 3 Puller, Weight 3¼ lbs.....Each, $1.25

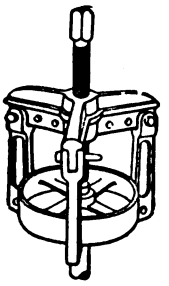


Pipe Bending and Shaft Straightening Attachment

Pipe Bending and Shaft Straightening Attachment

For use with the Two Arm Pullers only; consists of a pair of arms with hooks at right angles to the hooks on the regular arms and a forked end for the screw. It is indispensable in a repair shop for straightening propellers and jack shafts, bending exhaust pipes, removing universal joints, etc.

No. 2.....Weight 6¼ lbs. Each, $2.75
No. 3.....Weight 9½ lbs. " 3.50



Three Arm Puller

Pulling from three points will remove collars and work that cannot be started with the two arm puller.

Extra Long Beam for No. 3, 2-Arm Puller

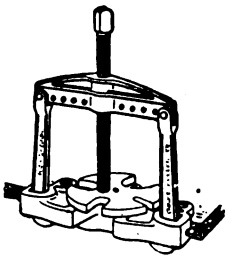
Designed for work of extra width where the regular beam will not reach. 19 inches long, Weight 13½ lbs.....Each, $5.56

Arbor Press Base

Makes an excellent and practical Arbor Press when attached to either size Puller. Bolts securely to work bench and Puller is fastened to it with two set screws.

No. 2—2 Arm base, takes work 9 inches in diameter, weight 18 lbs. Each, $5.50

No. 3—2 Arm Base, takes work 11¼ inches in diameter, weight 30 lbs. Each, $7.50

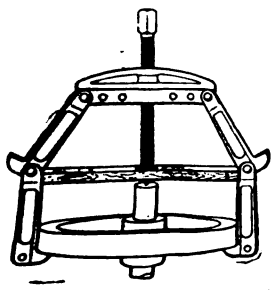


Arbor Press Base

Thin Jaw Arms

For use with either size Puller; designed for work that is too close to frame or case to use regular arm.

No. 2.....Weight 1¼ lbs. Each, $0.80
No. 3.....Weight 2¼ lbs. " 1.00



Two Arm Puller on Work of Large Diameter (a piece of wood being used as a spreader.)

Price List of Extra Parts

NO. 2 PULLER		Each	NO. 3 PULLER		Each
2 Arm Beam	Weight 4¼ lbs.	$2.56	2 Arm Beam	Weight 7½ lbs.	$3.56
3 Arm Beam	" 5½ "	3.34	3 Arm Beam	" 10¼ "	4.44
Screw	" 2¼ "	2.00	Screw	" 5¼ "	2.20
Combination Arms	" 1½ "	.80	Combination Arms	" 2¼ "	1.00
9 inch Arms	" 2¼ "	.80	10 inch Arms	" 3¼ "	1.00
Pins		.06	Extension Arms	" 3 "	1.00
			Pins		.06

The Materials and Workmanship in these tools Absolutely Guaranteed.

THE CRANE PULLER CO., 54 Lake St., ARLINGTON, MASS., U.S.A.

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THE SIGNIFICANCE TO *YOU* OF THE MEMBERSHIP OF THE

Automobile Dealer and Repairer

IN THE ASSOCIATED BUSINESS PAPERS, INC.

YOU depend upon the Automobile Dealer and Repairer for an unbiased and accurate report of all news affecting your business interests.

Probably too, you give heed to its editorial counsel in many matters of considerable consequence. You have a right therefore, to know about the policies and principles back of the important service rendered by the Automobile Dealer and Repairer.

The membership of this publication in the Associated Business Papers, Inc. (the International Association of Class, Trade and Technical Papers), means that it has achieved an exceptionally high publishing standard, and has subscribed unreservedly to these—

STANDARDS OF PRACTICE OF BUSINESS PAPERS

The publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself.

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups;" to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

If you have read the foregoing standards, there is not much left to be said, except to tell you that these principles are *present day realities* and not merely beautiful ideals for future attainment.

THE ASSOCIATED BUSINESS PAPERS, INC.

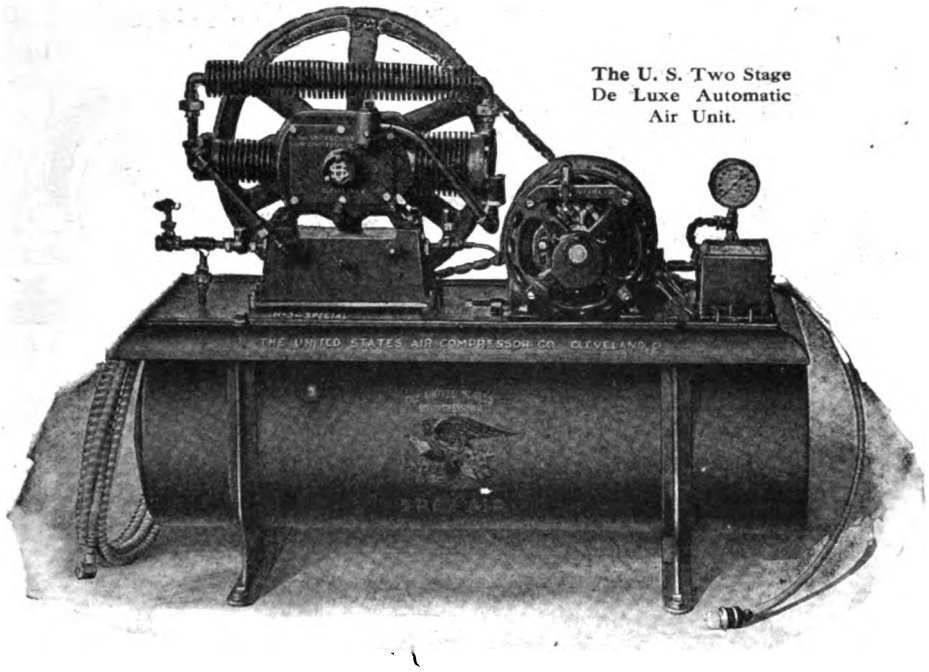
The International Association of Trade, Technical and Class Publications

220 WEST 42ND STREET NEW YORK CITY

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U·S· TWO-STAGE AIR COMPRESSOR U·S·

The Air Compressor Sensation of the Auto Shows



The U. S. Two Stage De Luxe Automatic Air Unit.

WE HAVE proved conclusively through years of experience that the Two Stage Air Outfit is unequalled and even unapproached in the compressor field.

We had absolute confidence in the improvements incorporated in our new 1917 De Luxe Outfit because they were based upon a *long study of conditions, extensive experimenting* and *actual service tryouts.*

Therefore we knew the trade would be agreeably surprised at the wonderful improvements attained in the new outfit. We must frankly confess, however, that our most optimistic day dreams never pictured as enthusiastic a reception as this De Luxe Outfit received at all the Auto Shows.

Garagemen of long experience were spontaneous in praise because they immediately appreciated the methods we had successfully employed to overcome common air compressor weaknesses. Some of the younger men were not so quickly convinced. They would look, listen, nod their heads and then pass along. The superiority of the De Luxe Outfit was so obvious however, in comparison, that almost invariably they returned. As a result *we booked 10 times the actual orders ever before obtained at an Auto Show.* Our factory, just doubled in size, is already taxed almost to capacity.

There are distinct reasons for this unusual success—14 of them in fact. Some are simply refinements of features common to all air compressors, others are exclusively features found in no other outfit.

The main one is the **Two Stage Feature** which permits the compressor to maintain higher efficiency with less mechanical effort and contributes to the quietness and life of the machine. Another is the **Intermediate Starting Tank** which permits machine to start against no pressure, thereby eliminating the cause of burned out motors. Still another is a special device which furnishes air **absolutely free from oil.** To fully appreciate this machine, however, you must get our catalog and descriptive circulars. Send the coupon for them now.

We suggest quick action to those considering the purchase of an air compressor so that they will not have to buy an inferior machine because of inability to get satisfactory delivery of a De Luxe Outfit.

UNITED STATES AIR COMPRESSOR CO.
Cleveland, O.

Gentlemen:-

Send me your catalog and circular describing the compressor which made such a hit at the Auto Shows, as advertised in A. D. & R.

Name.....

City.....

My Jobber is.....

JOBBERS WANTED.—We are desirous of hearing from Jobbers in a position to push this line, to whom we can make an attractive proposition.

U·S· THE UNITED STATES AIR COMPRESSOR CO U·S·

CARNEGIE AVE., CLEVELAND, OHIO.

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The Ford Chassis in Full Dress

The Tourabout Model is a full five passenger four-door job with all the comfort details that you can ask for, and the entire equipment is complete in every way. The price less wheels is $260.00.

The Sport Model is just that—a racy roadster that is unusual in every respect and stylish to the last degree. It is most comfortable. The equipment is also complete in every way. The price less wheels is $195.00.

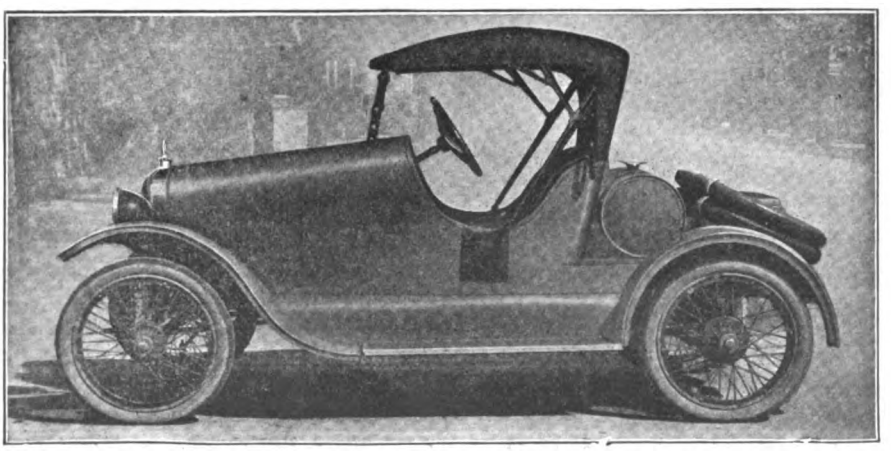
An Opportunity for Wide Awake Dealers

Beau Brummel Body Outfits are sold wherever Ford Cars are found. The field is large, the profits liberal and clean. There is no service to render. Each sale makes additional sales automatically and the orders are easily closed. We want representative dealers in every town. If you are progressive let us hear from you.

Our descriptive literature will be sent on request.

UNIVERSAL CAR EQUIPMENT CO.

1312 Bellevue Ave. **DETROIT**



Illustrating the Sport Model with Tourabout Model above.

Please mention the **Automobile Dealer and Repairer** when writing to advertisers.

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ALL YOUR GAIN

Isn't it surprising how quickly a good thing becomes noised about?

You would not think that any inventor could become enthusiastically interested in just a piston ring; that the product itself could be worked up to such a remarkable degree of perfection that it would fit in the place where it belonged so nicely, that a keen imagination would lead you to believe that it just grew there.

It is a Hobby with some men to see how good they can make a thing.

In this case it happens to be the

TESTITE PISTON RING

and a very—VERY good ring it is



The men who for years were clamoring for a first-class ring were and are exacting—but that is their right for they are always willing to pay a good price for a very good article.

Almost over night, you might say, we found Testite Piston Rings famous—the inventor was forgotten—that's natural—it was that particular Testite Piston Ring that "the boys" wanted. Why?—well, just because it was and is made with an eye single to absolute technical precision. That's why we say you would hardly imagine it possible that such a supposedly common thing as a piston ring could be made so uncommonly good.

Testite Piston Rings take the task out of hills and save garage bills.

Testite Piston Rings are made in all sizes to fit all motors.

Testite Piston Rings save gas by utilizing the entire fuel charge in the production of power. There is no waste. No loss of power, no waste of exploded gases past piston ring openings. Every atom of power generated by the explosion is focused upon the piston head, and in turn is transmitted to the crankshaft. None of it is let go, due to its ingeniously curved joint, that closes completely.

Testite Piston Rings are constructed of two eccentric rings that together form a concentric or ring of equal thickness and exert an equal pressure on the walls of the cylinder, and in cases where the cylinder is worn, they conform to every curve and cause smooth, powerful action. Testite Piston Rings are a boon to marine, and also to aeroplane motors, where the highest compression is so vitally important.

Testite Piston Rings make your motor measure more power, make it more responsive, and though the highest in efficiency, are the lowest in price for piston rings of their character.

Every ring is inclosed in a separate envelope with directions for installation and are packed twelve in a box for the trade.

Our literature, we believe, treats the Piston Ring question in an intelligent manner—learn more—write us—today—that's better than forgetting it.

STEVENS PISTON RING CO., Inc.

FREEPORT, N. Y. **BRIDGEPORT, CONN.**

—— AGENTS ——

FAIRFIELD AUTO CO., BRIDGEPORT, CONN. **E. J. WILLIS CO., NEW YORK CITY**

STANDARD TIRE & RUBBER CO., 104-6 Portland St., BOSTON, MASS.

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Put "Pep" in Your Customers' Cars

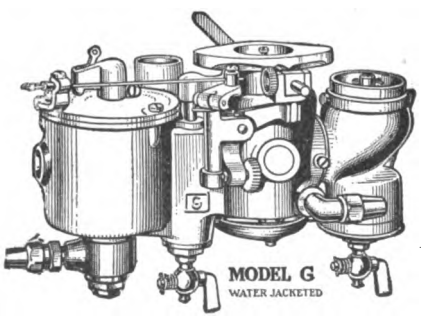
Pur-r-r-r-r-r-r-r-r! You know that rhythmical hum indicating eager power and velvety smoothness—with every cylinder doing its work with a will. It's the performance

of any good, modern motor, equipped with a

RAYFIELD CARBURETOR

It has a wonderful faculty of transforming low test gasoline into a powerful mixture. There's no trouble on long or high climbs.

Rayfield gives the range to idle or speed with a standard adjustment. It gives quick starting and pick-up, and guarantees 20 to 50 per cent greater mileage per gallon.



We authorize all Rayfield dealers to sell on this unconditional guarantee: If the purchaser is not absolutely satisfied after running his car 30 days, the carburetor is to be taken back and money refunded without question.

We stand back of every dealer who offers this broad guarantee.

Findeisen & Kropf Mfg. Company
2147 Rockwell Street, Chicago

BRANCH
1140 Michigan Ave., Chicago

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2¢ Will TIRE-DOH-ize The Ordinary Puncture



Copyright 1917, Atlas Auto Supply Co., Chicago

Tire-Doh is the most economical tire repair on the market—particularly when you consider the permanence of the results. Two cents' worth of Tire-Doh will make a perfect repair and leave that part of the tire *stronger* and *better* than the rest of it.

Permanently Repairs The Biggest Tears TIRE-DOH Adds Thousands of Miles To Tubes and Casings

Tire-Doh will repair the smallest puncture or the biggest inner tube tear. And it does difficult jobs that are absolutely impossible with other methods.



Tire-Doh is Not a Tire Filler. And it's not a patch that may come off—but a rubber compound that becomes an actual and permanent part of the tire. Seven years on the market and a thoroughly **proved** success.

MADE UNDER SECRET PROCESS—NO HEAT NOR TOOLS NEEDED

Tire-Doh has no equal, for the secret of its manufacture is carefully guarded. It eliminates the need of heat, tools and patches. Only Tire-Doh and your fingers are required to Tire-Doh-ize your tires.

Retail Prices

Complete Outfit, Large Size . .	$1.00
" " Junior " . .	.50
TIRE-DOH Alone, 2 oz. can . .	.50
TIRE-DOH Cement Alone, 4 oz. Can	.25



For Auto and Motorcycle Tires and Rubber Goods

Tire-Doh makes a quick, easy and economical repair, not only for auto and motorcycle tires but for all rubber goods, such as gloves, boots, hot water bags, etc. Also ideal for electrical insulation. Keep an outfit in your house as well as in the garage or car. If your dealer cannot supply you kindly send us his name.



DEALERS! All jobbers sell Tire-Doh, including yours. Order a quantity today—clip the coupon, insert your jobber's name, specify your order and mail the coupon to us. Tire-Doh Outfits retail at 50c and $1.00.

MANUFACTURED AND GUARANTEED BY

ATLAS AUTO SUPPLY CO., 656 W. Austin Avenue, CHICAGO, ILL.

Dealers

Atlas Auto Supply Co., 656 W. Austin Ave., Chicago, Ill.

Please send the following at your regular trade discount through:

(Jobber).....

_____ Doz. $1.00 Size Tire-Doh Outfits.

_____ Doz. 50c Size Tire-Doh Outfits.

_____ Doz. 50c Size Tire-Doh Alone, 2 oz. cans.

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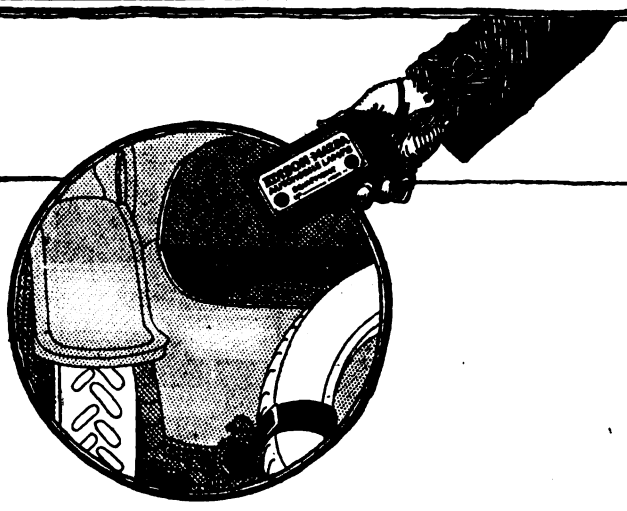
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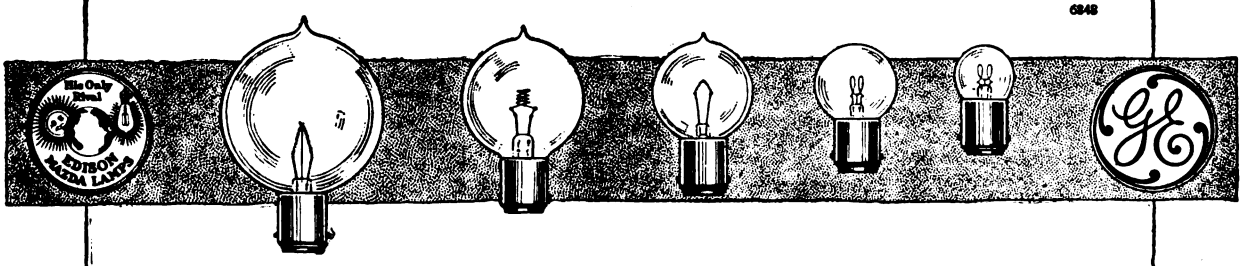
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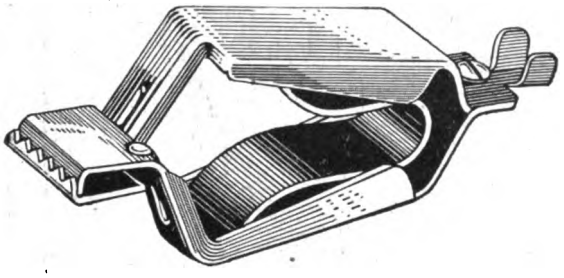
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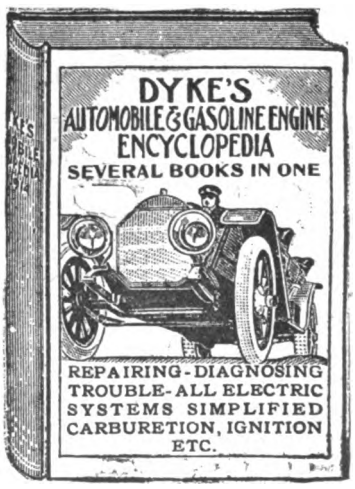
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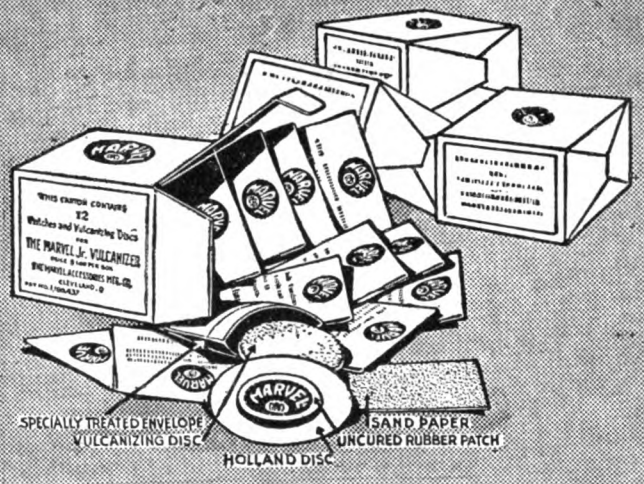
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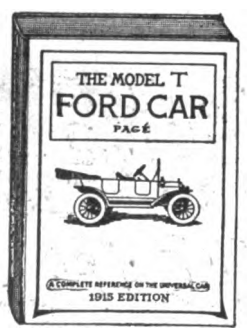
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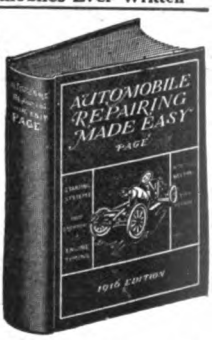
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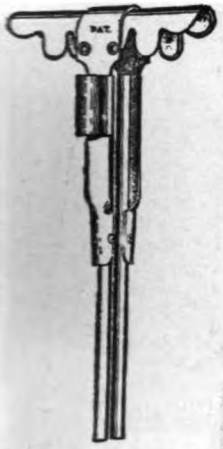
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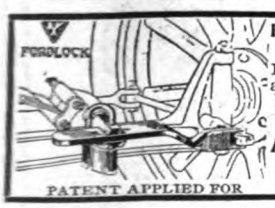
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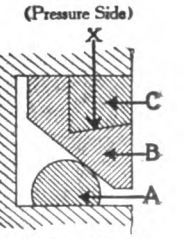
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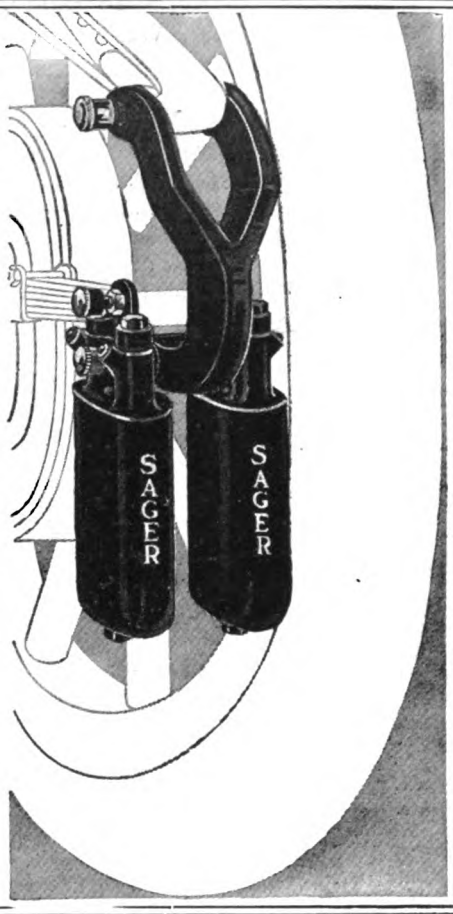
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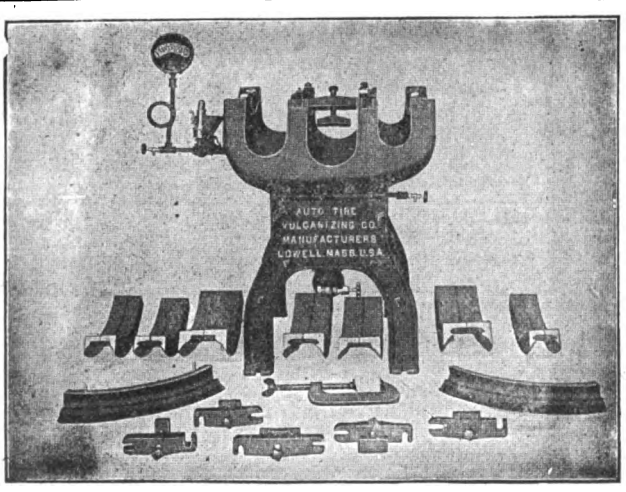
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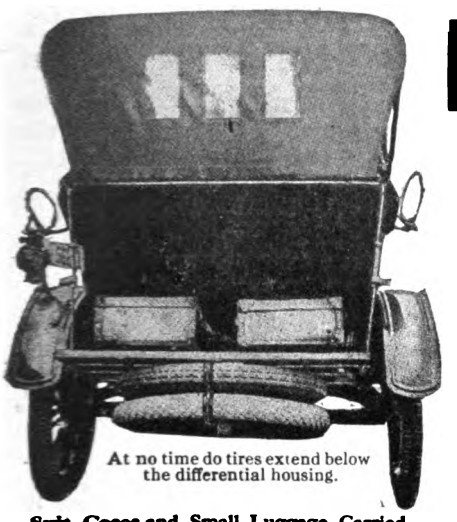
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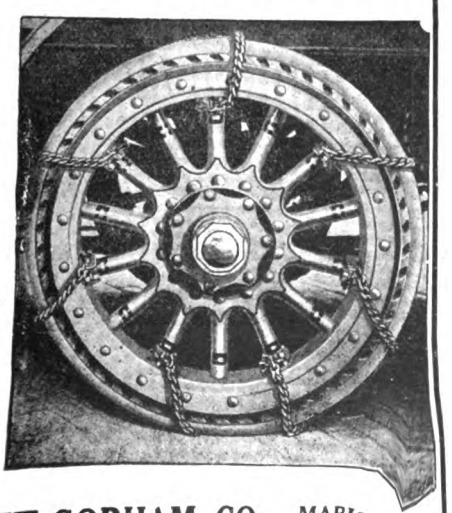
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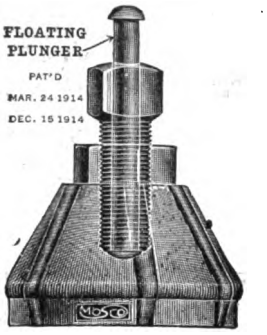
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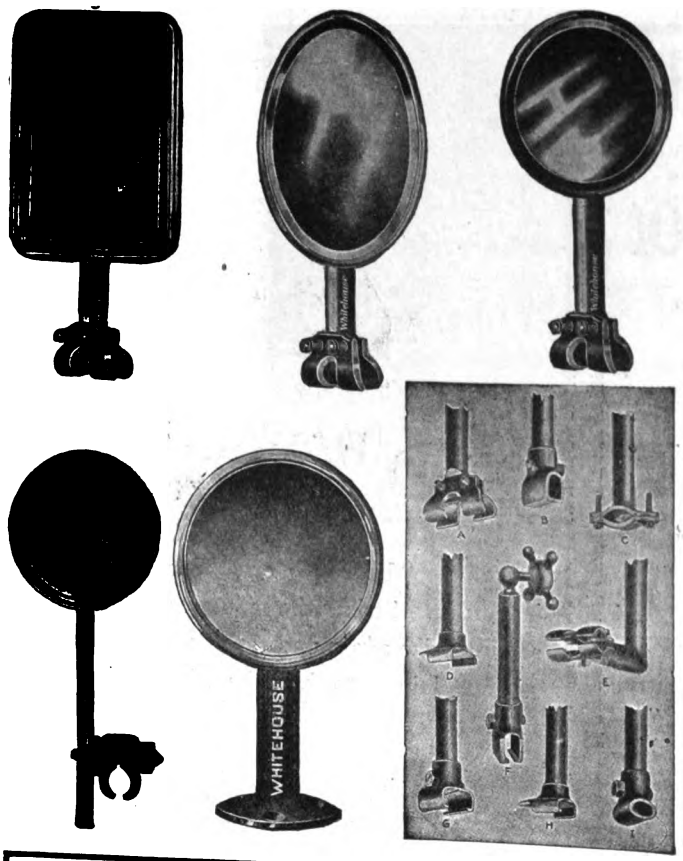
Made for the following cars:

Abbott	Jeffery
Apperson	Jordan
Auburn	Lexington
Briscoe	Liberty
Buick	Maxwell
Case	Moline Knight
Chalmers	Oakland
Chandler	Oldsmobile
Chevrolet	Overland
Daniels	Paige
Davis	Peerless
Dort	Pierce Arrow
Empire	Premier
Ford	Reo
Franklin	Saxon
Hudson	Velie
Interstate	

Your jobber has them in stock.
New models continually being added.
List of models and prices on application.

Motor Specialties Company
Manufacturers **WALTHAM, MASS.**

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A WHITEHOUSE AUTOSCOPE
is the quickest seller you ever handled.

Put one in front of any man—right on his car—while he sits at the wheel, and the sale is made. Can you beat that? Try it!

Write us today for dealers' prices.

List of Cars and Style of Clamp used on same.

Rectangular Autoscope.
No. 98-C 4 x 6 Beveled Plate Glass $2.00
No. 100 C 5 x 7 Beveled Plate Glass 2.50

Oval Autoscope.
No. 98-A 4 x 6 Beveled Plate Glass $2.00
No. 101-A 5 x 7 Beveled Plate Glass 2.50

Round Autoscope
No. 102-D 5-inch Beveled Plate Glass $2.50
No. 1020-D 5-inch Convex Glass 2.00

Round Fender Autoscope.
(For all cars.)
No. 105 5-inch Convex Glass, ball and socket joint, each $2.00

Round Autoscope.
No. 103-A 4-inch Convex Glass $1.00
No. 104-A 5-inch Convex Glass 1 20

All Autoscopes are finished in full black, black with nickel rim or black with brass rim. The price is the same for each. Specify your choice when ordering.

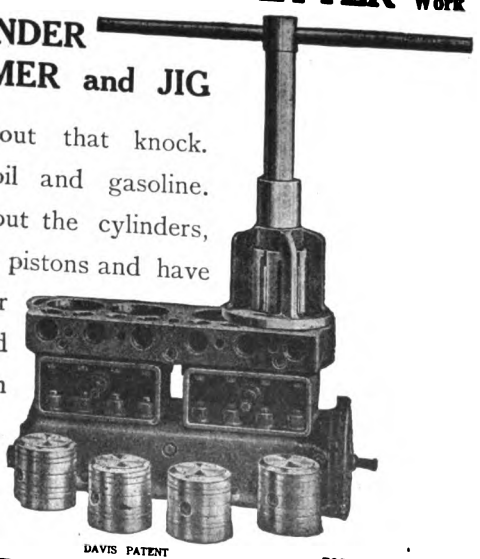
Type	Type
C Apperson	B [illegible]tary
I Allen	C Hollier
Abbott	King
C Anderson	C Kissel
G Conover	Kline
Winton	Lewis
A Auburn	A Lexington
I Briscoe	Locomobile
I Buick	Lozier
I Cadillac	A Marmon
Carter	G Maxwell
Case	Mercer
C Chalmers	Metz
A Chandler	C Mitchell
C Chevrolet	Moline
B No. 490	A Moon
Chevrolet	A National
C Cole	C Oakland
Crawford	H Olds
A Crow Elkhart	A Packard
Detroiter	C Paige
A Dodge	F Pierce-Arrow
Dorris	Premier
Dort	A Pullman
C Elkhart	Regal
C Empire	B Reo
Enger	I Saxon
E Overland	A Scripps
A Ford	Simplex
Franklin	Standard
I Grant	Stearns
A Haynes	D Studebaker
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C Hollier	A Velie
Inter-State	Westcott
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Whitehouse-LeCompte Mfg. Co.
Newark, New Jersey

BETTER Tools Mean BETTER Work BETTER Profits BETTER Business

CYLINDER REAMER and JIG

Take out that knock. Save oil and gasoline. Clean out the cylinders, fit new pistons and have a motor as good as when new.



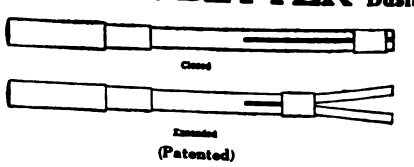
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FORD CONNECTING ROD AND MAIN BEARING REAMER
NO MORE SCRAPING. A FUSSY JOB MADE EASY.

TWO ALIGNING GUIDES FURNISHED WITH REAMER.

THE G. H. DYER CO., CAMBRIDGE, MASS.



(Patented)

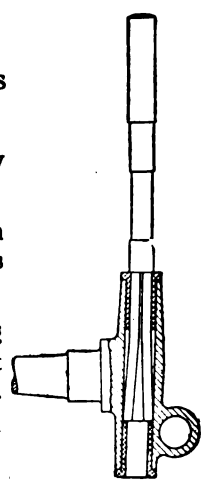
Removes
Steering Knuckle
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Spindle
} BUSHINGS in a JIFFY

Made of Tool Steel and nicely finished.

Indispensable to the repairman or the owner that does his own work.

When removing Steering Knuckle Bushings it is not necessary to remove wheel.

Pays for itself in a few minutes.



Jiffy Bushing Extractor for FORDS

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There is profit in a USL Service Station

Dealers prefer the USL agency and *satisfied* customers rather than a battery that requires constant repairs—with complaints.

Live dealers have stopped apologizing for out of date batteries, and have placed their battery business on a solid foundation by selling USL Batteries that deliver satisfaction and service.

A *pleased* customer with his car *running* and "battery happy" is an asset—it means more business because of more customers.

USL Batteries are sold on a 15 months' *guaranteed adjustment plan* (many USL Batteries are now running in their third year). USL Batteries are sold on a definite "know the cost basis"—the correct way—the USL way.

If there is no USL agency in your town, write us for our proposition

U S Light & Heat Corporation

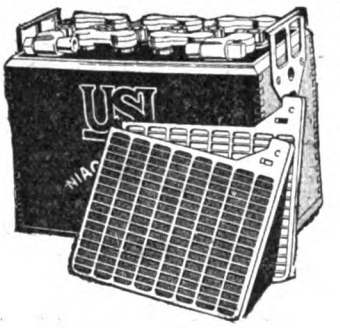
Drawer "G," Niagara Falls, N. Y.

Branches in: NEW YORK CHICAGO KANSAS CITY CLEVELAND SAN FRANCISCO DETROIT WASHINGTON, D. C.

Service Stations in Principal Centers



We conduct a newspaper advertising campaign in addition to other sales helps for the dealer in every city where we have a Service Station.



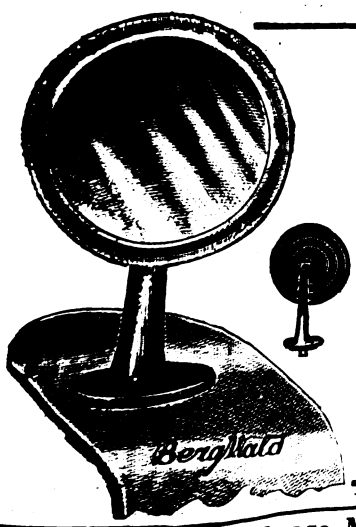
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Highest Compression PISTON RINGS

MODERN MOTOR PARTS CO.

Factory Offices, 604 Stewart Building, Rockford, Ill.

Chicago Salesrooms, 1124 Michigan Boulevard.



"BERGWALD" MIRRORS

not only add to beautify your car, but give you that feeling of contentment, knowing that you will not back into the object behind you, for you can clearly see the objects behind you when looking into the mirror.

"BERGWALD" mirrors are the only ones that contain no solder nor rivets to break loose when most needed. The parts are electrically welded together and pressed steel is used in place of cheap castings.

No. 30.	Windshield Mirror	Diminishing Glass,	$1.50
No. 30B.	" "	Beveled Plate "	1.75
No. 60.	Hedgeard "	Diminishing "	2.00
No. 60B.	" "	Beveled Plate "	2.25

BERGWALD MFG. CO.
21-23 East 4th St. NEW YOR

HERE'S PROOF OF CARBURETOR EFFICIENCY

A letter from Mr. Bert Watson, a Prominent Racing Driver.

Regarding your Carburetor which I used at the Olympic Park track at Newark, N. J., would say that this instrument worked to perfection under most trying conditions.

The track was flooded with road oil to lay the dust, but owing to recent rains had not soaked in, the consequence was a mess of oil and water completely covering the Carburetor. However, I succeeded in winning four events out of a possible five, a blow-out putting me out of the race while leading.

The races were as follows: 1-2 mile trial against time. 3 mile 300 cubic in. and under. 3 mile 450 cubic in. and under. 5 mile class D, free for all.

Among those present were: Joe Dickinson's 110 H.P. Stutz Special, Leonard's 90 Fiat, Fraser's T. & F. Special, Theobald's 135 H.P. Mercedes and others.

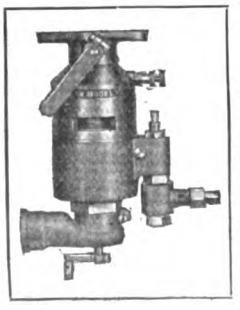
Immediately after the races I drove the car to New York without changing Carburetor adjustment and could throttle down to 10 M. P. H. in high gear with ease.

I may add that I came within one second of breaking the track record, and considering the condition of the track, where I frequently struck the motor base and sunk deep enough to hit the steering gear bell crank. It speaks well for the power developed, my motor is a very small one, one of the smallest present.

I am just leaving for the Chicago Speedway and intend to leave the H. & N. with the same adjustment just as it is.

Thanking you for eliminating my Carburetor troubles.

Yours very truly,
BERT WATSON

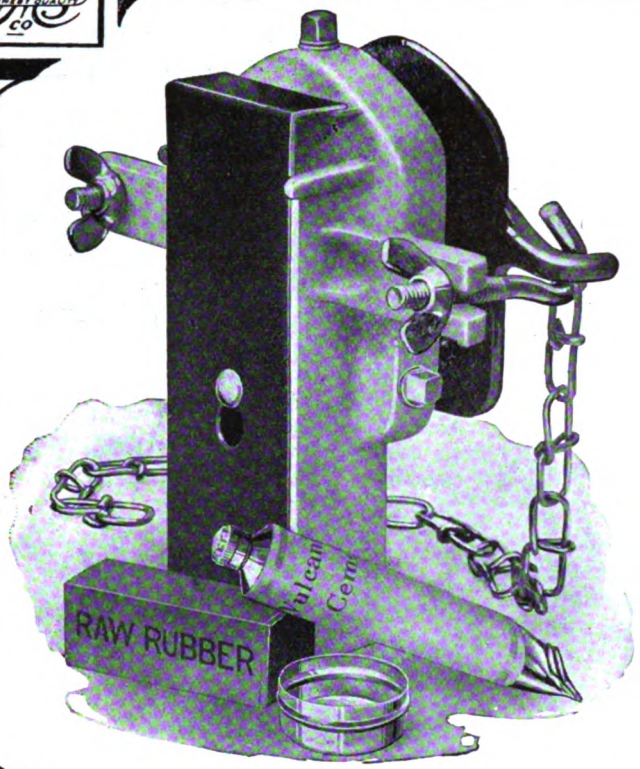


Ask for Free Booklet G2.

Name make, model and H. P. of your car. We'll then show you how you may get more snap and vigor—extra power, more speed, greater flexibility, with less fuel consumption. The H & N Carburetor is sold on 15 days' trial. It must do what we claim or back goes your money. Write for further proof.

THE H & N CARBURETOR COMPANY, Incorporated
Main Office:
1675 Broadway, NEW YORK
Branches in All Large Cities

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Here is
Practical Preparedness

THE kind of preparedness that saves a lot of trouble by taking a little trouble—and tire trouble IS trouble—ask any irate motorist who is "caught" a long, long way from the "nearest tire repair shop."

Now as to preparedness: You carry a real, not a make-shift, tire repair outfit **on your car.** You use it to **prevent** trouble; but if the worst happens, you are prepared, you have the **remedy,**—and you make a **permanent** repair. Further, you **increase** tire mileage by using a

Sure-Cure Steam Vulcanizer

It does a perfect job on tubes or casings of any size. Works in all kinds of wind and weather. Flame is entirely enclosed. Everything is furnished except the gasoline required and the match; and you need not be an expert tire man to operate it.

NICKEL PLATED, WEIGHS 4 POUNDS, PRICE $2.25

The National Motor Supply Co.

Main Office and Factory
PAINESVILLE, O., U. S. A.

DEALERS—Write for our attractive proposition.

"YANKEE" TOOLS Make Better Mechanics

It Feeds Automatically

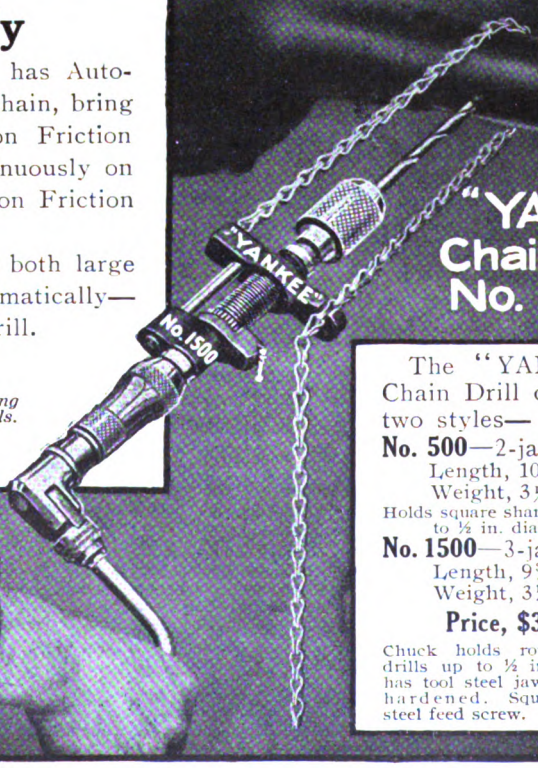
This "YANKEE" Chain Drill, No. 1500, has Automatic Friction and Ratchet Feed. Tighten the chain, bring the drill point to the work by a few turns on Friction Feed—shift the little lever and you drill continuously on Ratchet Feed until the job is done. Then on Friction Feed you rapidly remove drill from the work.

The Automatic Ratchet Feed takes care of both large and small drills, feeding uniformly and automatically—and you won't break them with this Chain Drill.

Your Dealer Can Supply You

Write for "'Yankee' Tool Book," free to garage men, showing all "YANKEE" metal- and wood-boring and screw-driving tools.

North Bros. Mfg. Company, Philadelphia, U. S. A.



"YANKEE" Chain Drill No. 1500

The "YANKEE" Chain Drill comes in two styles—

No. 500—2-jaw chuck
Length, 10¾ in.
Weight, 3½ lbs.
Holds square shank drills up to ½ in. diameter.

No. 1500—3-jaw chuck
Length, 9¾ in.
Weight, 3¼ lbs.

Price, $3.50

Chuck holds round shank drills up to ½ in. diameter, has tool steel jaws specially hardened. Square thread, steel feed screw.

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For The "One Woman" Top

DU PONT FABRIKOID

RAYNTITE

Single Texture Top Material

Rayntite is more than the ideal one-man top material. It is also ideal for the "one woman" top.

All far-sighted automobile manufacturers recognize the growing importance of the woman in the choice of cars.

Witness the increase in the use of colored bodies, graceful designs, ornamental interiors of closed cars, and moorish finish Fabrikoid for upholstery.

A Rayntite top is light enough for the average woman to handle, yet guaranteed not to leak for one year, and built to last as long as the car.

Trade Authority Tells of Trend

From the show number of *The Automobile* of January 4. 1917, we clipped the following:

long in arriving.

Tops Are Lighter

Tops are tending to be lighter. The old-fashioned top consisted of two layers of material, each being thick and massive. Now there are many cars with only one thickness of material, just as waterproof, less attractive to dust, and a good third lighter.

Why make your car top heavy, and the "one-man" top a joke, by using material twice as heavy as it needs to be?

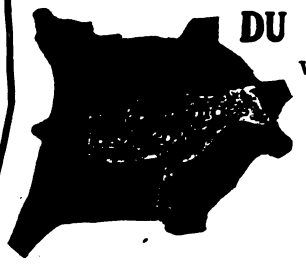
Now Made in Two Varieties

RAYNTITE No. 1—Single texture with Fabrikoid surface—and
RAYNTITE No. 2—Single texture with Fairfield Rubber surface.

Each is guaranteed one year against leakage.

If the car you are considering is not topped with Rayntite, find out whether you or your wife can really handle the one-man top.

Samples of either variety on request



DU PONT FABRIKOID CO.
WILMINGTON, DELAWARE
Works at Newburgh, N. Y.,
and Fairfield Conn.

Canadian Sales Office and Factory,
Toronto

Tire Adjustments Guaranteed FREE

If you are buying tires you want full value. If you are selling tires you want to give your customer full value. Tire adjustments can be made easy and also satisfactory to both parties if exact mileage records are available. Our Motorist Record makes it possible to keep this record with least amount of trouble and the Records are free to Owners and also to Dealers and Garages for distribution to customers. All that is necessary, fill out coupon below and mail today. The offer will not be repeated in the Automobile Dealer & Repairer. The Record contains tables for all kinds of car records, showing both efficiency and cost.

OWNERS' COUPON

Enclosed find stamped addressed envelope for free copy Motorist Record.

Name .....
Address .....
Name of Car.....
Do you do own repairs?.....
Buy tools from .....A. D. & R.

DEALERS' GARAGE COUPON

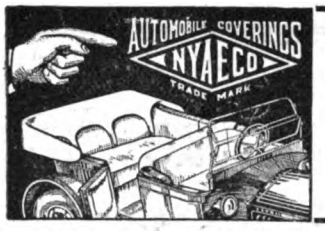
Please send free of all charges 50 Motorist Records which we will distribute to owners.

Name .....
Address .....
Do you stock tools for resale.....
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Mail to Walden-Worcester, Inc.
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Manufacturers

351-355 WEST 52nd STREET, NEW YORK, N. Y., U. S. A.

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Also: Auto Tops for all cars, Auto Fabrics of all kinds, Curtain Fasteners, Snap Fasteners, Celluloid. Ford One-Man Tops, Ford Ji fy Curtains, Tire Covers, Wash Aprons, Back Cushions, Wind Shields, Radiator Covers, Etc.

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INSTIST ON AUTOMOBILE COVERINGS NYAECO TRADE MARK BRAND

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For Ford Cars

A Tire Changed in 60 Seconds

Does away with the delay, the annoyance, the time and dirt of tire changing—spare tire is carried on spare wheel, interchangeable front or rear one nut to unscrew, that's all. Equipment consists of four hubs, extra wheel and flange. Costs $30.00.

H-S Letts Manifold Heater

For Ford, Chevrolet Cars

Price, $6.00

Guaranteed to reduce gas consumption from 20 to 40 per cent. No interference with design or construction of engine—installed in few minutes.

H-S Repair Parts Ford Overland Cars

Guaranteed for perfect fit and quality of material.

H-S Specialties Are Sold by H-S Jobbers
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THE P. B. B. ASSEMBLY

Changes a Ford into 1500 lb. Delivery Car
Price $150, f. o. b. factory.

BEACH PROCESS BUSHING PRESS

Wonderful Money Saver for Garages and Repair Shops
Price $125, f. o. b. factory.

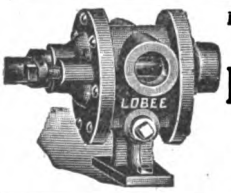
The GREB CO., 197 State St., Boston, Mass.

RATTLE, RATTLE, in my car, How I wonder where you are ?

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For good circulation or Automobile or Motor Boat, use a

Lobee Pump

LOBEE PUMP & MACHINERY CO.
1790 Niagara Street, Buffalo, N. Y.

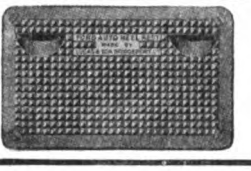
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Write for Catalogue telling why the four wheel drive principle as applied in F. W. D. Trucks means

Dependability and Economy

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Four Wheel Drive Auto Company,
Clintonville, Wis.



AUTO HEEL REST FOR FORDS

SIZE 5" x 7" x ⅛"

Made of frosted aluminum. A neat, useful foot rest, sold by all dealers, at $1.00 each, or will be sent postpaid on receipt of the price.

Dealers—Send for circular and trade discount. Made only by

J. L. LUCAS & SON, Bridgeport, Conn.

STOP THE SPRING BREAKAGE.



It's a poor policy to risk repeating the annoyance of a broken or weak spring—and the delay—by saving only a very little in buying or selling a *cheaper* spring instead of a "NEW ERA *BETTER* SPRING."

Don't replace a broken spring with one no better.

Wise dealers—sell only the best—

New Era "BETTER" Springs are the oldest and largest used line for replacement—at same price as from car factories. Made for all cars, GUARANTEED one year against breakage or sagging, graphited between leaves for two years' lubrication.

Write for complete line, discounts—or state requirements and class of business.

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871 Woodward Ave., Detroit, Michigan.

Sedan Anchor Top Coupe

For Ford Cars

May be attached to Ford Touring Cars or Roadsters in a short time by anyone Once attached the car becomes a beautiful glass-walled limousine. The cost is very low. Make your Ford as comfortable as it is useful the year round. Write for prices and catalog. Many wise dealers make good money selling Anchor Tops. We also make Tops for Buicks and Oaklands.

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Work while you ride. Scientifically correct. Proven best by 3 years' service.

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Celluloid Cleanser

The only product ever offered to clean and preserve the celluloid in automobile curtain windows. Removes Dirt, Scratches and Discolorations.

Money-Making Proposition for Dealers.

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No Glare No Danger

A shadowless light from gutter to gutter on a line with your bumper and an ample distance ahead for absolute safety.

Your garage man will be glad to get them for you.

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Furnish efficient and economical protection for cars in dead storage. They are made of heavy, durable paper, in standard sizes to fit any cars.

MADE ONLY BY

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Reg. U.S. Pat. Office

Enable the motorist to get 5,000 to 10,000 miles more Service out of his old, worn tires—changing them into practical new ones in 30 minutes. International Soles are built of fresh new rubber and tire fabric just the same as new tires. Write for catalog, sample, guarantee and prices. There are a few more good territories open for live dealers.

The International Rubber Co., 38 W. Tennessee Denver, Colo.

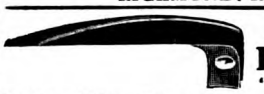
Guaranteed Puncture Proof

LAUREL 35

Five passenger Touring Car - - - - $85
Four passenger Clover-Leaf Roadster $89

If there is no agent in your territory we have splendid agency proposition for you. Write us.

LAUREL MOTOR CAR COMPANY
RICHMOND, INDIANA



Auto Top Roof Cover

"Tailored to Fit any Car"

Roadster $5.95. Touring $7.95. *Parcel Post Paid*

Others up to $15, easy to apply; you save ⅓ price of top. We also build new and repair old auto tops and wheels. *Send for catalog* and samples of the goods we use in top roof and seat covers. Seat covers $5 to $25. **Dealers write**

Split Hickory Wheel & Top Co., 1196 Sycamore St., Cincinnati

IMP CARBON CHASER

The New Fuel Element **Saves 25% Gasoline, Eliminates Carbon.** For all engines using Gasoline for fuel.

One Imp Tablet to every 5 gallons of gas.

Can of 20 tablets 50 cents. *All dealers or direct*

IMP CARBON CHASER CORP.
Dept. 132, **1465 Broadway, New York City**

Dealers and Agents Wanted.

PILOT "THE CAR AHEAD"

Six Forty-five $1150

Five-Passenger "Double Cowl" Touring Car
Four-Passenger "Get-Chummy" Roadster

PILOT MOTOR CAR COMPANY
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WOODS LIGHT FOUR MODEL No. 46

$380. F. O. B. Harvey, Ills.

Write for descriptive literature. It's worth while.

WOODS MOBILETTE CO.
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Adamson Mfg. Co., East Palestine, O.

HORSEY

No Cement

INNER TUBE PATCH

Best Made

Small Box, 8 Patches.....$
Large Box, 12 Patches.....

Manufactured by

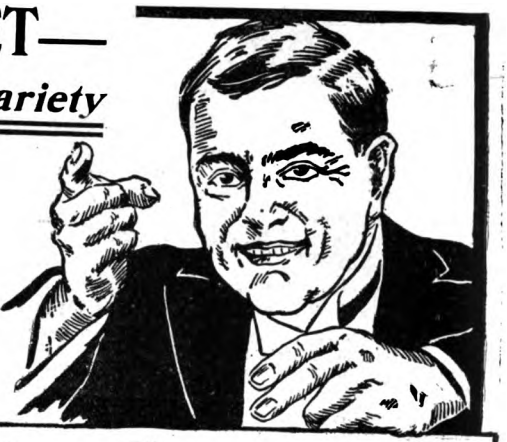
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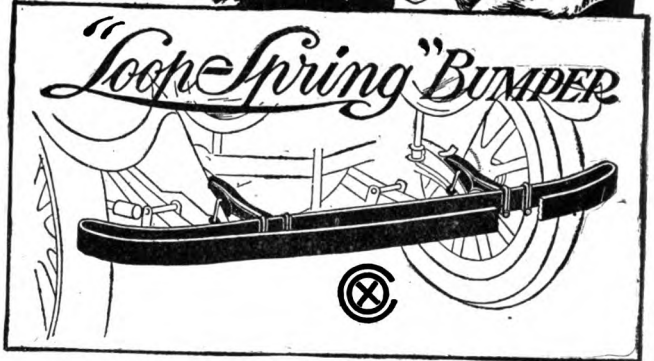


"You know Jim is a very particular man—if that 'Loop Spring' Bumper is on his car—believe me it's going to be on my car," says Tom, and Dick gets his because of Tom's recommendation, and all the time this—

90% "Clamp-on" Bumper with "Loop Spring"

is more than holding its own and making friends—because it meets the demand for a Bumper on which the bar itself is resilient. You can see that it is a continuous spring.

Its unfailing popular approval is because its gallantry of conduct in action is sure. O yes—get catalog No. 43.

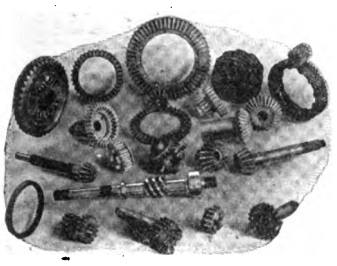


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BRAENDER Bull Dog Non-Skid

Trade Mark



NO COST TO OPERATE

ATTRACTS ATTENTION

Whenever blown, Wherever shown

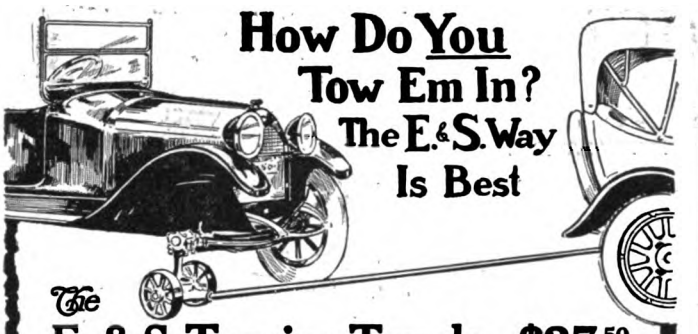
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The

E. & S. Towing Truck At $27.50

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NOTE THESE FEATURES: 14-inch roller-bearing wheels of refined malleable iron and steel; patented grease cups; 18-inch tread; height adjustment up to 18 inches; two towing poles—120-inch for rear axle, 60-inch for front axle towing; 120-inch pole for attaching rigidly to front axle. Weight 160 pounds; weight carried over center of axle. Can travel roughest or sandiest roads at good speed. No ropes or chains to break. One man can handle it.



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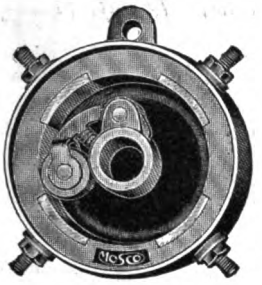


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Terminals insulated all the way through. One-hand, self-closing oiler. Pressed steel arm and compression spring on brush assembly. Brush assembly can be had separate.

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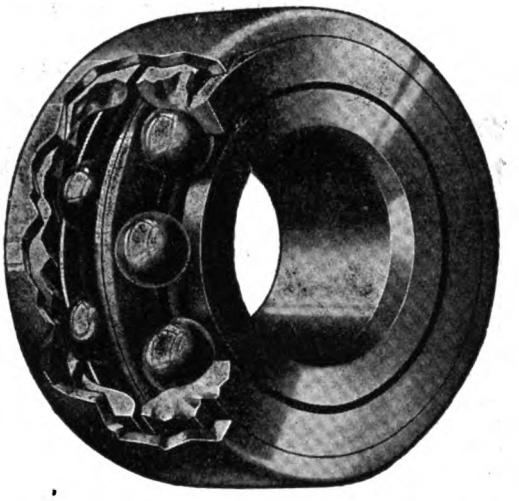
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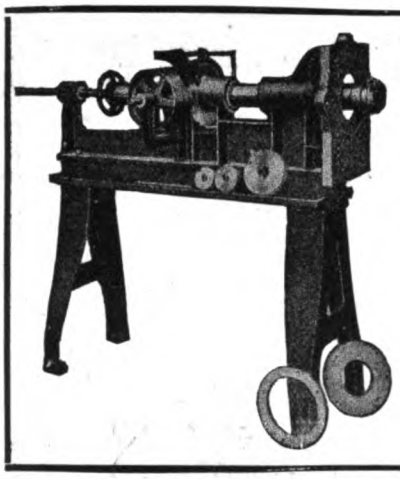
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Can be successfully operated by anyone familiar with machine tools.
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Gives 100 per cent easier riding

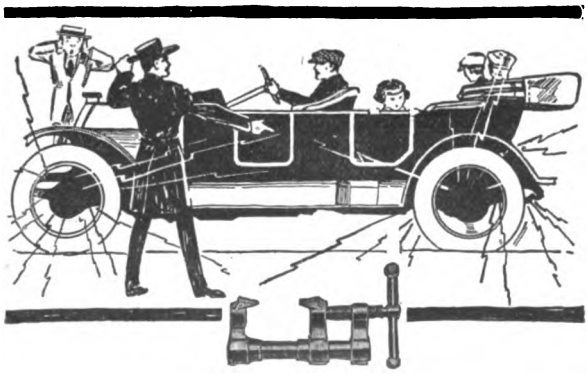
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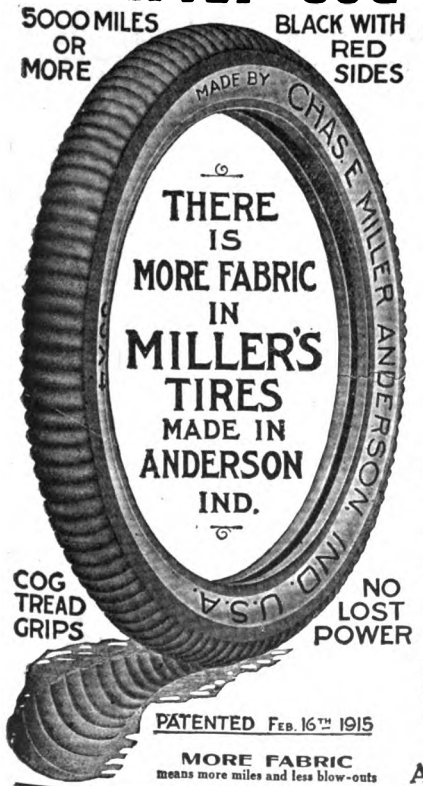
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No Tire of this Best Quality and Price can reach the Distributor and Dealer only by

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VULCANIZERS FOR EVERY USE

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Repairs 3, 3½, 4 inch tires and all size tubes.

Furnished complete as illustrated, including 24x4 inch tube plate, 4 clamps, 4 pair bead molds, clamp, steam gauge, pop valve, boiler, gasoline burner outfit $41.50
Complete with Gas Burner, 40.00

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Because with the patented pole shoes

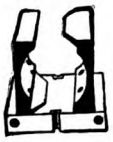
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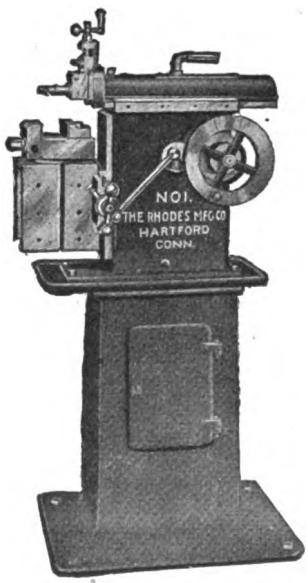
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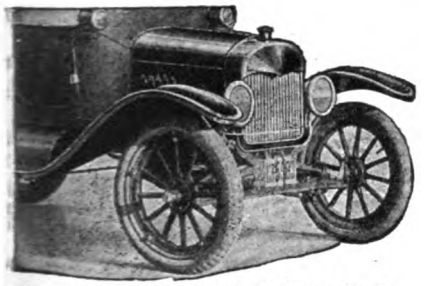
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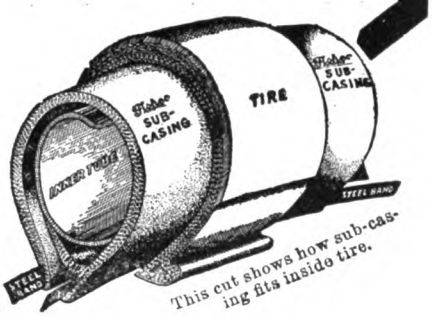
The Junk Heap is evidence that you do not, and that blow-outs are the cause of your loss by not getting full mileage.

RIM-GRIP SUB-CASINGS are the remedy.

They provide, at a small expense, an additional strength to withstand the strain thrown upon the tires, and prevent the tires from blowing out.
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This cut shows how sub-casing fits inside tire.



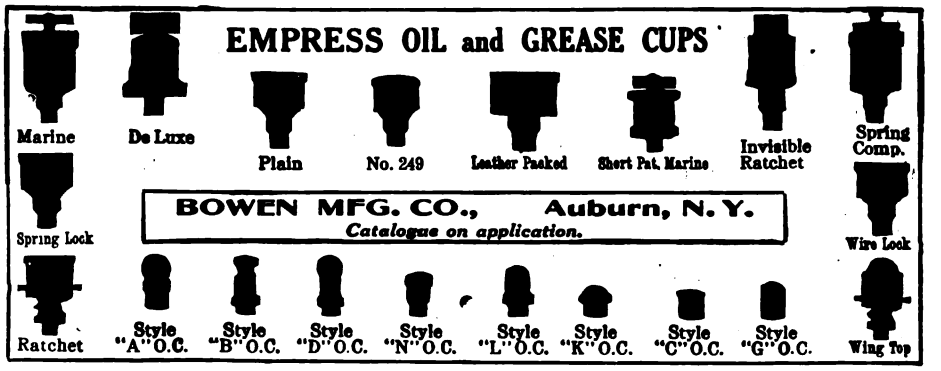
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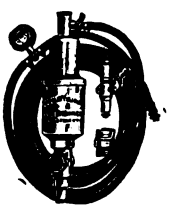
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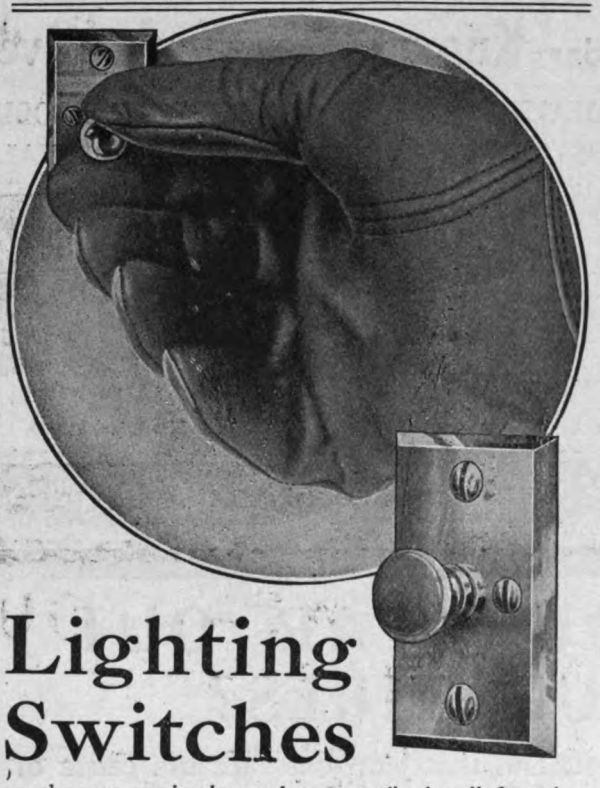
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Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

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The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

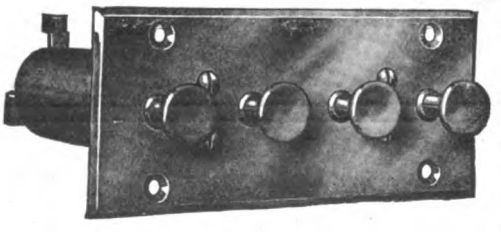
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Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

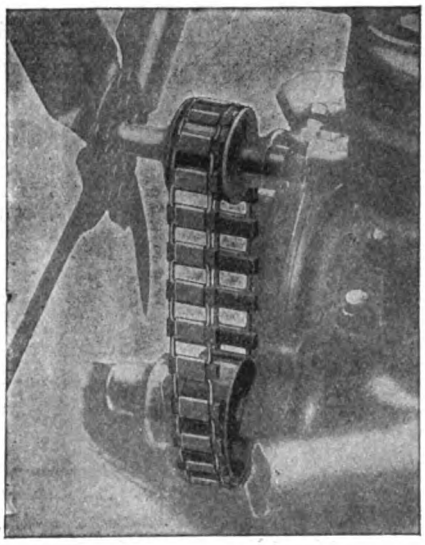
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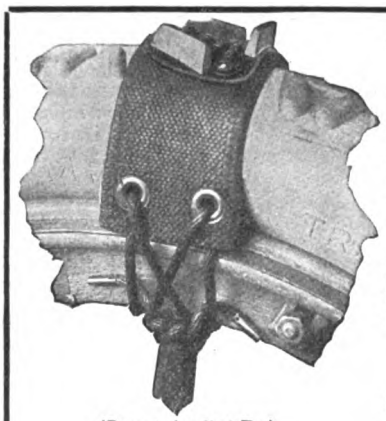
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$1.00 Each

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With a Set of These MUD HOOKS

on the rear wheels and a "live" motor, any Pneumatic Tired Car *can be driven thru and out of anything in which its wheels can touch bottom.*

Dealers, Repair & Garage Men

These sell on sight to anyone who knows what it means to fight bad roads.

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All commercial lists are typewritten, show financial rating in dollars and are 1917 compliation, and guaranteed 98% correct. Ask for Price List No. 82, showing 2,500 other classifications of dependable mailing lists.

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NOT every good-looking top you see is new. Many are old ones refinished with

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which brightens and waterproofs the fabric, leaving it pliable. Easily applied and dries quickly.

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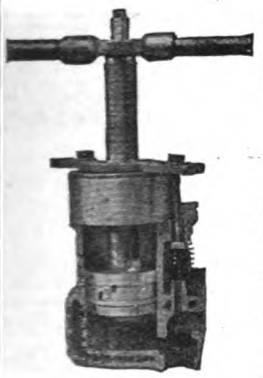
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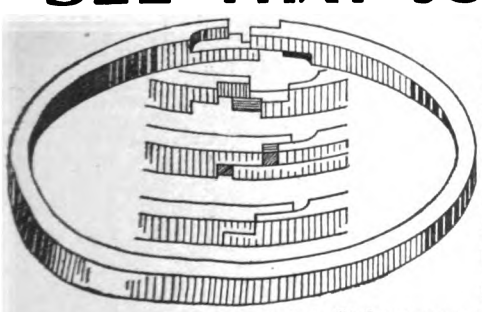
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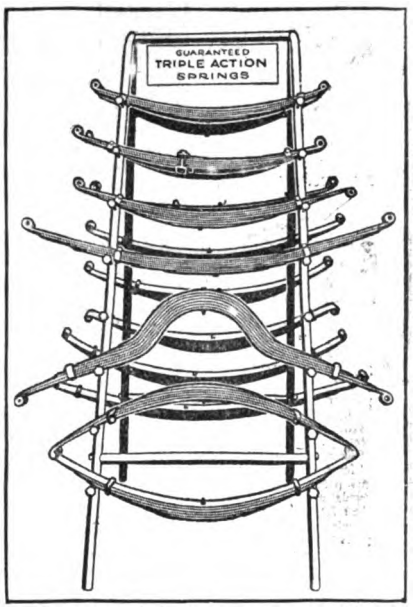
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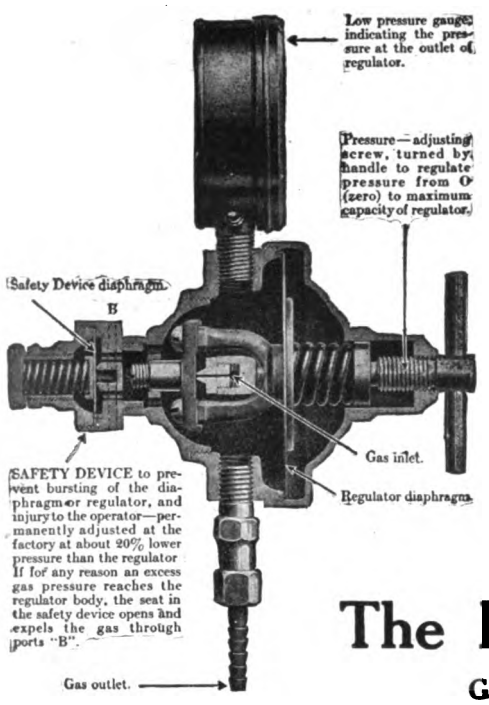
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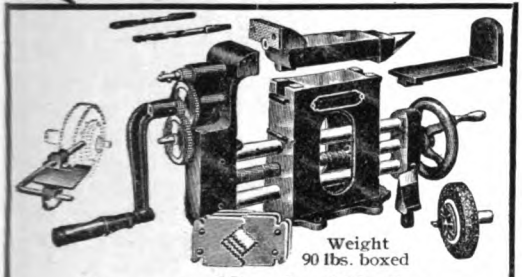
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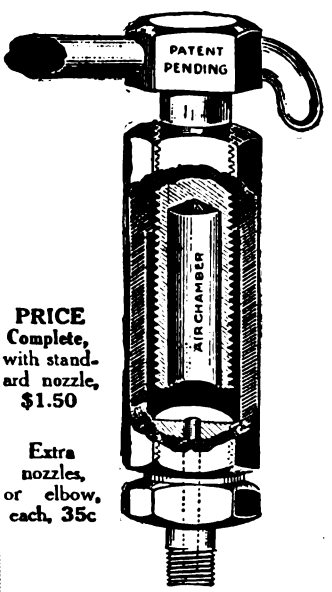
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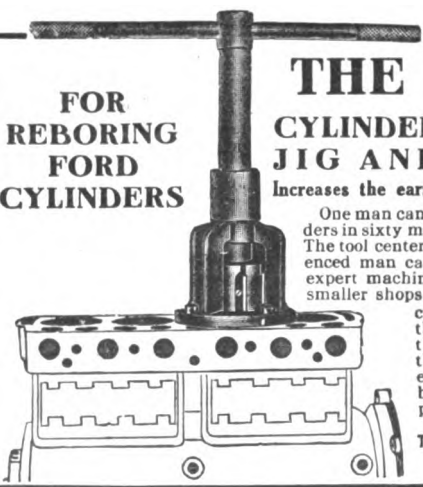
PIECE No.	Outside Diameter	Inside Diameter	Length	Approximate Weight
A	1	½	12	2
B	1¼	½	12	3½
C	1½	¾	12	5
D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15½
K	3½	2½	12	17
L	4	3	12	21
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FOR REBORING FORD CYLINDERS



Increases the earning power of your shop

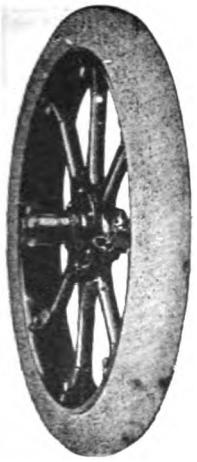
One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

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FOR FORDS

Make an End of Wheel Troubles
Will Not Creak and Are Unbreakable



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When a wooden wheel is broken, it usually is necessary to get a new wheel. When a Parker-Hydraulic Pressed Steel Wheel is bent, it can readily be straightened.

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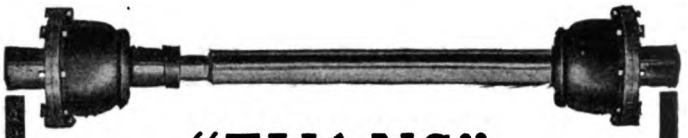
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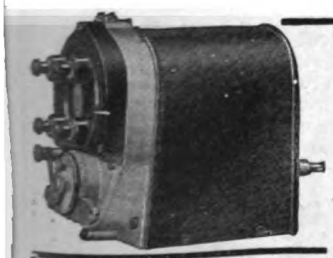
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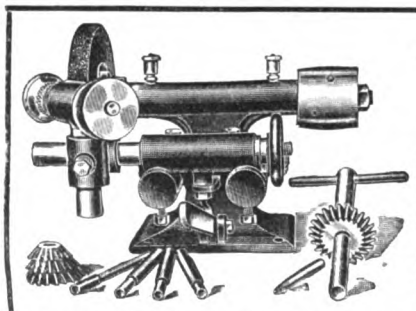
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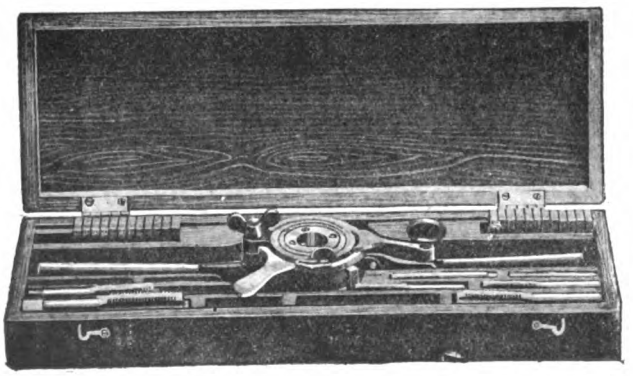


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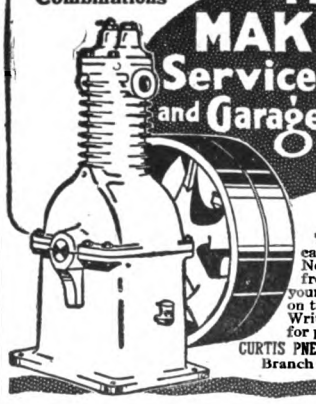
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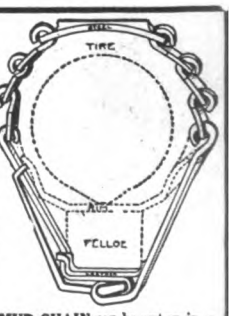
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Increase your business by giving better service.



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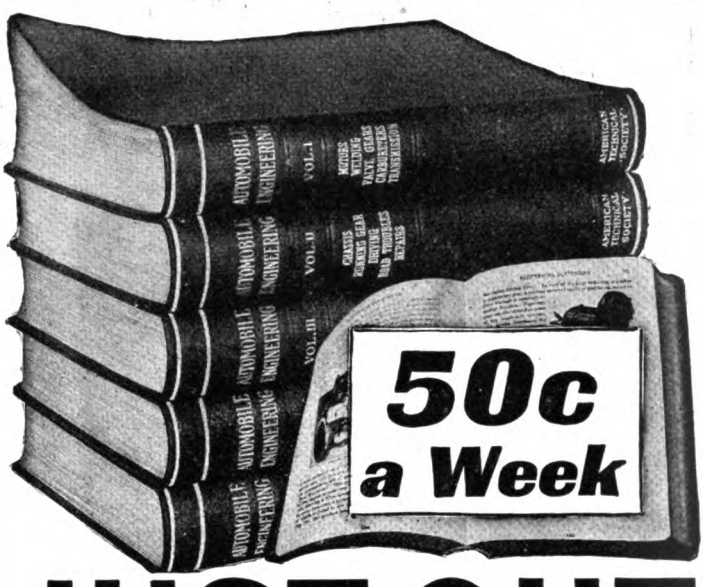
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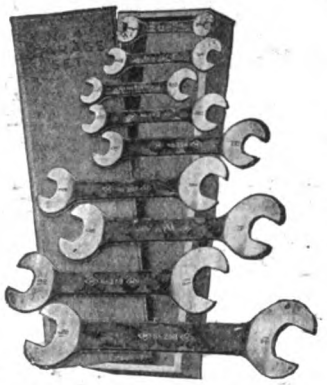
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Price $1.00

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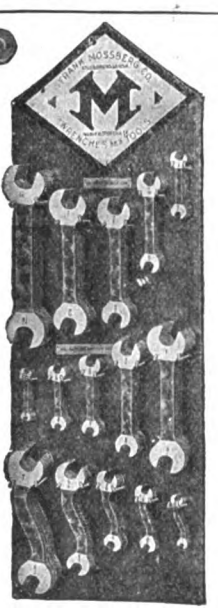


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are so constructed as to be impregnable to the chemical action of water, oil and ozone, eliminating the possibilities of short circuits and disintegration.

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BRUNNER

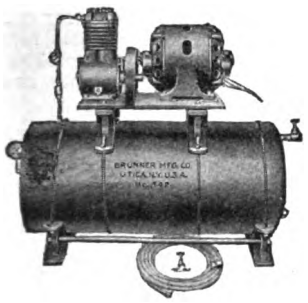
He seeks the Garage that is Brunner-ized This Motorist who is Brunner-wised



Yes, Mr. Garageman, the Brunnerwise Motorist Seeks the Brunner Equipped Garage Because He Knows It Is the One Place Where He Can Always Depend on Efficient and Unfailing Service, Such As He Knows Brunner Service To Be.

He seeks the Brunnerized Garage because he knows that the garageman who installs Brunner Service has figured on something else besides the saving of a few dollars, he knows that the Brunnerwise Garageman has his patrons' welfare in mind at all times and that the rest of his equipment is usually of the same high standard as Brunner Equipment.

The Brunnerwise Motorist is a firm believer in reciprocity, too, Mr. Garageman, he is a good spender and willing to spend his money with you for gasoline and supplies in return for Brunner Service which means so much to him.



Do You Believe in Advertising, Mr. Garageman?

If so, we want you to read these "ads," because they are of vital interest to you; we want you to know about the Brunnerwise Motorist and the Brunner Sign, which has proven such a valuable advertising medium for the garageman using Brunner Service.

To the Brunnerwise Motorist the Brunner Sign is a sure sign of prompt and efficient service, not sometimes, Mr. Garageman, but every time—day in and day out, year in and year out—and that is why

The Brunnerwise Motorist Seeks the Brunnerized Garage

WE USE A BRUNNER AIR COMPRESSOR
FREE AIR
FOR YOUR CONVENIENCE

(Continued on Next Page)

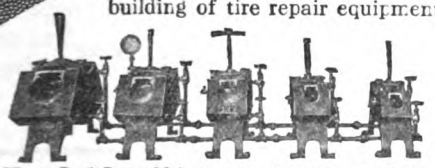
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A TIRE-RE-PAIR OUTFIT *with* SPECIFICATIONS BELOW

TIP-TOP
OF AKRON
TIRE-RE-PAIR OUTFIT

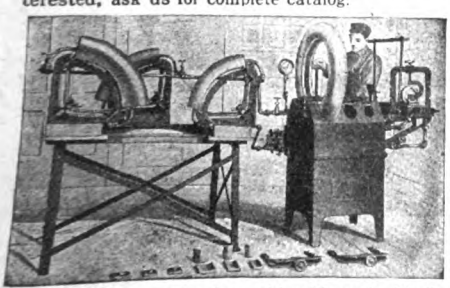
The new type F Outfit, illustrated at the right, is a remarkable achievement in the building of tire repair equipment. This is the first time that a complete outfit with the range of adaptability and the high quality shown by the specifications below has ever been sold for the price of $125.



Type C—5 Cavity Vulcanizer Piped for Separate Boiler.

We Make a Complete Line of Tire Repair Equipment

And are in a position to furnish outfits to meet various requirements of service, output and range of adaptability at prices from $50 to $225. If interested, ask us for complete catalog.



Type B—Cavity Vulcanizer, with self contained boiler, inside patch vulcanizing attachment, and 8 in. x 20 in. Tube Plate.

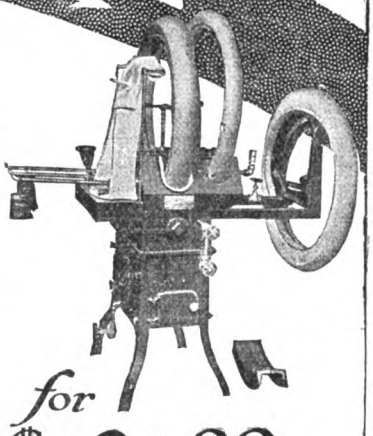
SPECIFICATIONS

Outfit Consists of

Two cavities—2½-3 and 4½-5. Reducing shell for the 3½-4. Inside patch 3½-4, on which practically all sizes of inside work can be done.

2½-3, 3½-4, 4½-5 bead molds in either Q. D. or Straight Side furnished with outfit.

Made in one-fifth circle.



for $125.00

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Auto Tire Repairing is the best money-making business today for the man with little capital. Millions of autos in use—and the number increasing by thousands every twenty-four hours—insure a greater demand for tire repairing than repair shops can begin to take care of. Everybody connected with the automobile business is making big money—and you can too.

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Please send me further particulars regarding your Tire Repair Outfits and copy of your Free Book.

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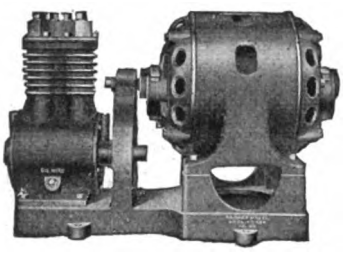
BRUNNER

He finds the garage that is Brunner-ized This Motorist who is Brunner-wised



Yes, Mr. Garageman, and When He Finds the Brunnerized Garage He Also Finds Prompt and Efficient Service. At His Disposal. He Knows When He Sees the Brunner Sign That He Has Found a Garage That Can Give Him Real Service.

He finds a good full length of Brunner "Resistoil" Air Hose, the kind that never leaks until the last particle of the outside covering is worn off by constant use, full to the brim with cool, pure air, and when he claps the automatic tire connection onto his tire valve, he finds just what he always finds at the end of the Brunner air hose, all that he came for and plenty more. He finds the air pure and cool because the oily vapor which must pass into the tank by reason of the heat of compression and proper lubrication of the compressor, has condensed in the tank, and the pure, cool air separated from the oily vapor has passed out of the other end of the tank through the hose and into his tire.



Do You Believe in Signs, Mr. Garageman?

Well, the Brunnerwise Motorist does and so does the Brunnerwise Garageman; so, if you want to do a little good advertising and do a larger and better business this spring, you should cater to the Brunnerwise Motorist. There is always an exchange of pleasant courtesies and cash as well when

The Brunnerwise Motorist Finds the Brunnerized Garage

(*Continued on Next Page*)

WE USE A BRUNNER AIR COMPRESSOR
FREE AIR
FOR YOUR CONVENIENCE

Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

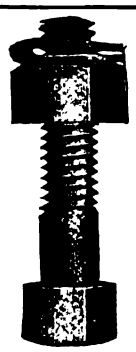
1500 SIZES. YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING

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New York City

EDGAR T. WARD'S SONS
44 Farnsworth Street
Boston, Mass.



Showing Spring Nut Lock tightened against nut—permanently locked until removed.

Spring Nut Locks

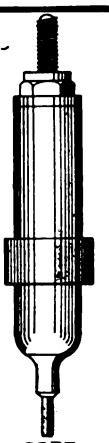
are the simplest, surest, safest device to **positively lock** any nut on any bolt. Resist all vibrations. Cannot harm threads. Easily applied. Released whenever desired.

Cheapest and Best

Spring Nut Locks assure absolute security on any machinery or parts where nuts and bolts are used. Slip easily over the bolts and tighten with a turn of the wrench to hold until released—when they can be used over and over again. Take no more space on the bolt than two thin washers Made for all U. S. Standard threads. Principal S. A E. Standard threads for automobile use in preparation.

Jobbers, Garage Men—All Dealers—should take steps to supply the early demand of their customers. Write for prices and discounts today.

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608 Transportation Building. CHICAGO, ILL.



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CORES FOR SPARK PLUGS

Made of high grade mica, absolutely tight, preventing all escape of gas at time of explosion.

With this mica core the electrode and insulating bushing are a unit of construction and a permanent assembly.

Mica Cores Give The Best Results

Write us about them today

The RAYO MICA CORES & TUBES MFG. CO.
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BRUNNER

He meets the man who Brunner-ized The garage which he has patronized —



For When He Meets You, Mr. Garageman, He Vents His Feelings Undisguised, in a Hearty Handshake Emphasized By a Smile of Satisfaction, Which Is a Part of the Daily Routine of the Garageman Who Displays the Brunner Sign.

And now, Mr. Garageman, to make a long story shorter, we might say that this whole thing simmers down to the question of whether or not you want the trade of the Brunnerwise Motorist? We have created him for you, and a Brunner Air Compressor in your garage would place you in position to render him Brunner Service, while a Brunner Sign on your garage would serve as an introduction.

If You Have Not Read Brunner's Garagman's Handbook on Compressed Air, You Should Read It and Get the Facts Concerning the Garage Air Compressor Situation, Today



We will be very glad to send you this book along with our new No. 14 Catalogue, and the name of the Brunner Jobber covering your town. And we want you to know that our line is sold exclusively through the largest and most responsible jobbing houses in the country, whose binding guarantee along with ours goes to you with Brunner Equipment.



Brunner Manufacturing Company

Main Office and Plant: Utica, N. Y.

Cincinnati Branch: 419 First National Bank Building, Cincinnati, Ohio

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Honestly Made and Honestly Sold

Tires, Tubes and Accessories

EXCLUSIVE FEATURES

of material and workmanship have made this line famous for service and **repeat orders.**

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For the Retailer—Complete line of Cementless Patches, Reliners, Lace-on and Hook-on Boots, Blow-out Patches, etc., and

EXCLUSIVE TERRITORY

on American-Akron smooth and non-skid tires; and red and gray re-inforced inner tubes.

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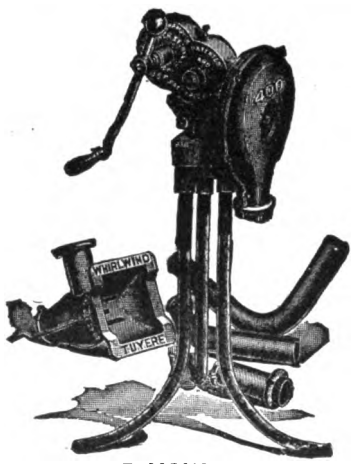
THE AMERICAN RUBBER AND TIRE COMPANY,

AKRON, OHIO.

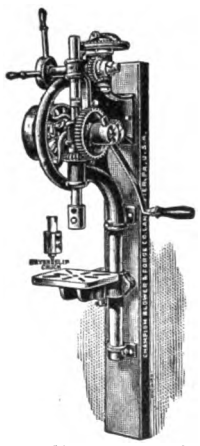




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FAMOUS 400



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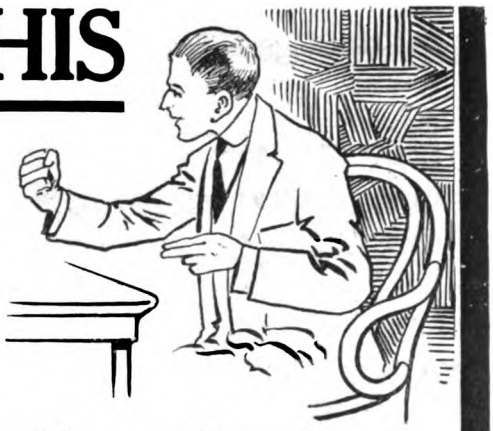
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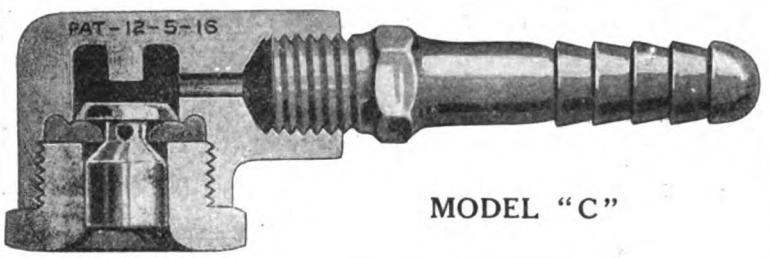
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What do you know about it—have you looked it up? Do you know that RUBBER WASHERS do not come in contact with the tire stem?—and for that reason they last indefinitely. The DETACHABLE STEM is a separate, distinct, exclusive feature —NOW, get this! These are IMPROVEMENTS over all ordinary valves.

Model C is used in garages, tire service and gasoline filling stations, and all places where air is used for filling tires.





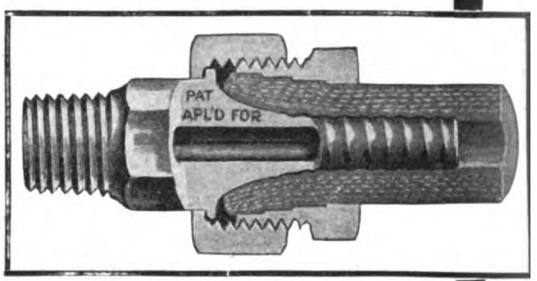
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Hansen Hose Clamp

It holds hose in place under extremely high pressure

NEVER FAILS

Will Not Leak or Blow Off



Off and on automatically—instantaneous in action, and will not leak.

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HOSE CONNECTIONS WITH AIR GAUGE—HOSE CLAMPS

The Hansen Mfg. Co., Cleveland, Ohio



Your Battery Business Depends

on the kind you stock, Mr. Dealer. To the user it's a question of service—of how much value he gets per dollar invested. Service and value are the outstanding features of

WITHERBEE BATTERIES

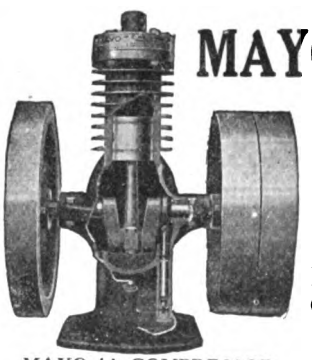
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MAYO Air COMPRESSOR

No matter what the size of your garage or repairshop, there is a MAYO Free-Air Outfit that will exactly meet its requirements.

Install a MAYO "Free-Air" Outfit today—and it will start making new friends and customers for you *at once.*

No service is more appreciated than "free air."

The most successful and prosperous garages and repairshops in the country use MAYO Garage Equipment.



MAYO Portable Garage PUMP



MAYO Air Storage TANK

For prices and full information write for Catalog number 7.

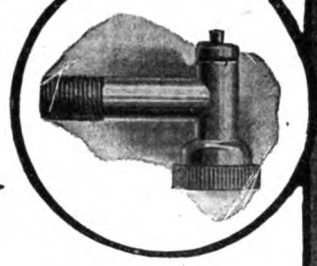
MAYO-SKINNER MFG. CO.

2115 ELSTON AVENUE, CHICAGO, Ill.

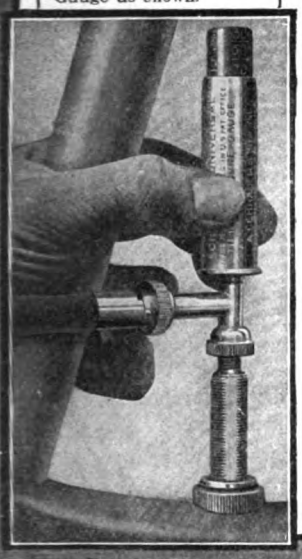
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Attach Pump Connection to pump hose and apply Gauge as shown.



THE SCHRADER UNIVERSAL PUMP CONNECTION

permits you to measure the air in your tires *without disconnecting the pump.*

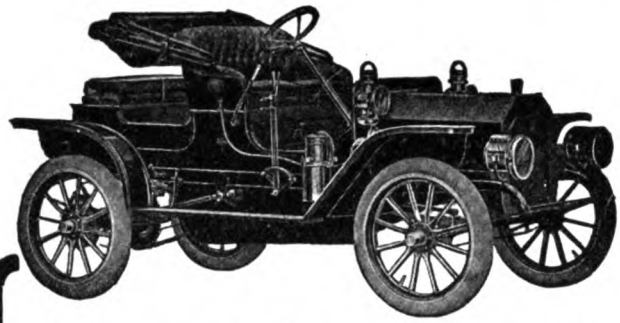
It greatly facilitates the work and materially reduces the labor of inflating tires, especially where a hand pump is used.

Ask your dealer to show you how it works.

It fits all pumps.

Price, in U. S. A., 35 Cents

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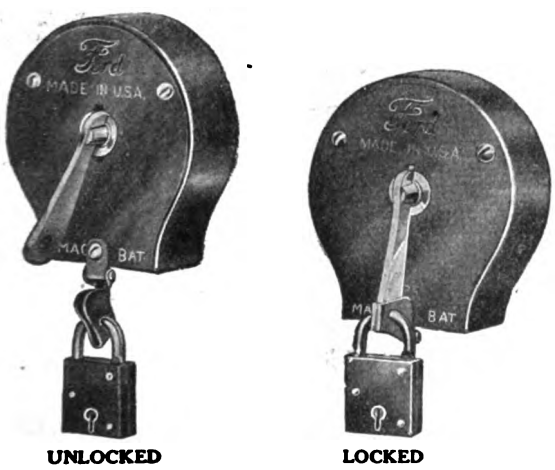
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A NEW LOCK FOR FORD CARS
The Sandell Switch Lock

(Patent Applied For)

SIMPLE AND SURE

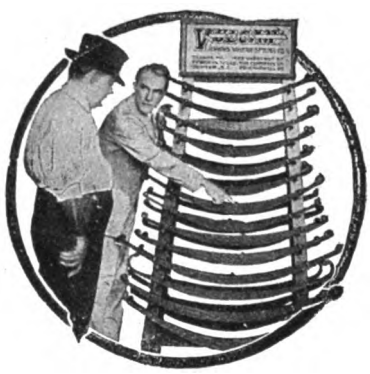
Permanently applied in less than a minute by taking out a screw and putting it back through the device. It cannot be tampered with, as the screw cannot be reached when the car is locked.

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Sent Postpaid on Receipt of Price

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MORE FORDS STOLEN EVERY MONTH!



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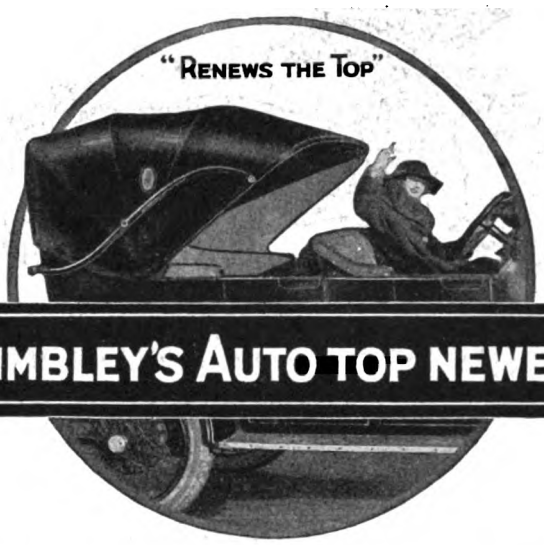
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New, fresh and clean—the kind of a top you admire on your neighbor's *new* car; a splendid, lustrous finish. All you need is

PIMBLEY'S
AUTO-TOP-NEWER

—a black liquid compound that you put on with a brush. It dries instantly—doesn't rub off—weatherproof—waterproof—wears marvelously well and long. For leather, mohair, pantasote. For seats, cushions and trim. Also fine for axles, running-board and under parts of car. At garages, drug and supply stores: 50c—85c—$1.50.

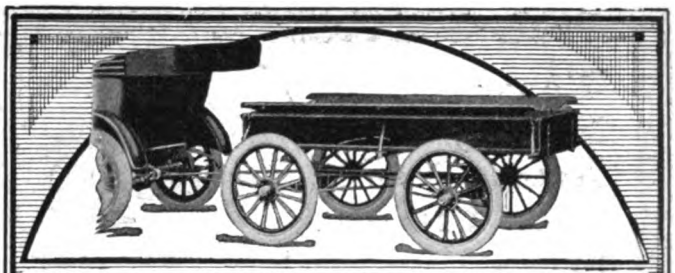
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"Cleans and News any Exterior Finish"

It is unequalled for youthifying your car. Not an oil, polish or wax—just *a* **RENEWER.** Brings to life and newness the manufacturer's first finish. At garages, drug and auto supply stores: 50c and $1.00.

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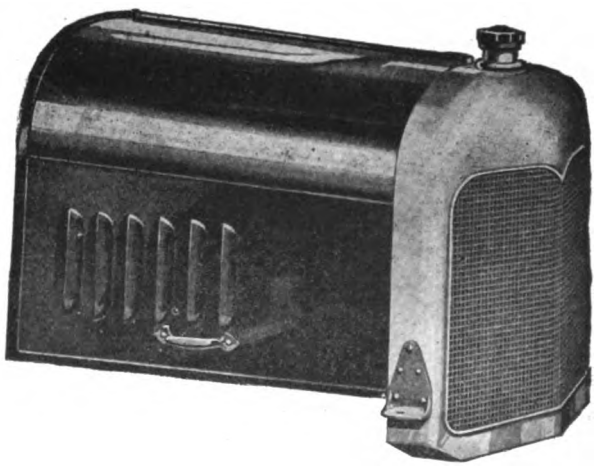
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For the farmer, merchant, or draying contractor, these sturdy 4-wheel trailers are ideal. They are economical to buy, require no upkeep, and will increase hauling efficiency 100%.

Parry Trailers are the result of years' experience in manufacturing buggies and wagons. They are rigidly made of the finest grade of seasoned lumber, and are assembled by expert mechanics.

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A limited number of Nickel Plated "V" type Radiators with streamline hood, extension starting crank, and all parts ready to install on your 1914-1915-1916 Model Ford Car, at the extremely low price of **$27.50,** cash with order. These combinations ready for shipment. In ordering state plainly, year in which your car was built.

We have a limited number of "490" Chevrolet Radiators. (Shell not painted.) Will close out this lot at **$20.00** each, cash with order. Also, other special and stock Radiators for Pleasure Cars and Trucks at attractive prices.

WRITE FOR INFORMATION TODAY.

Our Repair Department is complete and presided over by experts. Let us know your requirements.

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TO CHANGE TIRES ON A SPLIT RIM



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Every garage needs it to give quick service to tire customers and to save time and money.

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It's new. *The Quick-Ezy.* Write today for full information.

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BENTON
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Unbreakable wound mica insulator quickly cleaned by opening metal-to-metal joint and scraping or washing mica. Joint always gas tight. No deterioration from cleaning. Case-hardened wrench and thread surfaces. Service guaranteed.

Price $1.00

Write for our liberal Agency Proposition and a copy of Booklet shown.



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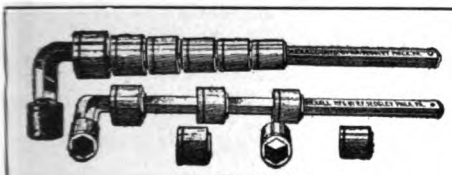
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AND WE REPAIR IT WITHOUT CHARGE

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"HEXALL" SOCKET WRENCH

A splendid tool. 10½" hexagon steel handle, 7 sockets made from bar steel, case hardened. Sockets pack neatly on handle when not in use. Friction ball in handle prevents them from dropping off. Weight only 21 oz. Price $1.50.



"K. & S." RATCHET WRENCH

7" handle, steel forging, two screw driver bits of best tool steel. Extension bar, six inches. Seven sockets of case hardened steel, for bolts and nuts from 5/16 to ⅝ of an inch. Weight, 1¾ lbs. Set, complete with 11 pieces, $2.50.



SMOOTH-ON
TRADE MARK REG. U.S. PAT. OFF.

IRON CEMENTS
No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - $1.00

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Jersey City, N. J.

For Sale by Supply Houses.



Samson

THE BIGGEST AND BEST LINE FOR 1917.

Protection and Co-operation. ***Write for our proposition.***

AMERICAN ELECTRIC CO., CHICAGO, U. S. A.



This Tire Can't Puncture



THIS IS THE TIRE

that gives you freedom from every kind of tire trouble. Think of driving your car indefinitely without a thought of a pump, patch, puncture or blow-out. Think of driving over any kind of road with a care-free consciousness of perfect tire security.

DAYTON AIRLESS TIRES ride as easy as any Pneumatic. They are not solid, but have piers of live, resilient rubber that absorb jars and jolts. No trouble, no repair expense.

COST PER MILE OF SERVICE IS LOWER THAN ANY OTHER TIRE YOU CAN BUY.

One Ford owner got 24,000 miles out of Dayton Airless Tires Write for Free Booklet, and information. State size of tires you are using.

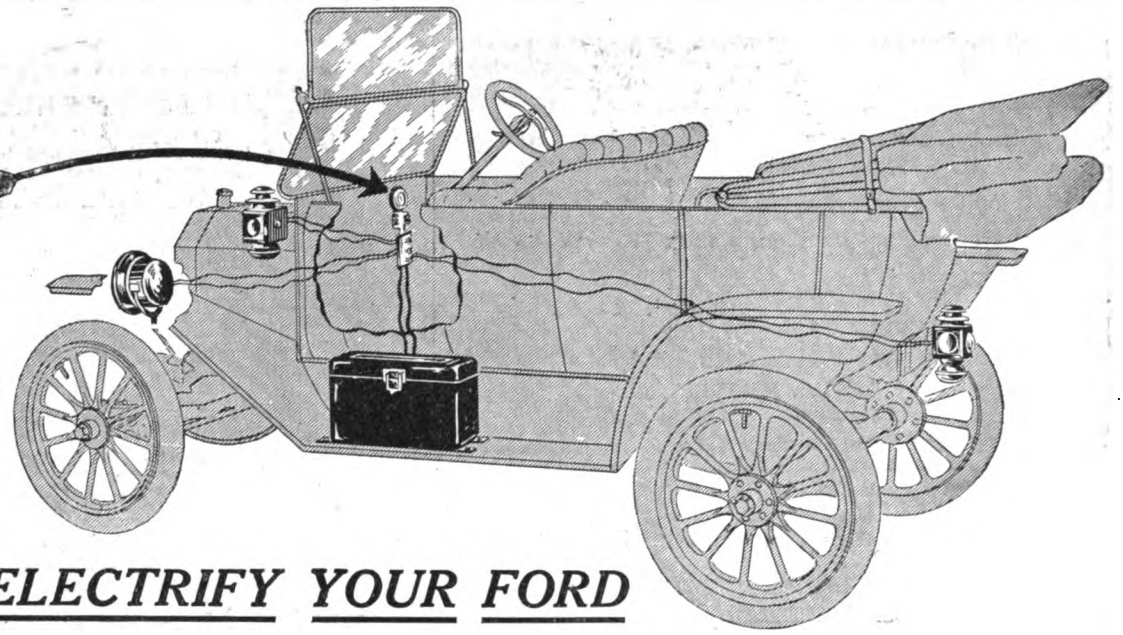
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Dayton Airless Tires have no competition. National advertising is bringing thousands of inquiries. Some dealer in your territory will reap the profit on sales. Write for detail of liberal contract

The Dayton Rubber Mfg. Co.
3103 Kiser Street - Dayton, Ohio

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JUST PRESS THE BUTTON

ELECTRIFY YOUR FORD

From "Head to Tail" in 30 minutes. Cost, outfit complete, only $24.

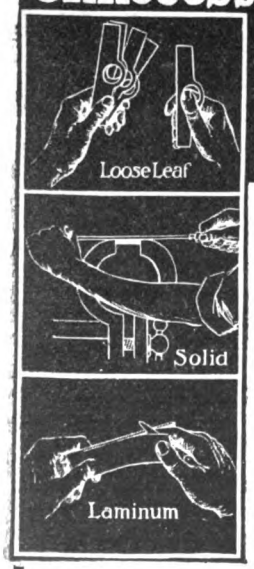
Headlight Outfit Separate, price $7.50. Consists of Headlight-Regulator, 2 special Nitrogen lamps for headlights, Dimmer switch on steering post, all necessary wire and material to make outfit complete, with instructions.

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Keep Down Costs, Avoid Unnecessary Expensive Labor By using LAMINUM

The MATERIAL for SHIMS



Consider the saving in time in being able to take up a shim and with your knife, peel off sufficient laminations to make the desired reduction instantly

With a Smooth Surface of Uniform Thickness,

making a perfect adjustment possible.

No laborious filing of solid shims or the nerve-racking attempt to assemble the loose-leaf shims, which allow dirt and oil to accumulate between the leaves.

We are now selling over 100,000 Laminum Shims per month for Ford cars alone.

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Write today for catalogue and sample.

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MAXFER

THE WHALE FOR WORK

TON TRUCK

"DEPENDABLE"

Is what a dealer said when asked to name the MAXFER Co.'s new one-ton, worm-drive truck.

ELECTRIC STARTER
ELECTRIC LIGHTS
WORM DRIVE
BAILEY NON-STALL DIFFERENTIAL

The MAXFER Company will pay to any dealer **$100.00** who will suggest a better name than "*Dependable*" for this new one-ton truck.

Maxfer Truck & Tractor Co.

5025 So. Wabash Avenue Chicago, Ill.

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Toliver Puncture-Proof Tubes sell easily—our representatives make $5.00 to $50.00 a day net profit. No competition whatever—ours are the only positively puncture-proof inner tubes on the market. Because they are guaranteed for

5,000 Miles of service without losing air through a puncture, any motorist will consent to try them at once, and straightway he becomes a constant user of Toliver Puncture-Proof Tubes. We are now introducing also the

Toliver Plain Tube which is not puncture-proof—but is the highest grade inner tube that U. S. gold can buy.

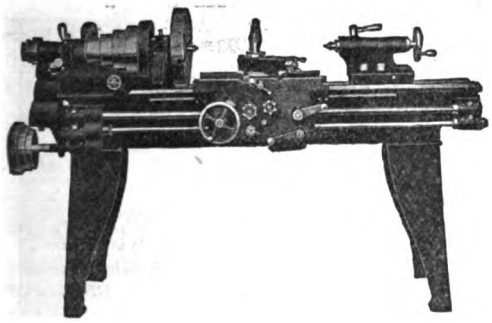
If you wish to establish a **Business of Your Own** with unlimited possibilities for profit, here is the opportunity. Small capital is required. If you are a salesman—a real salesman—$75.00 to $100.00 will start you well.

Write Us for Complete Details

Toliver Tube and Tire Company

523-F, Foster Bldg., Denver, Colo.

Fast Sales Big Profits



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices.

THE MONARCH MACHINE TOOL C

SIDNEY, OHIO

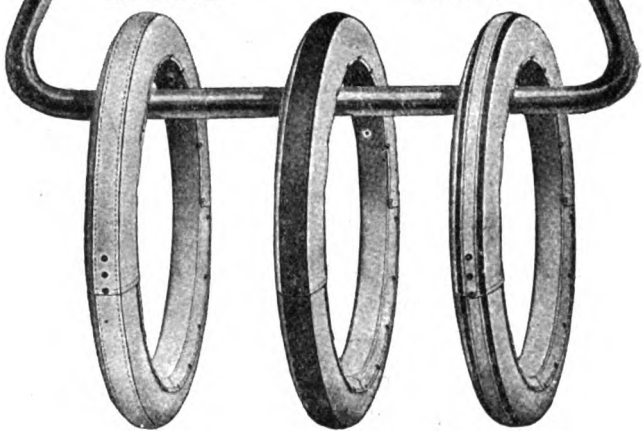
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protects spare shoes—three snappy styles in all sizes to match any car's color scheme. At your dealer's or direct. Write for booklet.

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Equip Your Garage With A Whitney Hand Miller

so you won't have to turn away profitable repair business, or turn it over to the machine shops.

The Whitney will take care of any milling job in the line of auto repairs. With it you can cut gears, cams, sprockets; do key seating, straddle milling, profiling, slotting, slabbing, drilling, die sinking and countless other operations.

With this all-around machine, you can handle the work in your own garage. You can avoid delays; you can accommodate customers.

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The Whitney Mfg. Co., - Hartford, Conn.

Chains—Keys—Hand Milling Machines

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"NORMA"
BALL BEARINGS
(Patented)

In this respect machines are like men—their worth lies in their capacity for bearing responsibilities. Upon the magneto, lighting generator and starting motor rests the responsibility for the satisfactory performance of a car or truck. And it is a significant fact that, almost without exception, these electrical accessories having the highest reputation for dependability, used upon cars and trucks of the highest repute, are insured against bearing trouble by means of "NORMA" Bearings. Which simply means that "NORMA" Bearings are known to be trust-worthy bearings—and their presence in a magneto or lighting generator or starting motor is an evidence of that quality which makes for long service.

Be Sure Your Electrical Accessories Are "NORMA" Equipped.

"NORMA"

THE NORMA COMPANY OF AMERICA
1790 BROADWAY NEW YORK
Ball, Roller, Thrust, Combination Bearings

Quickly Saves Its Cost
FOR CUTTING HEADLIGHTS
"RED DEVIL" Circular
Glass Cutter No. 033
"It's all in the wheel."



Enameled wood handle and base, "slip proof" bottom; steel rod and head. Pays for itself on the first headlight you cut. Hand honed, tested steel wheel. Mailed for 50c. Discount on quantities. *Write for free booklet.*

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Add to Garage Profits by Oxy-Acetylene Welding
Savings made please your patrons and pay good substantial profits.

PREST-O-LITE
Dissolved Acetylene
(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high-grade welding apparatus for $75.00 (Canada $100.00). The average user will also need gas cylinders at an additional cost, and about $10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.



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The World's Largest Makers of Dissolved Acetylene
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Oil Sealing "NO-LEAK-O" Piston Ring
TRADE MARK REGISTERED



The Ring with a REASON

For Every Effect there is a CAUSE

When your motor lacks power, carbonizes, uses too much gasoline and oil—There is a Cause. One of the most serious mechanical defects contributing to the immediate carbonization of any motor is piston-ring leakage. You can't make a gas-tight piston-ring. Write for folder giving valuable information.

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BAILEY DIFFERENTIAL
Prevents Skidding and Stalling

For pleasure cars, trucks and tractors. Positive drive to both wheels on straightaway. Automatically throws all power into wheel which has the better traction, thus eliminating spinning, skidding, slipping, side-sway and stalling—making driving easy and safe in mud and snow, on icy or wet pavements.

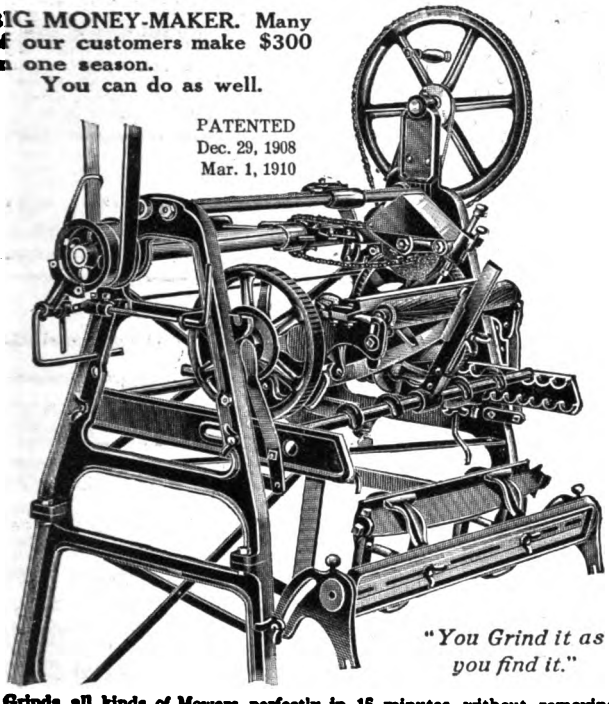
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"IDEAL"
Lawn Mower Grinder

BIG MONEY-MAKER. Many of our customers make $300 in one season.
You can do as well.

PATENTED
Dec. 29, 1908
Mar. 1, 1910



"You Grind it as you find it."

Grinds all kinds of Mowers perfectly in 15 minutes without removing wheels, ratchets or reel-knife, BETTER, QUICKER and EASIER than it can be done by hand. Has perfect Skate Sharpener Attachment. Run by hand or power. Nearly 10,000 in use. Price, only $60. Sold on easy-payment terms. Also makers of the "Peerless" Horsemower Grinder.

WRITE TODAY for catalog and full information.

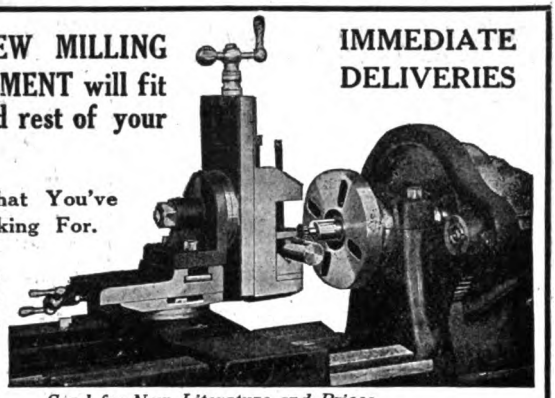
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THIS NEW MILLING ATTACHMENT will fit compound rest of your lathe.

Just What You've Been Looking For.

Very Handy for All Sorts of Milling Jobs.

IMMEDIATE DELIVERIES



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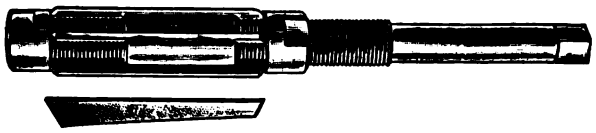
Barnes Drill Co., Inc. 1907 818 Chestnut St., Rockford, Ill., U. S. A.
Builders of the All-Geared Drill and Gap Lathes.

The best made for repair work

The Critchley Expanding Reamer

Reg. U. S. Patent Office

Try One and You Will Want More.

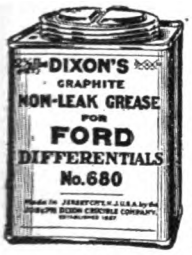


Reams odd size holes

Send for Circular

CHADWICK & TREFETHEN
32 BOW STREET PORTSMOUTH, N. H.

HAVE YOU ORDERED
your stock of
DIXON'S NON-LEAK GREASE NO. 680
in the NEW 2½ lb. package?



No. 680, an old member of the DIXON line of lubricants, is an adhesive, graphited grease, primarily intended for use in differential cases which have a tendency to leak.

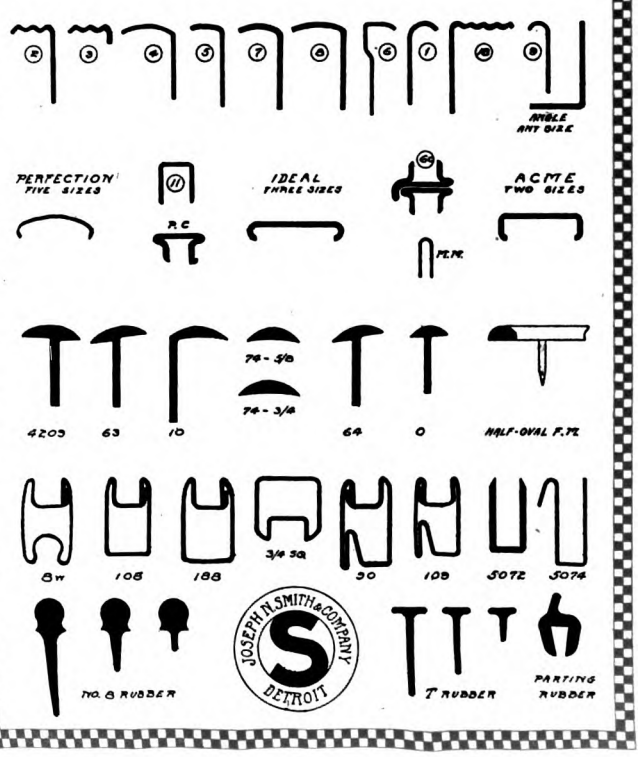
The new 2½ lb. package contains the proper quantity of this lubricant for Ford rear axles. It meets an insistent public demand for a high-class lubricant in a medium size package. It has already received nation wide approval.

Send for booklet No. 184G and dealer's proposition.

DIXON'S GRAPHITE Automobile LUBRICANTS

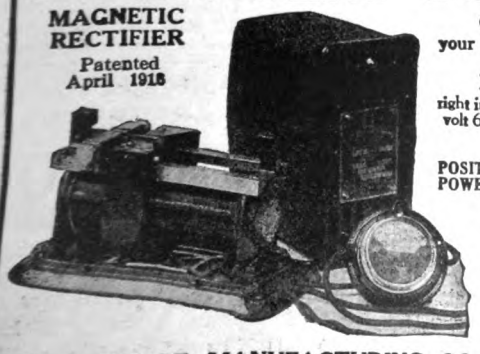
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JOSEPH DIXON CRUCIBLE CO.
ESTABLISHED 1827

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F-F BATTERY BOOSTER

MAGNETIC RECTIFIER
Patented April 1918



CHARGES your overtasked starting and lighting storage **BATTERY** right in the car from a 110 or 220 volt 60 cycle A. C. lamp socket.

Insuring a POSITIVE START, MORE POWER and BRILLIANT LIGHTS at a minimum of trouble and expense.

$15 Complete
F. O. B. Cleveland

Get Bulletin No. 10

THE FRANCE MANUFACTURING CO., Cleveland, Ohio
Jobbers and Dealers Throughout the United States and Canada

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Dealers Make Money!

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$325

Tonford

TRADE MARK

$325

All the facts that sell the Ford, sell the Tonford. Highest grade truck attachment made,—easiest to attach,—strongest, most durable. Best constructed truck unit on market,—lowest priced. Get busy now, while territory is still open. Write today. Learn how "Tonford" dealers pile up profits.

Detroit Truck Co., Mfrs., Detroit

THIS REINFORCEMENT PREVENTS STONE BRUISES, CURB BRUISES, HINGE CRACKS, BLOWOUTS AND PUNCTURES

THIS NON-SKID CANVAS TREAD EXTENDS ENTIRELY THROUGH THE TIRE, PREVENTS THE TREAD FROM PEELING OFF

PATENTS PENDING

EXAMINE

this Cross Section which is reinforced by the two strips of canvas, also inserts imbedded in the tread, leaving the tread smooth, but gives traction and also prevents the tread from heating. This is the only **NON-SKID** tire from the 1st to the 10,000th mile made. This high grade tire is guaranteed for 6,000 miles but averages 10,000. It draws 25 per cent. easier than tires with **KNOBS** or chains, which is a big saving on **GASOLINE.** Free booklet telling many other advantages and agents' proposition.

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3 TIMES STRONGER ALL FABRIC

THIS PREVENTS RIM CUTS

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Save $25 to $50

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A B C Two Unit Six Volt
Starting and Lighting System
for Ford Cars
$95 Installed

A B C STARTER COMPANY
Dept H, 33 E. Woodbridge St., Detroit, Mich.

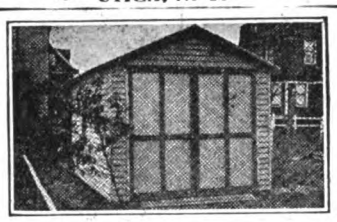


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Inner Liner
For Automobile Tires.

A complete inside fabric reinforcement. Enables you to get 500 to 1000 miles more from a nearly worn out tire. The flaps prevent slipping, therefore insuring stuck to tire and can be transferred from one to another and used over and over. Try the **"Kant Slip"** Inner Liner **now,** and get a few hundred miles more out of your old tires. It will pay.

Sold by dealers and by mail
Send for circular and prices.

All Sizes **FORD & LYON, Fitchburg, Mass.**



HOMES FOR AUTOMOBILES
$60 UP.

Portable or Permanent Buildings, Steel, Wood or Concrete Garages, Toolhouses, Boathouses, Bungalows, Storehouses, Factories, Office Buildings, Etc.
DESIGNERS AND CONSTRUCTORS OF BUILDINGS.
HOBOKEN GARAGE MFG. CO.,
'Phone 618. **74 Bloomfield Street, Hoboken, N. J.**

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Two part, pressure tight.

Write for offer to dealers.

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BALL AND ROLLER BEARINGS.



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THE NEW DEPARTURE SERVICE STATION
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Fit Any Thumb Nut Post Up To 3/16.
Insulation Ferrule Takes Up To 7/16.
For spark plugs and other terminals. Durable and reliable. Applied or removed without taking thumb-nut off. Holds wires without solder, locking on post when nut is tightened. Vibration proof. Patented U. S. April 7th, 1914.
4 for 25 cents
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"Little Giant" Gear and Wheel Puller
Makes All Pulls Quick and Easy

Answers all pulling purposes. "The harder the pull, the tighter the grip." No special appliances needed. Adjustable to 13 in. Indispensable garage tool. Price, $10. Money back, if not satisfied. Big discount to dealers.
Premier Electric Company, 4033 Ravenswood Ave., Chicago

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THE BEST BATTERY PROCURABLE.
Look for the G. L. B. Service Station.
Garage and Repairmen, control the replacement business in your territory.
Write Us About This Today.
GENERAL LEAD BATTERIES CO., **Newark, N. J.**

KEROSENE Gas Lamps



Burns Kerosene or Gasoline
one just as well as the other; or the two mixed. Make their own gas. 300 to 600 C. P. at ¼c an hour. Family or Business use.

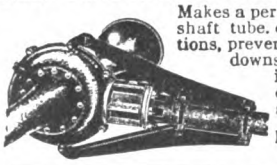


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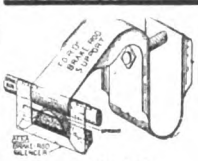
AUTO DEALERS, ATTENTION!
UTILITY VARNISH RENOVATOR is a money maker for you, and keeps your customers happy. Keeps the varnish on the Auto looking new, is non-acid, non-alkali; saves time, labor and varnish. Ask your jobber or send direct for trial size.
POUGHKEEPSIE UTILITIES CORPORATION
Department A, **Poughkeepsie, New York**

VULCANIZERS
Our Vulcanizers have stood the test for over eight years and are used and recommended by tire manufacturers, and the majority of Tire Repair Concerns.
Send for our catalogue.
O'NEIL TIRE & RUBBER COMPANY. Akron, O.

EKERN DRIVE SHAFT TUBE SUPPORT FOR FORDS.



Makes a perfect support for drive shaft tube, eliminates all vibrations, prevents expensive breakdowns. Can be attached in ten minutes by anyone. Shipping weight six pounds.
Price Per Pair, $3.50
EKERN BROS. MFG. CO.
Flandreau, S. D.



Pat. Applied for
Price, 35c. Set.

TRADE
AFFA
MARK
SPECIALTIES
For the FORD
BRAKE ROD SILENCER
Snaps On. Stops Rattle.
JOBBERS WANTED.
W. S. GRAFFAM,
49BW Carleton Street
Newton, Mass.

1917 CASE 40

Many new refinements of machinery and appearance yet no increase in price. $1190 F.O.B. Racine.
J. I. CASE T. M. CO., Inc., 142 Liberty Street, Racine, Wis.

Rives **AUTO-PEDAL NEVERSLIP** Pads





Made of Live Rubber
Attached to ANY CAR in a Minute **Full Set $1**
Dealers: WRITE FOR TERMS
Geo. H. Rives Mfg. Co., Inc.
Dept. B. 2187 Woolworth Bldg., New York



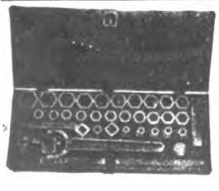
Pat'd. Dec. 21, 1915

"PERFECTION" Pedal Pads

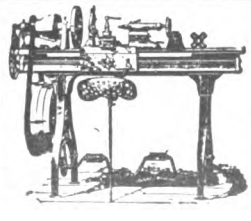
FOR EVERY MAKE OF CAR
Clamped on in less than one minute. No bolts, or drilling of holes in pedal necessary
Send for free printed matter.
Auto Pedal Pad Co., Inc.,
792 Seventh Ave., New York

ADCO SHOCK ABSORBERS

Prices reduced to **$10** a pair
Write for trade discounts
AUTO DEVICE MFG. CO.
61 Mason St. Milwaukee, Wis.



BAY STATE
SOCKET WRENCH SETS
are high grade tools made for real mechanics whether professional or amateur.
Four sizes, $3.00 to $10.00
Send for circulars.
GEO. A. CUTTER Sales Agent
Taunton, Mass.



BARNES LATHES
9 to 18 inch Swing.
SEND FOR LATHE CATALOG
W. F. & JOHN BARNES CO
206 Ruby St., Rockford, Ill.

OLD SOL NITROJECTOR No 100
THE 100% PERFECT SPOTLIGHT
Hawthorne Mfg. Co., Inc., Bridgeport, Conn., U.S.A.
MAKERS OF OLD SOL WINDSHIELD SPOTLIGHTS AND ELECTRIC LIGHTING DEVICES

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Everything from Garages to Factories

Erected easily and quickly. Taken down just as readily and moved to any desired new location. Weatherproof, fireproof, timeproof. Wonderfully durable. Whatever the need—garage, booth, boathouse, office, storehouse, school, cottage, barn, hospital, or factory, there's an Edwards Steel Building for the purpose. Write today for descriptive literature and prices.

THE EDWARDS MANUFACTURING COMPANY
Metal Roofing, Metal Lockers, Rolling Doors, etc.
1423-1473 Eggleston Ave., Cincinnati, Ohio

The Campbell Iron Company

Wholesale Automobile, Garage and Machinists' Specialties. Duplicate parts for Fords carried in stock.

Write for new catalog for

Equipment and Tools for the Garage and Auto Repair Shop.

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FREE ENGINE BOOK

Before you buy any Engine—Read my Book, **"How to Judge Engines."** Tells how to distinguish a High Grade Engine by the difference in cylinders, pistons, valves, ignition, etc., with less cost for fuel, up-keep and repairs. Book Sent Free together with my LOW FACTORY PRICES and Easy Payment Plan. "Built by Experts" 90-day trial offer, etc. Address

Save Half 2, 3, 4, 6, 8, 12, 16 and 22 H-P, Sizes.

ED. H. WITTE, WITTE ENGINE WORKS, 2496 Oakland Ave., KANSAS CITY, MO. 2496 Empire Bldg., Pittsburgh, Pa.



Mends All Metals—Stops Leaks

A real metal solder complete in collapsible tube, ready for quick repairs.





SOLDERALL

Indispensable for the service station man or the private car owner; a recognized necessity for the home, shop or garage. Tube and torch in handsome box sent prepaid for $1.25. DEALERS WRITE FOR PRICES.

Tube 25c — Solderall Company, 131 Sussex Ave., Newark, N. J. — Torch $1.00



TOOLS

For shop, factory, garage and home, many high class tools attractively priced in our "ODDS and ENDS" pamphlet—which is mailed free on request by

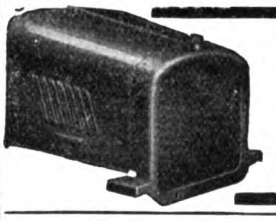
MONTGOMERY & CO., 105 Fulton Street, NEW YORK CITY



RUNYEN SELF-MEASURING -- GREASE CABINET --

A GARAGE NECESSITY

RUNYEN MANUFACTURING CO.
GRAND RAPIDS, MICH.



The Universal Streamline Hood and Radiator Shell gives the Ford a full streamline effect

Retail Price is $17.50 F. O. B. Cleveland

Dealers and Jobbers Write for Discounts

The Universal Specialty Mfg. Co
903 Leader Bldg., Cleveland, O

LECTROFLATER

ELECTRIC AIR PUMPS

Costs 1/10 of a cent to pump largest size tire. Cheapest, handiest, for garages, service stations, tire dealers, repair shops. Either direct or alternating current. Automatic lubrication 125 lb. air pressure guaranteed, without heating. Prices, $45 to $160, F. O. B. Baltimore. Including gauge, hose, plug, coupling and electric cord.

THE BLACK & DECKER MFG. CO.
121 So. Calvert St., BALTIMORE, MD.

EVEREADY Storage Battery

Only Guaranteed Non-Sulphating Battery

Electric Row Boat Motor



Make your Row Boat an Electric Launch. Buy a Jewel Detachable Row Boat Motor run by electricity. No odor or dangerous gasoline. Simple, noiseless and powerful. Attaches to any Row Boat and runs on two six volt Batteries. This is our 5th successful season.



Open Window Battery

Look inside your storage battery through the patented open window. See condition of plates and height of electrolyte. If you need a new automobile starting Battery buy a Jewel and save money, 6-60 Special $8.50.

MOTORCYCLE ELECTRIC LIGHTING SYSTEM

The Jewel Generator Motorcycle Storage Battery and complete lighting system is in great demand. Agents wanted. Write for prices and catalog K13.

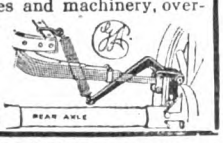
JEWEL ELECTRIC CO., 112 N. Fifth Ave., Chicago

G. A. SHOCK ABSORBERS

Are a great saving to tires and machinery, overcome all the disagreeable bounce and vibration,

Making Riding and Driving a Pleasure.

Write today for full particulars.



GENERAL APPLIANCE CO.
Milwaukee, Wisconsin

Lazco Products — Dealer' Profits

Vulcanizers, Spring Lubricators, Engine Trouble Detector, Fire Extinguishers, Etc.

Get our quotations.

THE LAZARUS MANUFACTURING CO.,
752 Prospect Avenue, Dept. R, Cleveland, Ohio

CLEAN YOUR ENGINE REGULARLY WITH A



WAGNER AUTO ENGINE CLEANER

One qt. kerosene and 6 lbs. air pressure cleans all dirt, grit and grease from engine. Prevents wear, actually saves half the usual repairs. Quick, economical, thorough, easy and cleanly to operate. Necessity for repair shops.

Wagner-Hoyt Electric Co., 1902 B'way, New York City

KORINE CARBON REMOVER

Quart $1.00 Half Gallon $1.75 Gallon $3.00

Cleans in One Hour Will Not Injure Motor

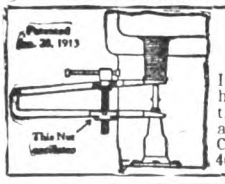
KORINE CARBON REMOVER CO.
136 Federal Street Room 317 Boston, Mass.

THE AMESBURY BENT GLASS COMPANY, manufacturers of Convex Lenses for automobile headlights. Also, Diffusing Lenses which are absolutely no-glare. A trial order means your future business.



AMESBURY BENT GLASS COMPANY,
Factory, Carriage Avenue,
AMESBURY, MASS.

Write for printed matter.



"C. P." Improved VALVE LIFTER

Price, $1.00 by mail

It works like a vise and holds like a vise. It holds the spring rigid. Used on any car.

CLINTON MACHINE WORKS
460 High Street, Clinton, Mass.

Springfield Tire Detacher



For removing clincher tires, any size from 3" to 5". Weight, 1½ lbs. Japan Finish.

Price, 65c Postpaid

The Shawver Co., Springfield, Ohio

YANKEE Pump $5

A woman can work it with one hand. Clamps on running board in a jiffy—folds to fit any tool box—never dries out and loses compression.

APEX ELECTRIC MFG. CO., 1411 W. 59th St., Chicago, Ill.

COMMERCIAL COWL-DASH and SHIELD for Ford Delivery Cars.

Easily installed on old or new style Ford. Makes your Ford Delivery a 1916 model. Complete, f. o. b. Adrian, Mich., $25.00

Body Builders—Get our Special proposition.

MANUFACTURERS—Will build to your specifications when quantity warrants.

PAGE WOVEN WIRE FENCE CO., ADRIAN, MICH. Windshield Dept.



PORTER'S BOLT CLIPPERS

"Easy" "New Easy" Allen-Randall



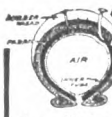
To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.

H. K. PORTER, EVERETT, MASS.

Easyon Chains

"Grip Like a Mud Hook—Ride Like a Bare Tire"

INSYDE TYRES



Inner armor for automobile tires. Prevent punctures and blowouts. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details Free. *Distributors and Agents Wanted.* Sales Guaranteed. Liberal Profits.

AMERICAN ACCESSORIES CO., Sta. C D., Cincinnati, O.

ROME RADIATORS

Quality, Efficiency, Durability.

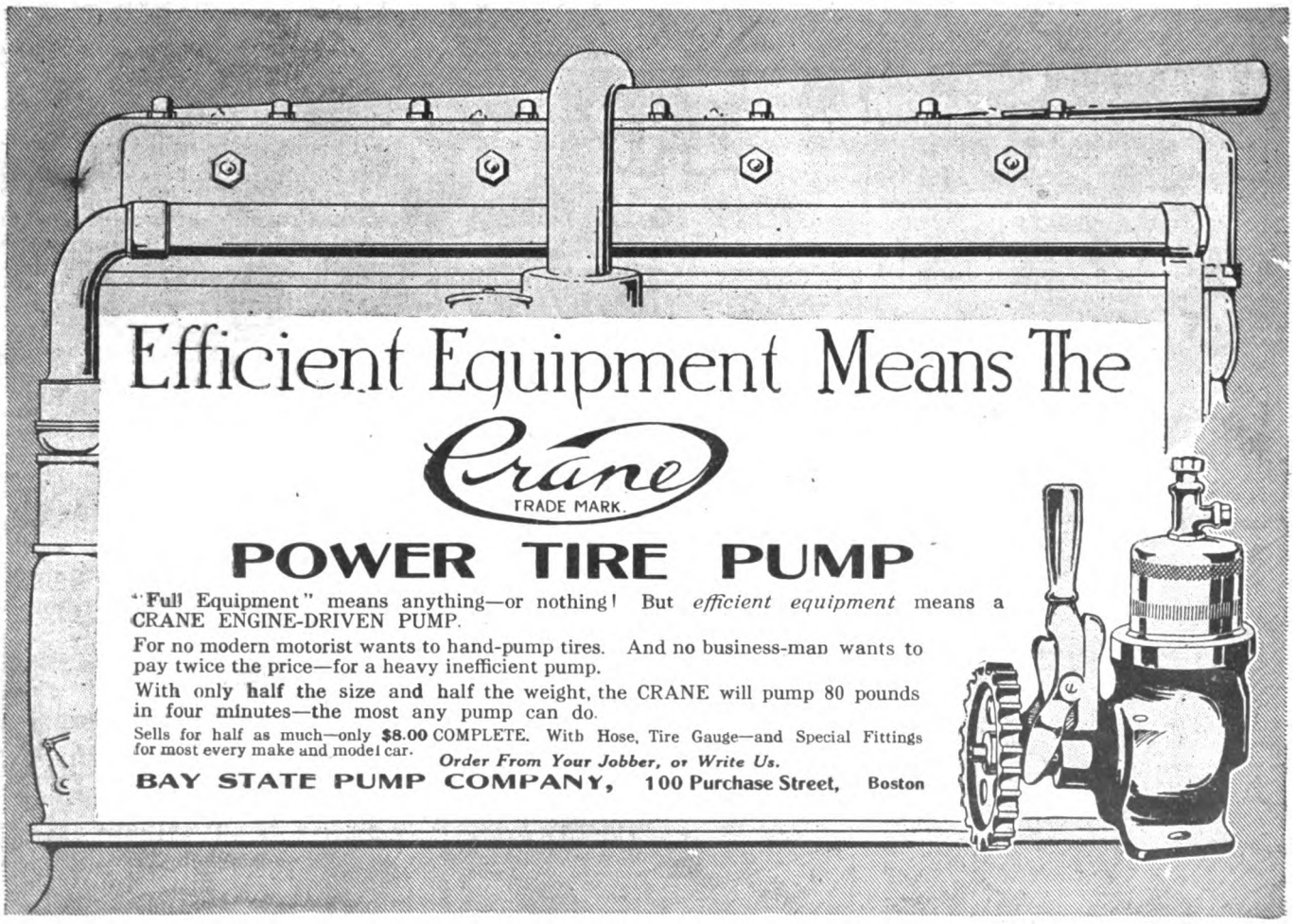
We repair and replace all makes of radiators

ROME-TURNEY RADIATOR CO.
WHITESBORO STREET, ROME, NEW YORK.

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FAIR LIST PRICES

FAIR TREATMENT

Have This Sign Selling for You

GOODRICH TRADE MARK TIRES

Where You See This Sign Goodrich Tires are Stocked

THE GOODRICH DEALER'S SIGN is a friendly face which halts the automobilist in the need of a tire at your door.

It is an OUTSIDE salesman that sells a customer *before* he enters your store.

For every tire user knows that wherever he sees a *Goodrich Dealer Sign* THERE he finds a *Goodrich square dealer* selling the best tires made at the Fair Prices of the Fair List.

He knows that *behind* that sign stands GOODRICH FAIR TREATMENT ready to make good to him anything the tire he buys *may* not.

Furthermore, the tremendous pulling power of *Goodrich's 1917 advertising campaign* which sows the land *thick* with the *sales* of *Goodrich Tires* is in each Goodrich Dealer Sign.

The great national magazines and weeklies, the metropolitan dailies and your own home town papers are ALL SELLING for you—WHEN YOU HAVE A GOODRICH DEALER'S SIGN OVER YOUR DOOR.

GOODRICH

SILVERTOWN CORD TIRES SAFETY TREAD FABRIC

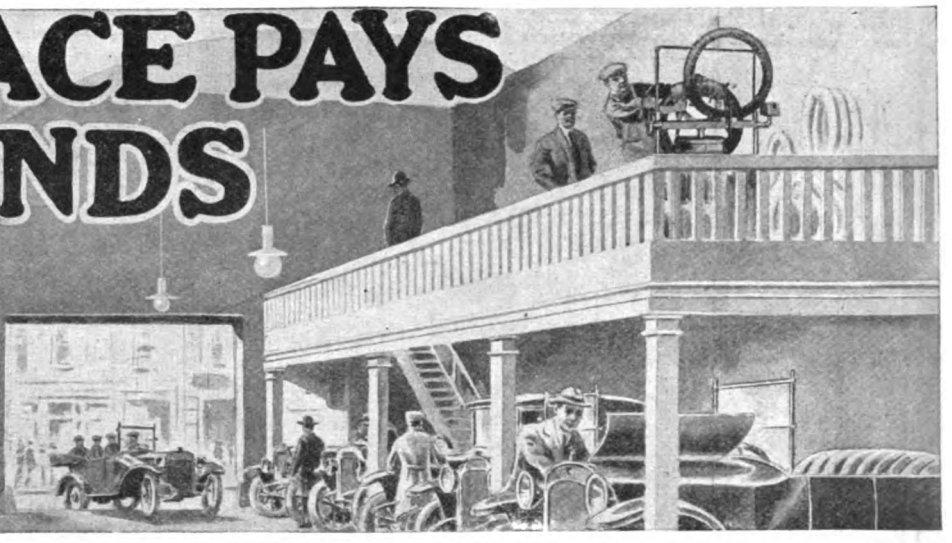
Goodrich Brown Tubes and Gray Tubes

The B. F. GOODRICH RUBBER CO.
Akron, Ohio

BEST IN THE LONG RUN

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AIR SPACE PAYS DIVIDENDS



Building air castles—the right kind of air castles—the kind that utilizes every bit of waste space for which you are paying rent—is good business and brings big returns.

If you are operating a garage, or a sales room with the usual high ceiling—how simple to erect a balcony upon which to do tire repairing—a feature very likely to become the most profitable part of your entire business.

More tire mileage is wanted by everyone who drives a car. You and I know that by taking care of every little cut and stone bruise immediately, you can increase the mileage from 25% to one-half, or more. Why it is not done, is because the average owner doesn't know it, or his car is stored where there is no repair shop, and so, day-by-day it is neglected.

HAYWOOD'S Model D.B. VULCANIZING PLANTS

Therein lies your chance. See that the tires of every customer in your garage are in ship-shape all the time—let the owner know that for a few cents you can make a repair that will save a few dollars. He not only will have the repairs made, but will tell his friends about you and your method of doing business.

It's the cheapest kind of advertising for your place imaginable—it simply makes you a multitude of friends, taxing the capacity of your garage, and bringing tire repair business of those who cannot utilize your place for storage.

Don't you see what a wonderful opportunity this is—the customer is already at your door—he needs you. A suggestion—a little education on how to save his tires, and your work will grow—and—grow.

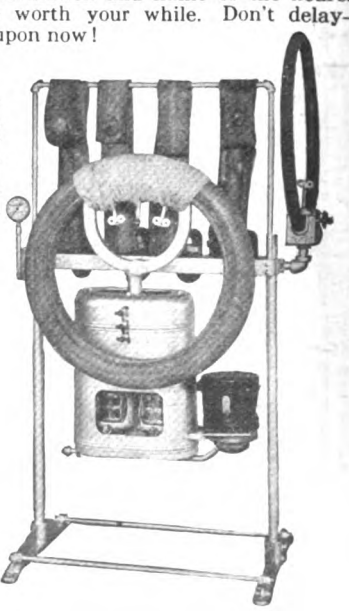
A WONDERFUL MACHINE—This Plant is a wonderful machine—simple, compact, quick acting, requiring little room. A balcony is ideal. Perhaps you have been thinking of putting up a balcony for your office. Make it a little larger and include a vulcanizing plant. If you haven't one now, you are not earning all that you should.

This new machine is designed for garage work, and will do all ordinary repairs on casings or tubes. It will earn its cost almost any week.

THE PRICE IS LOW—The price is unusually low—only $45—an investment no garageman can afford to stop to consider. Its operation is simplicity itself. Anyone can do it without special training—our splendid book of instructions makes it all perfectly clear. A little practice on an old casing or two will quickly educate you. Or come to our complete training school at the factory—the expense is very modest—but none of our customers have found this necessary on this machine.

So fill out the coupon and send today for the complete information and name of the nearest jobber. It's worth your while. Don't delay—send the coupon now!

HAYWOOD TIRE AND EQUIPMENT COMPANY
528 N. Capitol Ave.
Indianapolis, Ind.



A BUSINESS OPPORTUNITY COUPON

Mr. M. Haywood, Personal, 528 N. Capitol Ave., Indianapolis, Ind.

Dear Sir:—Please send me full details how I may start a Haywood Sundry Supply Store and Tire Repair Shop in this locality.

NAME.....

ADDRESS.....

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Yesterday This Tire Was In The Junk Heap



—today it is equipped to give 5,000 to 10,000 miles more service—***far better service*** than it ever gave before, for now it is absolutely guaranteed at least 5,000 miles of service without a puncture.

European Motorists Get 10,000 to 15,000 Miles from Ordinary Tires

For the past three years, European motorists have been getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American motorists have been satisfied with 1,000 to 3,000 miles—and what is even more important, European motorists have almost entirely eliminated the constant dread of punctures, blow-outs and rim-cuts.

They do it by putting Steel Studded Treads on their tires—and in the last eight months over 40,000 American motorists have followed their example and have protected their tires with Durable Steel Studded Treads.

Guarantee 5,000 Miles Without Puncture

To many motorists this fact—**guaranteed 5,000 miles without puncture**—is of more interest than the money saved by eliminating tire repair bills. The constant dread of puncture or blow-out spoils the joy of motoring. Each unnecessary noise—each bit of broken glass or sharp edged stone—each bump or "pop"—makes the motorist think of tire trouble FIRST. Durable Treads are backed by a signed guarantee—as good as a government bond—for 5,000 miles without puncture—and most users get 10,000, 12,000 and 15,000 miles.

We Deliver Free

Without a cent deposit—prepay the express—and allow YOU to be the judge. Remember that the new 1917 Improved Full Cover Durable Treads are gripped tightly by the rim, just the same as the tire—absolutely water and sand proof—and **easily applied in your own garage,** in thirty minutes without special tools.

Special Discount

We offer a Special Introductory Discount to motorists in new territory on the first shipment direct from the factory. The sales of Durable Treads (the PRACTICAL Tread) increased 800% in the United States alone during the past year—over 40% of these sales were unsolicited—made through the recommendations of other Durable Tread users.

Mail the Coupon

Tear it off and mail it now—don't run your tires another week in a barefooted condition. We have an interesting book of "10,000 miles on One Set of Tires," sample and guarantee ready to send you FREE—mail the coupon TODAY and find out how to get at least 5,000 miles **more service** out of your tires.



The Colorado Tire & Leather Co.

45 Tread Bldg., Denver, Colo. **D-5 Transportation Bldg., Chicago**
720-54 Woolworth Bldg., New York

Guaranteed 5000 Miles Without a Puncture

TEAR OFF—MAIL

The Colorado Tire & Leather Co.
45 Tread Bldg., Denver, Colo.
D-5 Transportation Bldg., Chicago.
720-54 Woolworth Bldg., New York.

Gentlemen:—
Without any obligation send me your free book, "10,000 Miles on One Set of Tires," copy of guarantee, and tell me about your Special Discount Offer.

NAME .....
ADDRESS .....
.....
MY TIRE SIZES ARE .....

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26 Millions of People Is a Big Audience!

Yet, reckoning but four persons to a family, this is almost exactly the number that for months to come will read in magazines of National circulation, the advertising story of Gordon Seat Covers and Gordon Easy-On Tire Covers.

These great advertising mediums—The Saturday Evening Post, Collier's, Leslie's, Literary Digest, Life, Metropolitan, Cosmopolitan, McClure's Magazine, Hearst's Magazine, and Motor Life are so many silent salesmen, molding and crystallizing the individual need and desire of all these people toward the purchase of Gordon Covers.

And think for a moment of

The Tremendous Purchasing Power of These Millions

—farmers, mechanics, merchants, manufacturers and professional men—hundreds of thousands of them actual car owners and every one a possible owner.

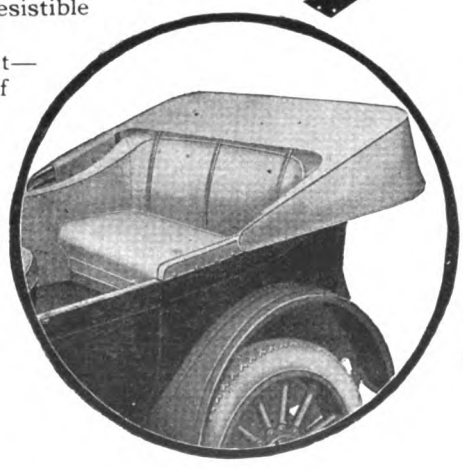
Yes! and don't forget the wives! Three times in four, the woman of the family either does the purchasing or is the active influence back of the purchase. And because this is so, Gordon Seat Covers will grace thousands of motor cars this coming year that would otherwise show only the grime and stain of travel.

No, indeed! Don't forget the wives. In all your local advertising, when you talk Gordon Covers to your customers and friends, bear heavily on their neatness, cleanliness and fine appearance.

That this will multiply sales goes without saying, for a bright, clean car makes an almost irresistible appeal to a woman.

And here is the very kernel in the nut—**co-operation**—you pushing the sale of Gordon Fabric Specialties **locally,** in conjunction with the great Gordon country-wide campaign which is creating the demand that will bring buyers to your door.

Advertising is the greatest selling force in modern business—of that there is no question. And here is an opportunity for you to reap its benefits at practically no cost to yourself. Will you do it?





The J. P. Gordon Company

306 N. Fourth Street Columbus, Ohio

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STA-TITE PISTON RINGS

THE most important agents in the delivery of power to the crank shaft are piston rings. If your piston rings are leaky you are using more oil and are getting less miles per gallon from your gasoline than you should. Your car is hard to start. It won't climb hills. It knocks and lacks power. And your cylinders are continually full of carbon. *All of which means endless waste and trouble.*

STA-TITES End All This

We realized the need for perfect piston rings that would eliminate this waste and trouble. We determined to *fill* that need and *have succeeded.*

We knew that perfection could be attained only by specializing. So piston rings are our sole product. All our thought, all our time, all our effort, are put to turning out perfect rings.

Sta-Tite Rings excel all others in scientific design. They are cast individually from special formula iron. Each step in their production is handled by experts. Machinery that represents the highest development of modern times is used in their manufacture. Before leaving our factory each ring must pass a ruthless final examination.

No rings less carefully and less accurately constructed can achieve the saving in power and fuel offered by the Sta-Tite Piston Rings.

STA-TITES Prove These Claims

Sta-Tite Rings will prove any claims we make and make good any recommendations you may offer. Motor car owners everywhere understand the need for perfect piston rings and are learning of Sta-Tie superiorities.

Explain to your customers how Sta-Tites by their principle of construction assure more power with less fuel. Tell them to compare these rings with all others. They will then do as thousands of other motor car owners have done—equip their cars with Sta-Tites. This means increased motor efficiency and decreased cost *for them,* and satisfied customers, bigger business and greater profits *for you.*

Don't forget that we also make Quality Snap Rings. They offer the same perfection of construction, the same attention to accuracy that you find in Sta-Tites.

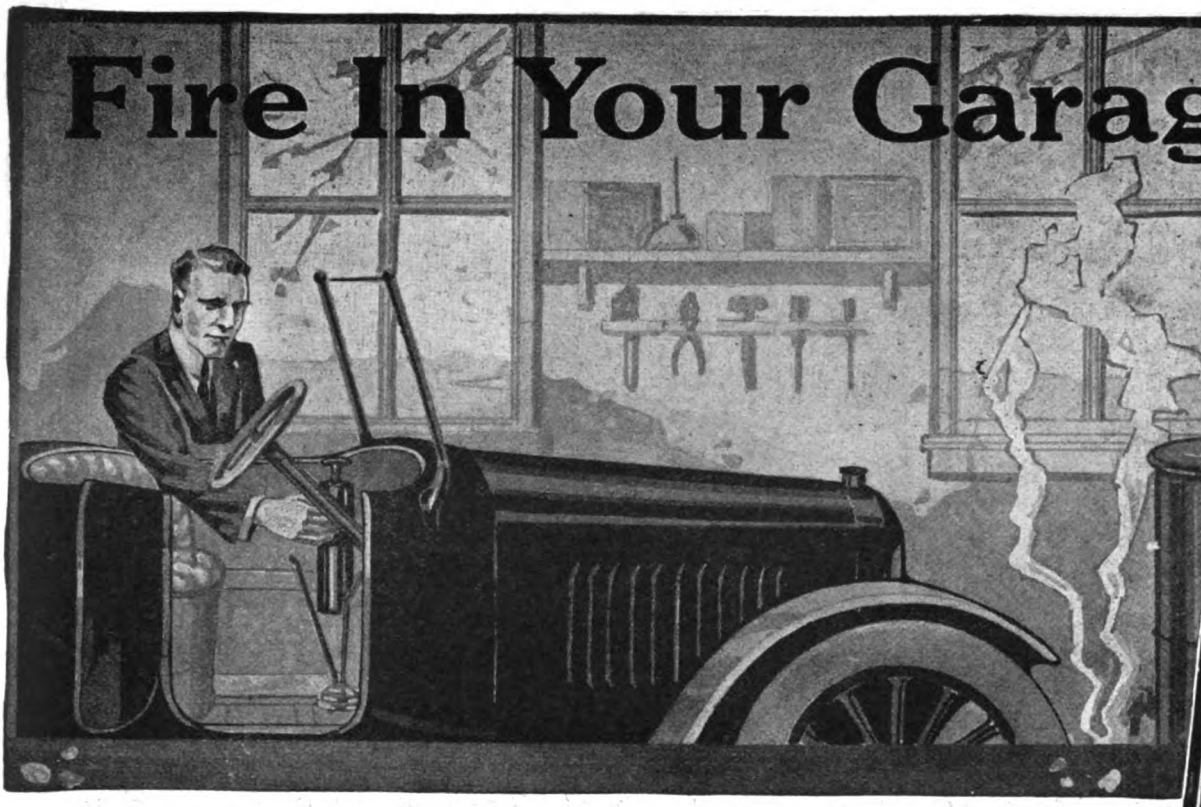
Write us today for complete information. Be ready to cash in on the demand we have created for these rings. We know the profits they have made for other dealers. We know they will do the same for you. So write today.

THE PISTON RING COMPANY, Dept. 114, Muskegon, Mich.

(64)

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Fire In Your Garage!



Not Today, Perhaps—or Tomorrow

But there is *always* the possibility of fire, *any* minute, without warning. Fyr-Fyter is your convenient, always at hand, sure defense against fire.

Fyr-Fyter Quickly Kills Gasoline Fire

Water only spreads a gasoline fire. Sand is but little better and seldom handy. Fyr-Fyter kills a gasoline fire in an instant.

Fyr-Fyter shoots a powerful stream, straight and continuous, a distance of 30 feet. Pump handle unlocks to right or left. Discharge insured from any angle. Fyr-Fyter fluid will not deteriorate, is always effective and is non-freezing even at 50 degrees below zero. It contains no ingredients harmful to car or upholstery.

Each extinguisher carries Inspection Label of Underwriters' Laboratories, Inc. Fyr-Fyter is made in three finishes, velvet-finish brass, nickel-plated and gun metal. It comes guaranteed with bracket and screws ready for attaching to wall or motor car.



Garage Men

You will find Fyr-Fyter an excellent profit maker. Easy to sell and backed up by generous advertising.

Cost—Trifling
Saves 15% Auto Fire Insurance

The fact that your insurance rate is 15% lower when your car is equipped with Fyr-Fyter shows you the esteem in which the insurance companies hold it. And the cost is extremely low when compared with the security and relief from anxiety which Fyr-Fyter brings.

Get Fyr-Fyter of Your Garage Man or Auto Supply House

If they are unable to supply you, write immediately to

THE FYR-FYTER CO., 103 Patterson Bldg., Dayton, Ohio

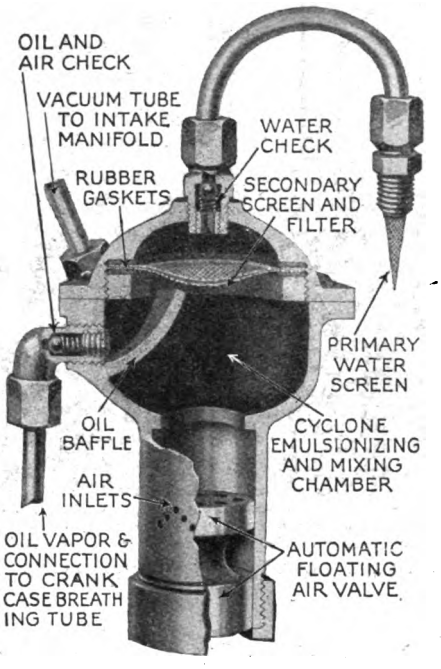
Fyr-Fyter NEVER FAILS

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Flint Carbon Goes!

—Guaranteed—

The greatest plague in the motor world conquered for good at last.



Makes a dirty engine clean. Keeps it clean. Pos-i-tive-ly! Guaranteed!

Wilmo

Decarbonizer and Economizer

A mere handful of bronze, ingeniously constructed, which transforms any water-cooled engine into a carbon-free, more-miles-to-the-gallon producer than the car manufacturer ever dreamed of.

Banishes, forever, flint carbon which robs the car of power and miles.

Draws water vapor from return water manifold, oil vapor from crank case breathing tube and automatically regulated air through gravity plunger air valve—thence to cylinders.

The water vapor absolutely removes the hard flint carbon deposit, and positively prevents further formation. The oil vapors preserve the condition of cylinder interiors.

A clean engine always, and an average of 25% increased gasoline mileage due to these automatic features as shown by exhaustive tests.

Fits engine of any automobile, truck or tractor, water-cooled type.

Sold under the absolute money-back guarantee of the makers.

To be extensively advertised.

Interesting sales proposition awaits you.

Write today.

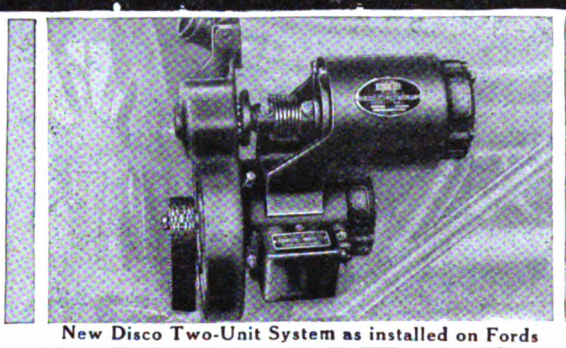
THE WHITTIER COMPANY

Makers of the Famous Wilmo Manifold

First National Bank Bldg., Chicago

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DISCO



New Disco Two-Unit System as installed on Fords

New Disco for Fords

The New Disco Two-Unit Starting and Lighting System for Ford Cars has important advantages over other Ford Systems.

Excess Power

It is the first Ford System with an abundance of **extra** power. It is generally known that other systems for Fords have been just powerful enough to start a Ford Motor under usual conditions, with little reserve power.

The motor and generator of the Disco System is the **same** as used in the system we are now installing in many cars having "Big Six" and "Big Eight" motors, such as the Continental, or Perkins "8."

They handled these motors with perfect ease even in the coldest weather.

This **excess** power assures easy starting under **all** conditions and lengthens the life of the system by preventing strain.

Ease of Installation

The entire System can be installed in less than 3½ hours, as the generator and starting motor come completely assembled and are fastened to engine with four bolts.

Removing four thru-bolts is all that is necessary to disassemble either unit, for cleaning or adjustments.

Greater Efficiency

The motor is equipped with the famous Bendix-drive used on the highest priced cars.

It spins the motor easily under a very low current draw.

The full power of the battery is maintained even in city driving, as the generator cuts in at about 6 miles per hour.

Convenience

The old type underfoot starting switch is replaced with a much more convenient device, a combination starting and lighting switch with dimmer. This is attached to the steering column immediately under the steering wheel and locks securely with a key, preventing the unauthorized use of either starter or lights. An ammeter, which serves to show whether the generator is functioning properly, is mounted on top of this switch box, in full view of the driver.

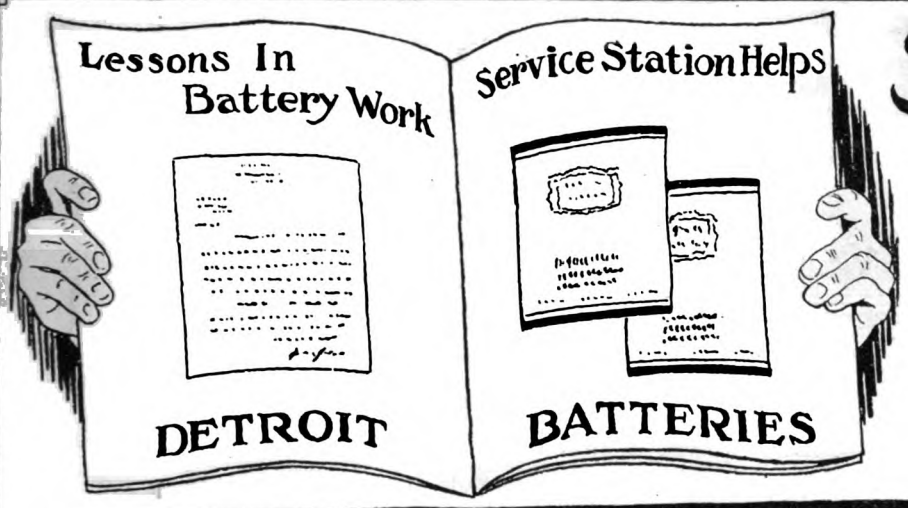
Price, $75.00—F. O. B. Detroit

DISCO ELECTRIC STARTER CO., Detroit

All Cars Would Be Better Cars If Disco Equipped



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This Free Portfolio will lead to this

DO you realize that there are just two things on a motor car that wear out and must be replaced time and time again—tires and batteries. These are the only two accessories which insure a steady, permanent resale business for the dealer who handles them.

The dealer who enters the battery business today, steps in just at the beginning of its greatest growth. The business will be trebled within the next three years.

This portfolio will explain how easily the Detroit Battery Company has made entering the battery business for the dealer who can measure up to their standards.

This portfolio will show you how we have taken all the mystery out of the business—how we even give a free course of instruction in practical battery work to our own service station men—how we help them get business—show them how to advertise, and how to treat their customers. The portfolio shows actual samples of the various service station helps—literature, signs, etc. It shows the office system which we have devised for our service stations.

And it will also contain a personally dictated proposition, showing you just what it will cost you to get into the battery business, what equipment is required—what our proposition to you would be and the probable profits you could expect in your particular territory.

And it will describe Detroit Batteries, which will be the foundation, and a mighty safe, sound foundation for the business. It will show how they have been made the longest lived, most powerful batteries on the market.

As a wide-awake dealer you ought to know the possibilities in the battery business.

You ought to have this portfolio right now.

It won't cost you a cent. Just fill out this coupon and mail it today

DETROIT BATTERIES

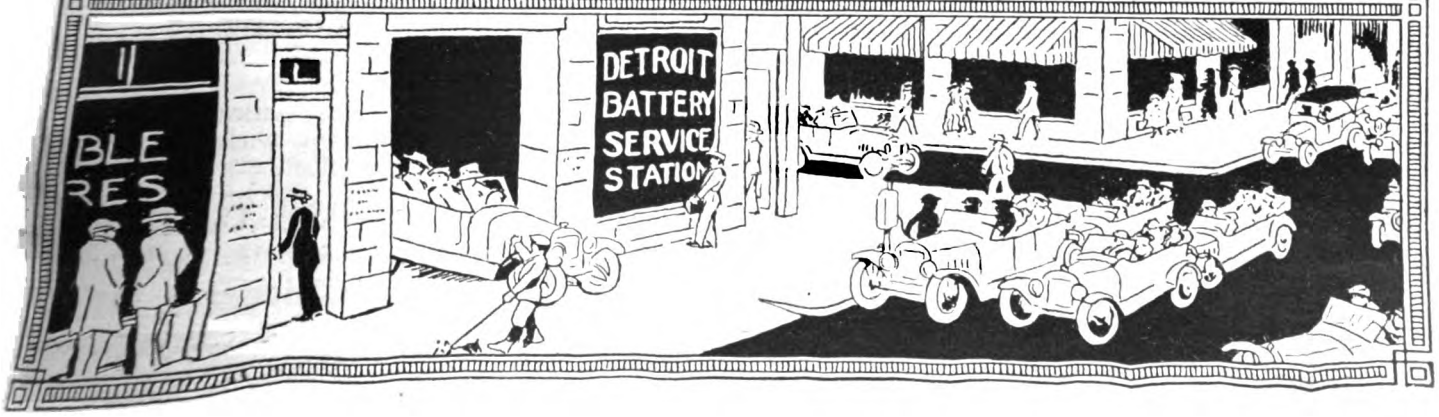
Detroit Battery Company,
DETROIT, U. S. A.

DETROIT BATTERY CO.,
109 E. High St.,
DETROIT, MICHIGAN

Send me the Portfolio.

Name.....

Address.....



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HONESTY

THE success of the Dearborn One-Ton Truck Unit is built upon honesty—honesty in design, honesty in materials, honesty in construction, honesty in advertising, honesty in selling. The results of this honest policy under which the Dearborn is made are found in the big, sound, growing, money-making businesses which Dearborn Dealers have established.

The field for the Dearborn Unit has hardly been scratched—it is practically unlimited. In *your* town and territory there are many *sure* prospects for the Dearborn. General merchants, expressmen, lumber dealers, farmers, dairymen, truck gardeners, manufacturers, contractors, etc.—these people need the Dearborn and will buy it. Almost without exception they are people who wouldn't think of paying $1500 for a truck (the average price of a one-ton truck), but they are interested in the Dearborn Truck because it can be obtained for $350 and a Ford chassis, and will give them just as strong and dependable a one-ton truck, which they can operate at less expense than a horse and wagon.

$350 and a Ford, New or Old, Make a

FORD-DEARBORN One Ton Truck

The Dearborn Unit is as well and carefully made as any truck chassis on the market. It is manufactured in our own plant and we guarantee it to be right. It is a simple matter—the work of only a few hours—for an auto mechanic to attach the Dearborn Unit to a Ford chassis.

90% of load is carried on sturdy rear axle and heavy truck wheels. Full 9-ft. loading space; heavy artillery type wheels with guaranteed hickory spokes and felloes; solid rubber tires. Standard tread, same as Ford front wheels. Baldwin roller chains and Baldwin steel sprockets. First quality materials used throughout.

Remember this: The Dearborn Truck Company is *not* a stock-selling organization. It is a real manufacturing company with a big, modern factory, making carload shipments daily.

Write today for the Dearborn Dealers' Proposition.

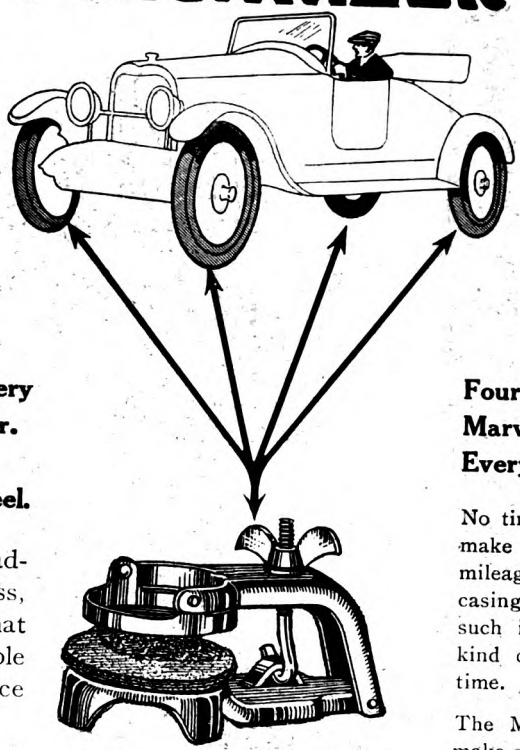
Dearborn Truck Company, 1252-64 S. Campbell Ave., Chicago, Ill.

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MARVEL
JR. VULCANIZER SR.

MARVEL JR. FOR TUBE REPAIRS

$1



MARVEL SR. FOR TIRES AND TUBES

$2

Four Reasons on Every Car for the Marvel Jr. Vulcanizer. One on Every Wheel.

Every bump on the roadway—every piece of glass, tack, or rusty nail that could bring tube trouble—is a strong selling force for the Marvel Jr.

No car is completely equipped unless the motorist has this handiest of all accessories ready to repair tube punctures at a minute's notice.

Four More Why the Marvel Sr. Should be in Every Tool Box.

No tire has a fair chance to make good — to deliver the mileage built into it—unless casing cuts, sand blisters and such injuries get the right kind of repairs at the right time.

The Marvel Sr. is made to make good repairs on casings or tubes no matter where the need arises. Complete outfit, with large supply of repair material sells for only $2.00. Ask your jobber today.

Just Starting! The Biggest National Advertising Campaign Ever Used to Sell Any Vulcanizer!

All through the selling season big space advertisements in Collier's, Literary Digest and Saturday Evening Post will tell car owners about the Marvel Jr.—will send them to you **to buy.** More than half a million Marvel Jrs. have already been sold and every car owner is a steady booster for them. Prepare to get your share of this business—clip the coupon here—send it to your jobber or to us.

Right now is the time.

The Marvel Accessories Mfg. Co.
7233 St. Clair Avenue CLEVELAND, OHIO

The Marvel Accessories Mfg. Co.
7233 St. Clair Ave., Cleveland, Ohio

Enter our order for ..... dozen Marvel Jr. Vulcanizers at $8.40 per dozen or ½ gross at $7.80 per dozen. Our Jobber's name is .....
address .....
Send us FREE the sales helps checked
[ ] Window Display [ ] Patches and discs for demonstration [ ] Folders [ ] Counter Cards.

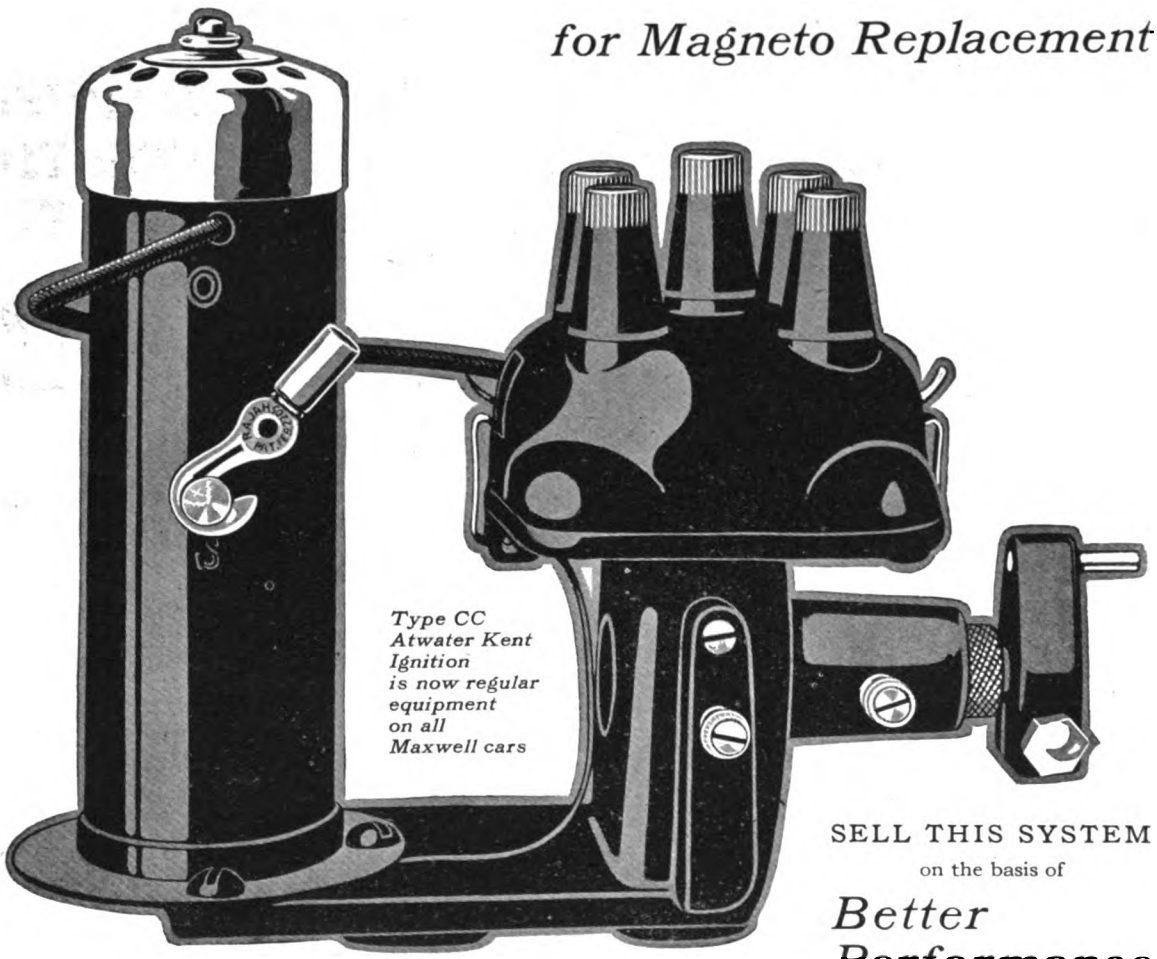
Name .....

Address .....

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ATWATER KENT
SCIENTIFIC IGNITION

for Magneto Replacement



Type CC Atwater Kent Ignition is now regular equipment on all Maxwell cars

SELL THIS SYSTEM
on the basis of
Better Performance

Mr. Dealer

IT is not necessary for us to sell *you* battery ignition. *You* do not care particularly whether battery ignition is better than magneto ignition. The one thing you *are* interested in is, "How can I cash in on the change that is taking—*has* taken—place?"

90 per cent. of 1917-18 cars** (exclusive of FORDS) **will be equipped with battery ignition in place of the magneto

A large percentage of these will be ATWATER KENT equipped.

Every magneto equipped car will be a better car if it is ATWATER KENT equipped.
Every magneto equipped car is an opportunity for you to make an ATWATER KENT sale.
Every ATWATER KENT sale will make a satisfied car owner, who will thank you for suggesting ATWATER KENT.
Every pleased ATWATER KENT owner will bring you other customers.

THIS IS YOUR OPPORTUNITY

The CC System will provide a bigger, hotter, more uniform spark at all speeds than any other ignition system of its type. It will give greater and smoother acceleration. It will admit of greater flexibility of motor operation—requires little or no attention—only one adjustment and that easily made with one hand and a screwdriver. The mechanism will outlast the car. It is fool, oil and moisture proof.

ATWATER KENT Type CC Ignition is the product of years of painstaking laboratory and mechanical research and is a finished instrument in every point of workmanship, accuracy, finish and performance.

The user of an ATWATER KENT equipped car is an ATWATER KENT enthusiast—he realizes increased pleasure, satisfaction, car performance and safety of driving.

ATWATER KENT MANUFACTURING WORKS, PHILADELPHIA, PA.

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Are You Getting All the Miles That Are Built Into Your Tires?

No matter how good your tires—unless your springs are efficient—they *cannot* give you the maximum mileage of which they are capable.

Every time *you pay good money* for tires, and don't bring the springs of your car to working efficiency—*you lose* a big percentage of the mileage possible from them.

When a tire is obliged to do its own work, and that of the springs also—it can't last as long; it doesn't give as big mileage.

You pay too much per mile when your car springs are not working properly.

By installing DANN INSERT in the springs of your car, you bring the springs to *maximum efficiency*, and then *any tire* delivers far greater mileage.

There is *no guesswork* with

DANN INSERT
"The Lubricated Spring-Leaf Bearing"

Our dealers back DANN INSERT with a written guarantee for 1500 extra miles (over and above the guarantee of each respective tire maker) on any new standard make of tire, when the tire is used on a car equipped with DANN INSERT.

Thousands of cars are equipped with DANN INSERT, and each and every car so equipped is delivering maximum tire mileage to its owner, and saving real dollars for him.

"The saving on two tires pays the cost of DANN INSERT."

Name and address of our dealer nearest you, who offers the 1500 extra-mile tire guarantee, also complete detailed information, will be mailed you upon request.

Mail This Coupon Now!

DANN INSERT is standard equipment on the following cars:

Winton—Austin—Disbrow

THE DANN PRODUCTS CO.
1095 East 152nd Street, Cleveland, Ohio

"Demand DANN INSERT in the Car you Buy"

A. D. R. 4/17

The Dann Products Company
1095 E. 152nd St.
Cleveland, Ohio

Please send me complete information relative to the above, as pertains to my requirements.

I am a { Car Owner. Dealer. Manufacturer.

Car.....

Model..... *Year*.....

Name.....

Address.....

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They've got to be

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

or they're not genuine LEAK-PROOF and they wont give true LEAK-PROOF service



The ability of a piston ring to hold compression and keep back surplus oil depends upon getting even, equal face pressure all around the cylinder wall.

The only way to do this is by means of the McQuay-Norris LEAK-PROOF Piston Ring principle, the design of which consists of two sections, each one of equal size and strength, fitted into and around one another to form together a perfect concentric ring. This is the only construction which can give absolutely balanced tension to the entire circumference of the ring.

This is the exclusive design of the Genuine McQuay-Norris LEAK-PROOF Piston Ring. It cannot be copied. No attempted imitation can give the same results.

Study its construction. Identify it by this distinctive angle-to-angle interlocking of the two sections.

Send for FREE Booklet "To Have and to Hold Power"—the standard handbook on gas engine compression. It shows how power depends on piston rings and why McQuay-Norris LEAK-PROOF Piston Rings are more efficient than any others. Write Dept. R.

Manufactured by

McQuay-Norris Mfg. Co., St. Louis, U.S.A.

BRANCH OFFICES:

New York	Chicago	Philadelphia
Pittsburgh	San Francisco	Los Angeles
Cincinnati	Seattle	Kansas City
St. Paul	Atlanta	Denver
	Dallas	

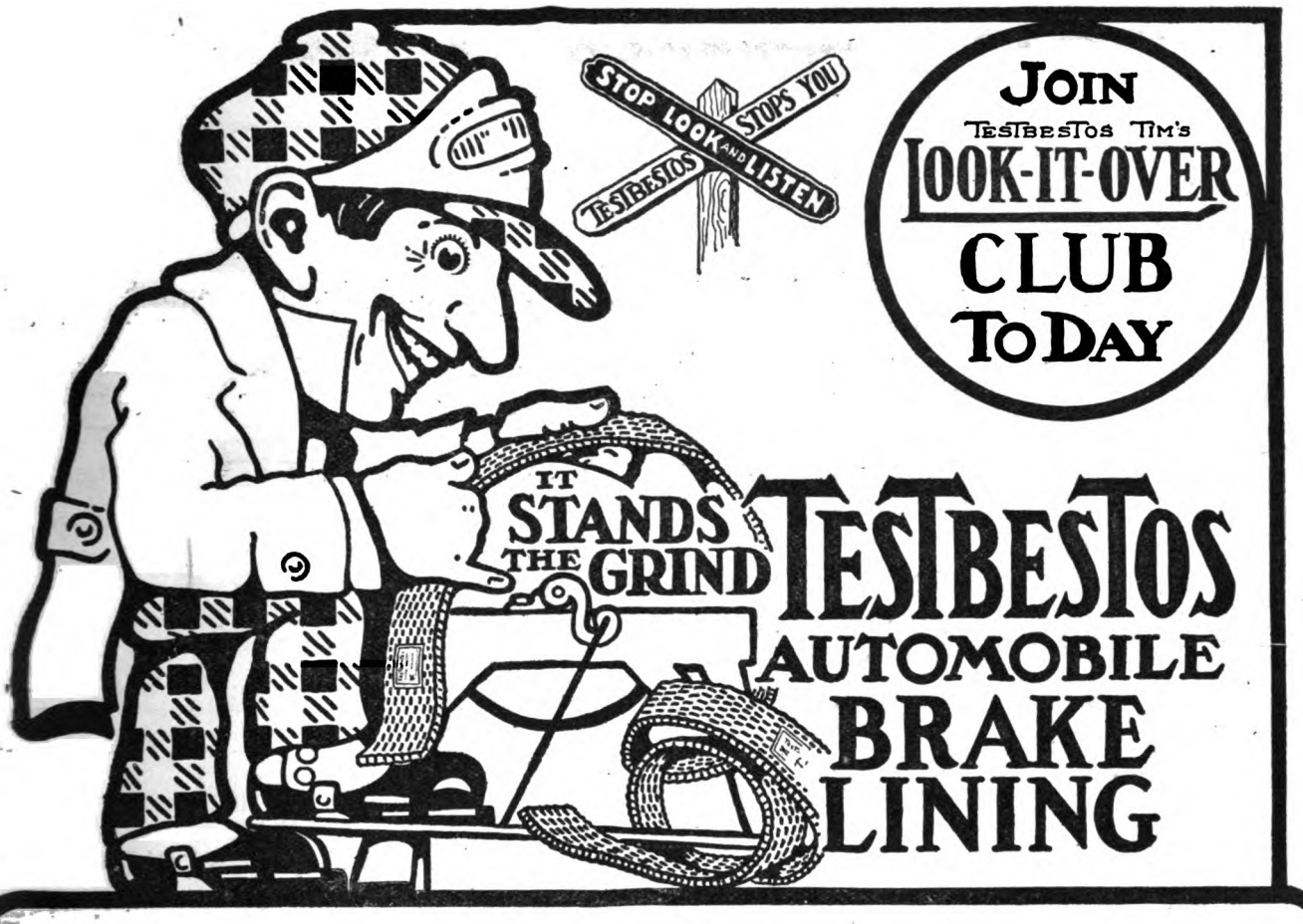
Canadian Factory: W. H. Banfield & Sons, Ltd., 372 Pape Ave., Toronto

And for Your Further Protection against Substitution

Genuine McQuay-Norris LEAK-PROOF Piston Rings are only put up in this special carton, under this copyrighted label. Each ring is separately wrapped in this sealed parchment container.



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Get ready for the big Spring drive!

HERE IS A MESSAGE FROM THE COMMANDER-IN-CHIEF:

"Notice my picture up above—I'm the happy chap at the grindstone. I am happy because I am the Grand Exalted Mogul of the Look-It-Over Club, a big money-making idea for the Modern and Honorable Order of Garage Men. I am just aching for a chance to tell you about it, so write me today. Just say, 'What's the big idea?'"

—TesTbesTos Tim.

TesTbesTos Tim is a real philanthropist—he helps you help yourself, and before the Big Spring Drive is over every garage man in the country will be organizing Look-It-Over Clubs. Get in at the start—write TesTbesTos Tim today.

AMERICAN ASBESTOS COMPANY, 1217 Stambridge Street, Norristown, Pa.

MANUFACTURERS OF

ASBESTOS YARNS, CLOTHS, THEATRE CURTAINS, TAPES,
PACKINGS, GASKETS, MULTIPLE DISC CLUTCH RINGS, Etc.

2-T

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SELLING *the* CHALMERS *is* SELLING BIG VALUE *at a* LOW PRICE

A factory building thousands of cars a year can offer greater value at a lower price than a factory of small output. This fact is brought home in the Chalmers.

A builder of experience can produce a better car than one who has been in the business for a short period. This fact, too, is proven in the Chalmers.

Big Difference Between Cars

Automobiles are like watches. Two watches may look alike. Yet one may be a Tiffany Swiss and the other a non-descript.

Some automobiles may resemble the Chalmers. Yet there may be vast differences.

Go Deep

If you are to get the correct idea of the Chalmers, you must go beneath the surface. There the big, important differences lie. Differences in materials. Differences in methods of building. Differences in quality of workmanship.

To look only at the exterior of the Chalmers you wouldn't discover that the gears and shafts of the transmission are of crucible nickel steel, case hardened and carefully heat treated.

Solid One-Piece Shaft

You wouldn't discover that the crankshaft is a single sturdy shaft of drop-forged heat-treated carbon steel, carefully balanced while rotating.

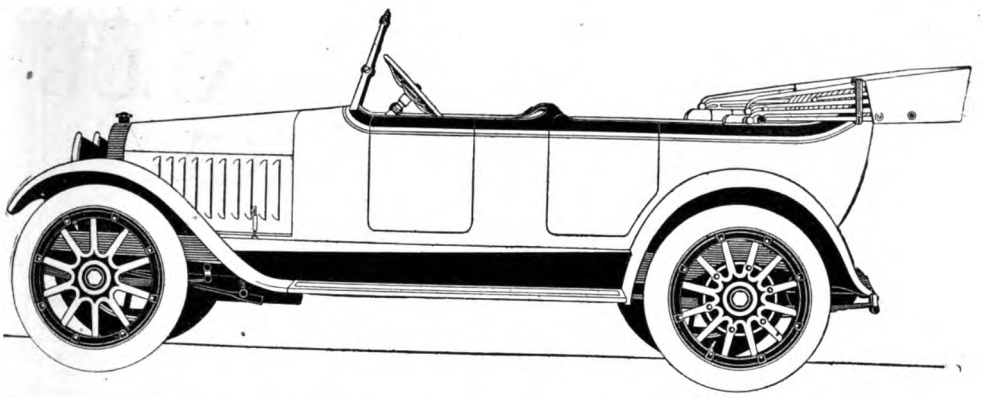
Nor would you discover that the Chalmers pistons are die cast from Lynite, a special aluminum alloy, and weigh only 12½ ounces each.

Deep-Lying Differences

To glance at the body you wouldn't realize that the body frame is built with such great care from select ash. That this is covered by one piece, welded sheet steel. Nor that under

CHALMERS MOTOR CO. Detroit, Mich. U.S.A.

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the genuine leather upholstery is high-grade curled hair and springs of extraordinary spring steel. Nor that the frame of the chassis is of carbon steel, 5 inches deep and ⅛ of an inch thick. With flanges 2½ inches wide. And with three strong cross members and reinforcing plates.

Be Deliberate

So when you examine the Chalmers don't look hastily. That's unfair to the car and unfair to yourself.

Some things you don't realize when you glance at the 7-Passenger Chalmers:

12½-ounce Lynite pistons.

Crankshaft balanced while in motion.

Cylinders and crank case cast in a unit.

Timken axles — built to Chalmers design.

Economical intake manifold.

Chrome nickel driving shaft.

Nickel steel differential gears heat-treated to secure hardness and toughness.

And many other important points of superiority.

All of the above means quality—the kind of quality you need in the car you sell, and the kind of quality you get in the Chalmers.

PRICES

Touring Car, 7-passenger	$1350	Roadster, 3-passenger	$1250
Touring Car, 5-passenger	1250	Limousine, 7-passenger	2550
Touring Sedan, 7-passenger	1850	Town Car, 7-passenger	2550

(All prices f. o. b. Detroit)

CHALMERS MOTOR COMPANY, DETROIT, MICHIGAN

CHALMERS · MOTOR · CO. Detroit, Mich. U.S.A.

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What Would You Think of a Manufacturer—

—who wrote to you with a stub pencil—"We are saving much money because we do not use typewriters and telephones."? You might well wonder whether his merchandise was as much out of date as his business methods.

You know that modern time and labor saving appliances are not added expenses, but that they have superseded slower and more costly processes.

The concern that uses your business paper to tell you its business story is simply making it easier for you to buy intelligently with the least waste of time on your part and theirs.

For the right kind of advertising shortens the distance between human minds just as certainly as the railroad has shortened the distance between places. It is still possible to walk from New York to Chicago, and it is still possible for a business to get along without advertising, BUT—

—don't forget that the seller who does not advertise, is not only paying for the results that such advertising would get him, but he is also *paying more than necessary.*

Progressive advisers are progressive merchandisers and it pays to do business with them.

THE ASSOCIATED BUSINESS PAPERS, INC.

The International Association of Trade, Technical and Class Publications

ALL OF WHICH HAVE SUBSCRIBED TO THE "STANDARDS OF PRACTICE"

Advertising & Selling
American Architect
American Exporter
American Hatter
American Machinist
American Paint & Oil Dealer
American Printer
American Blacksmith
Automobile, The
Automobile Dealer & Repairer
American School Board Journal
Architectural Record
Boot & Shoe Recorder
Brick & Clay Record
Buildings & Building Management
Bulletin of Pharmacy
Canadian Grocer
Canadian Railway & Marine World
Cement World
Clothier & Furnisher
Coal Age
Concrete
Domestic Engineering
Drygoodsman, The
Dry Goods Economist
Dry Goods Reporter
Editor & Publisher
Electrical Review & Western Electrician
Electrical World
Electric Railway Journal
Electric Traction
Engineering & Mining Journal
Engineering News-Record
Farm Machinery—Farm Power
Furniture Manufacturer & Artisan
Grand Rapids Furniture Record
Haberdasher, The
Hardware Age
Hide & Leather
Hotel Monthly
Illustrated Milliner
Implement Age
Industrial Arts Magazine
Inland Printer
Iron Age
International Trade
Lumber Trade Journal
Lumber World Review
Manufacturing Jeweler
Marine Engineering
Merchants Trade Journal
Metal Worker, Plumber & Steam Fitter
Metallurgical & Chemical Engineering
Modern Hospital
Motor Age
Motor World
National Builder
National Druggist
National Petroleum News
Power
Practical Engineer
Railway Age Gazette
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Shoe & Leather Reporter
Shoe Findings
Shoe Retailer
Tea & Coffee Trade Journal
Textile World Journal
Transfer & Storage
Woodworker

HEADQUARTERS: 220 West 42nd Street, NEW YORK CITY

Information concerning Business Papers cheerfully supplied.

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BENFORD'S

Distinguished by its Coat of Gold



Ten Million People are Reading about this Plug—

BENFORD is now spending $150,000 in a Sales and Advertising Campaign that hammers home the Benford Golden Giant message to every motorist in the country.

All through this Spring, full pages in the SATURDAY EVENING POST and other big national publications will be keeping Benford quality, Benford spark plug success and the remarkable Benford guarantee before the motoring public.

It is sound business for *you* to be ready with the Spark Plug these motorists will want—the Plug you know will give them the right service.

Get *your* share of the new customers and sure "repeat" business that the Golden Giant is creating for many thousands of progressive dealers.

Concentrate on Golden Giant—increase your spark plug sales and profits. Hitch up to the Golden Giant's success!—it means *your* success.

Is your stock ready?

BENFORD MFG. CO.
MT. VERNON, N. Y.

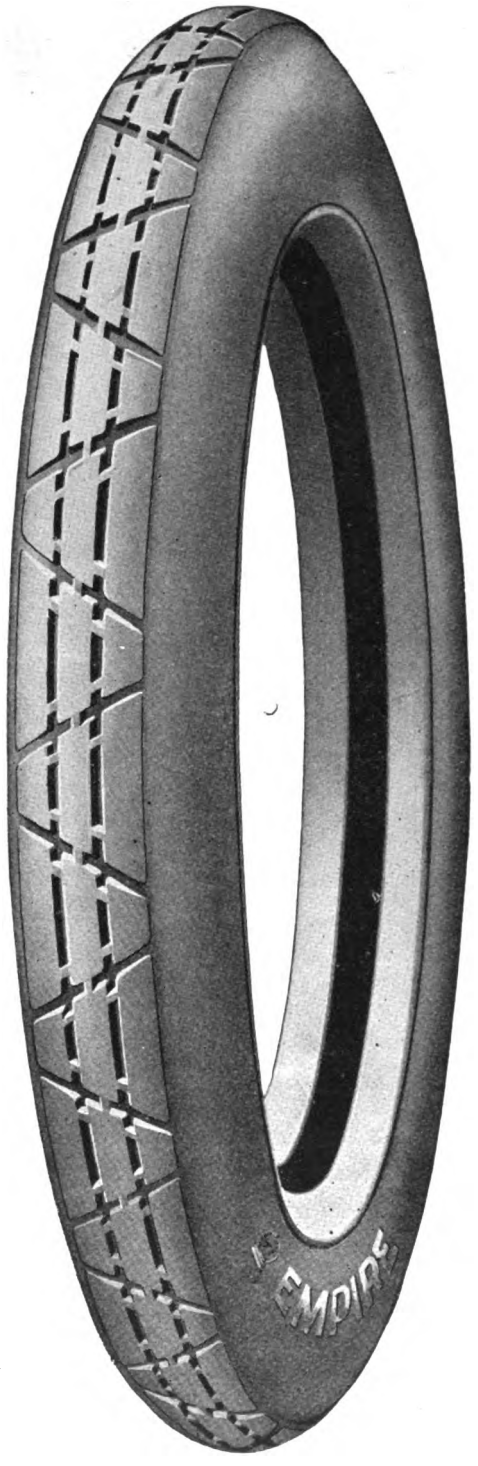
"Fifteen Years of Spark Plug Success"

THE ARISTOCRAT OF SPARK PLUGS



GOLDEN GIANT

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Extra Profits Extra Miles

There are two things in which you as a tire dealer are interested above all others—profits and satisfied customers.

You can get better profit on an Empire Tire than on any other tire in its class.

You can promise your customers lower mileage cost from an Empire Tire.

We make these two statements deliberately, and will back them up.

Empire Tires

are priced to you on a basis that gives you an extra long profit.

And they mean satisfied customers because

5000 miles is the adjustment basis on Empire Red Tires.

4000 miles is the adjustment basis on Empire Gray Tires.

Furthermore, we are advertising them persistently.

All this makes it worth money to be the Empire man in your locality.

Write or wire us today for our unusual proposition.

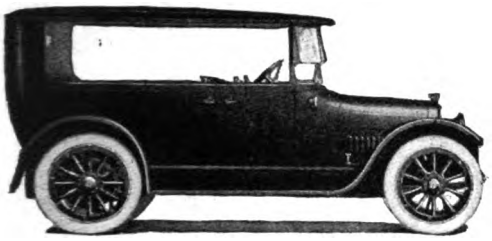
EMPIRE RUBBER AND TIRE COMPANY

Home Office and Factory, Trenton, N. J.

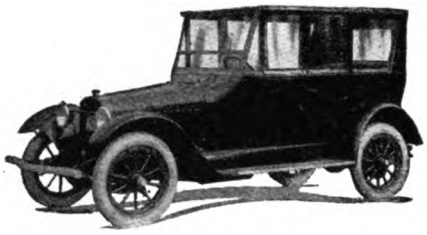
BRANCHES AND AGENCIES:

New York City	Philadelphia	Pittsburgh	Los Angelcs	Minneapolis
Boston	Buffalo	Chicago	Detroit	Newark

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THE CADILLAC CONVERTIBLE TOURING CAR



THE CHAMLERS CONVERTIBLE SEDAN

Royalty Once Rode in a Coach

Royalty and Success now ride in motor cars.

The Master Coach-builders' Craft was for centuries an art. The building of fine motor-car bodies, possessing all the perfection of handiwork of the veteran coach-builder, with modern materials and labor-saving machinery, is one of the great modern industries handsomely exemplified in

FISHER BODIES

A great army, including royalty and hundreds of thousands of the successful of the world, ride in the Fisher Bodies supplied for many of the best and most popular motor cars—375,000 cars a year!

It was natural, perhaps almost inevitable, that the Fisher Body Corporation, preserving the traditions of the old coach-builders' craft, building bodies of beauty, strength and durability, should continue one of the strongest of the coach-builders' ideals as to the proper finish of its bodies. The Fisher people use vast quantities of

Valentine's Varnishes

And other painting materials. Just as *all the finest of the old coaches* were painted and varnished with Valentine's Materials for all the royalty of Europe, and all the luxury- and refinement-loving people of America.

The garage paint-shop which studies successful modern methods will make no mistake if it also follows the lead of the old carriage-builders in the use of Valentine's painting materials. There is economy and there is the satisfaction of beautiful, durable results in their use.

Send for our book, "*Automobile Painting Systems.*"

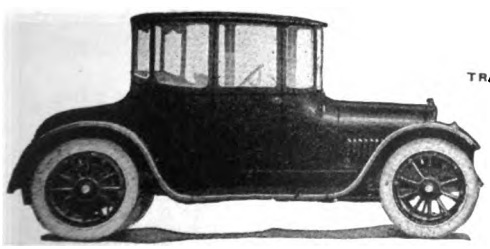
VALENTINE & COMPANY

Established 1832

Manufacturers of High-grade Varnishes and Colors

456 Fourth Avenue — **New York**

343 So. Dearborn Street, Chicago — **74 Pearl Street, Boston**



THE CADILLAC COUPE

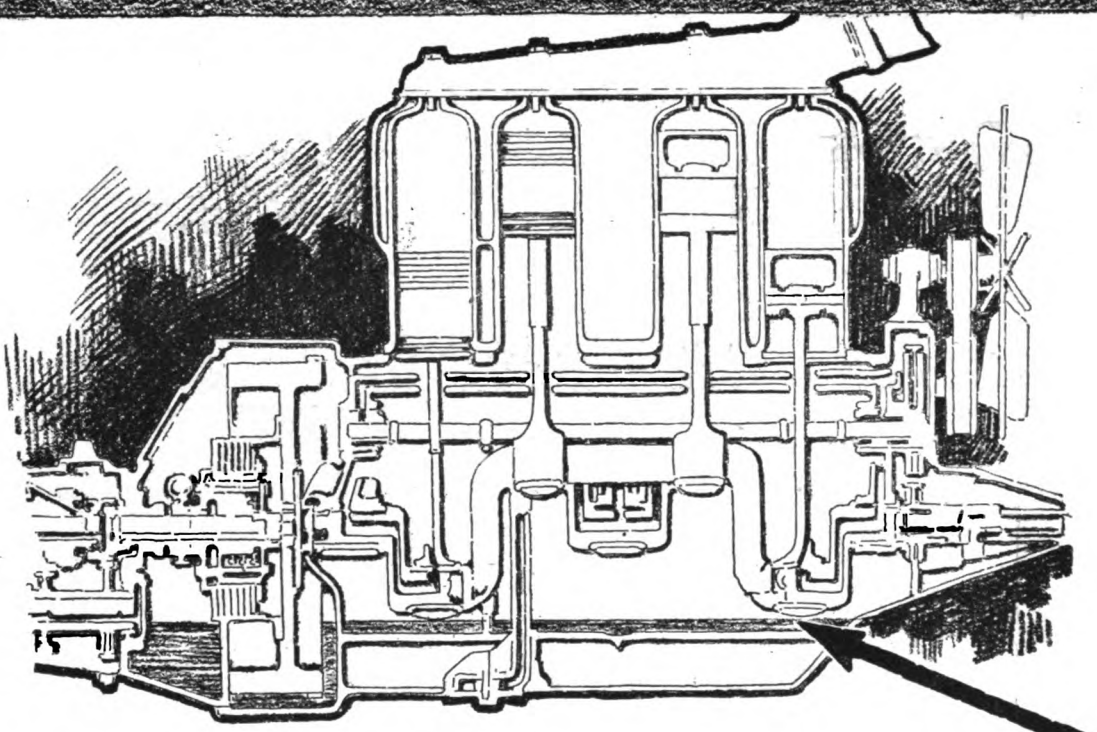
TRADE VALENTINES VARNISHES MARK



THE BUICK COUPE

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The Proper oil at the proper level

TEXACO MOTOR OIL

You can tell it by its clear, clean color.

YOU have seen cars trailing clouds of black, dirty smoke behind them. That smoke, as you know, is caused by too much oil.

Such a condition is wasteful and destructive. It is destructive because no matter how good the oil is, if fed rapidly, it will work past the piston rings, and because of the excess oil, only partial combustion is possible and carbon deposits will ensue.

Some oils will deposit hard, gritty matter. This clogs up the motor, sticks to the spark plug, causes missing and back-firing, and scores the piston rings and cylinder walls.

However, there are several oils which will not deposit hard carbon. With these the products of incomplete combustion are soft, fluffy and non-adhesive. They are blown off with the exhaust.

Such an oil is Texaco Motor Oil. Use it properly, keep it at the proper level in your crank case—inspect the indicator and be sure that it is in good order—and you will find it the proper oil to use under all conditions.

There are reasons—Texaco Motor Oil, on account of its basic qualities, cannot deposit a hard carbon crust. When too much Texaco Motor Oil is fed, the worst it can do is to form a soft soot which will not scratch or cut and which may be easily wiped off.

Texaco Motor Oil lubricates perfectly, keeping friction at a minimum. It gives a perfect seal between piston and cylinder walls thus preventing leakage of gasoline into the crank case. It maintains its original body and quality in use.

Texaco Motor Oil may be obtained at most good garages. The safest way, the best way, to buy is in one or five gallon cans.

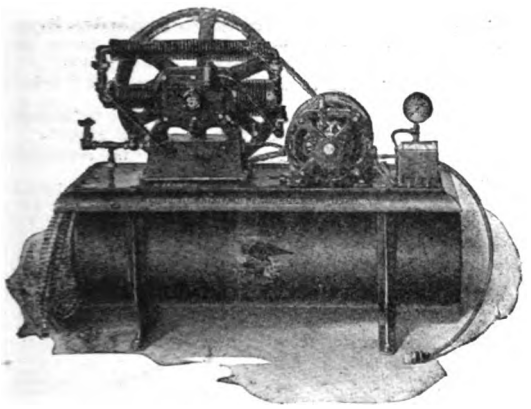
THE TEXAS COMPANY
New York Chicago Houston
DISTRIBUTING OFFICES IN MOST CITIES

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U·S· TWO-STAGE AIR COMPRESSOR U·S·

Select Your Air Compressor with the Same Care You'd Buy a Motor Car and It Will Be a

United States *Two Stage* DeLuxe Outfit



H-34 DeLuxe Automatic Air Unit

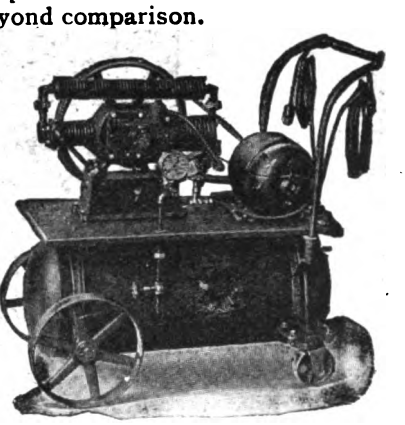
THESE days, when garages almost invariably experience mushroom growth requiring frequent replacement of equipment and enlargement of facilities, the buying of an air compressor is a subject demanding very serious consideration.

Wisdom requires that the garageman study the machine he considers buying with the same thoroughness he would apply to a motor truck or motor car. He should demand design which assures long life, quietness of operation, neatness of appearance, high pressure and capacity for the greatest possible demands.

The United States Two Stage Air Compressor is this kind of machine. The deeper it is investigated the more strongly one is impressed with the distinctiveness and superiority of its construction. Among these features is embodied every advantage found in other high grade compressors and several exclusive features which make its value beyond comparison.

One of the 14 improvements is the **Two Stage Feature,** which permits compressor to maintain higher efficiency with less mechanical effort and contributes to the quietness and long life of the outfit. Another and vitally important advantage is the **Intermediate Starting Tank,** which permits the compressor to start against no pressure, thereby eliminating the cause of burned-out motors. Still another is a device which furnishes **air absolutely free from oil.**

Everyone interested in garages or service stations should send for our catalog and circular, which describes in the clearest possible manner the 14 superior and exclusive features of the unequalled machine.

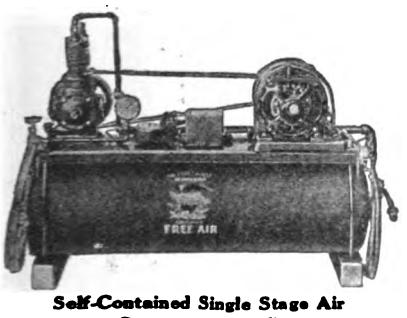


A Portable Two Stage Outfit

United States *Single Stage* Air Outfits

TO meet the demand for smaller outfits, of lower pressure than our Two Stage Compressors, we have developed a line of single stage compressors.

These outfits do not contain all the features of our Two Stage Air Compressors, but conform to the high standard of quality of material and workmanship adhered to in all United States Products.



Self-Contained Single Stage Air Compressor Outfit

We recommend them as the most efficient single stage compressors on the market. A circular is published showing this complete line, which COMPRISES A COMPRESSOR FOR EVERY GARAGE, REGARDLESS OF SIZE.

Jobbers Wanted

We are desirous of hearing from Jobbers, in position to push this line, to whom we can make an attractive proposition.

United States Air Compressor Co.
Cleveland, Ohio

Gentlemen:—Send me your Catalog and Circular describing the Compressor, as advertised in A. D. & R.

NAME .....

ADDRESS .....

CITY .....

MY JOBBER IS .....

U·S· THE UNITED STATES AIR COMPRESSOR CO U·S·

CARNEGIE AVE. CLEVELAND, OHIO.

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New York Coil Co. New York Coil Co. New York Coil Co.

FOOLS FORD THIEVES EVERY TIME

PRICE

THE NEW YORK

"SECURITY" SWITCH LOCK $3





"THIS BEATS ME"

An absolutely different—and better—device.

It is a heavily nickeled steel plate with a thief-proof barrel lock impossible to pick.

Readily attached in a few moments by merely removing the present name plate and fitting the "**SECURITY**" **SWITCH LOCK** in its place—only three screws needed to install it.

Just one turn of the key and metal bars entirely cover the screws, securely locking ignition and protecting screws.

The slickest car thief can't remove, short-circuit or "beat" switch.

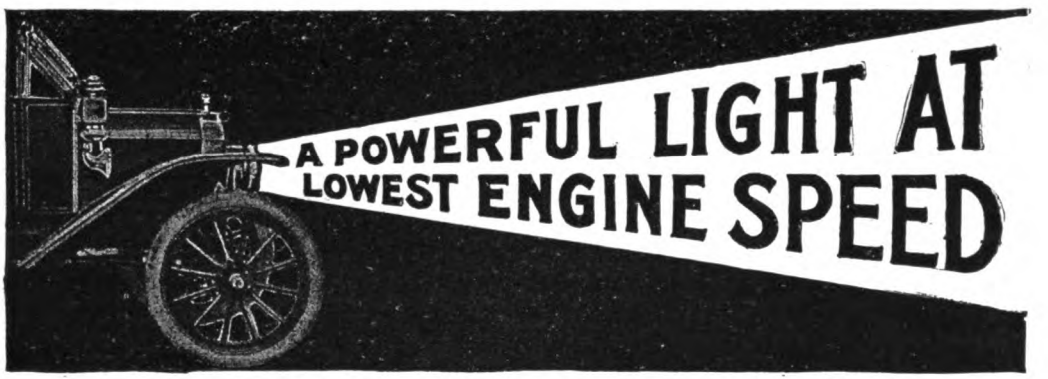
Remember, too, that Ford switch wires and attaching bolts need not be disturbed—can remain exactly as originally placed.

Not the slightest chance of wrong connections—no replacing of screws, bolts, etc.

Entirely avoids the troubles which so often annoy when a complete new **alleged** lock switch is installed—loose connections, bad contacts, etc., unknown with the "**SECURITY**" **SWITCH LOCK.**

There's but one real Switch Lock—it bears the **name "NEW YORK COIL COMPANY"** on barrel of lock. **Avoid and refuse all "just as good" substitutes.** Unconditionally guaranteed.

FORD CARS CAN NOW HAVE



A splendid light at medium or high speeds, and an instantly operated dimmer for any speeds by using the NEW YORK "SENIOR" HEAD LIGHT CONTROLLER—PRICE $5.00.

BOTH lights **ALWAYS** lit.

At 10 miles per hour, Controller supplies a better light than you now get at 20.

OPERATES ENTIRELY AUTOMATIC—without attention of the driver. The only instrument using the regular Ford bulbs, wiring and switch, that **CANNOT** harm Magneto or affect ignition or horn.



IT ALSO CONTAINS A DIMMER, which is operated by a rod running through dash—a touch and you can dim in passing other cars, or in City driving, to comply with traffic regulations.

YOU KNOW the necessity of good lights especially at crossroads and other dangerous places. There is but one solution—**THE NEW YORK CONTROLLER.** It is a well-made, scientific, trouble-proof device, not a "choke" coil "transformer" or other makeshift, but is **strictly guaranteed** to do just what we claim.

$5.00 complete—You can install it in ten minutes. Send Post Office Money Order now, and have lights equal to those on the big cars.

WE ALSO SUPPLY OUR "JUNIOR" MODEL WHICH DOES NOT HAVE DIMMING ATTACHMENT, OPERATES IN THE SAME MANNER, BUT CUTS OUT RIGHT-HAND LAMP AT LOW SPEEDS, PRICE $1.75.

NEW YORK COIL CO., 338-340 Pearl Street, New York, N. Y.

GRAY-HEATH COMPANY, *Mid-West Distributors,* 1440 Michigan Ave., Chicago, Ill.

New York Coil Co. New York Coil Co. New York Coil Co.

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New York Coil Co.

A BIG HOT SPARK IS WHAT YOUR FORD ENGINE NEEDS

After all, of what use are tight valves. high compression rings, good carburetors, etc., unless your ignition is **absolutely perfect?** Our high tension Distributor Ignitition is the same type adapted and used by almost every car in the United States today. We supply Ford car owners two types. **The Rhoades' Battery Ignition**—for use with battery only (6 dry cells supply ignition for 2000 to 3000 miles), price $20.00, and the **Uni-Coil Ignition System** which is operated from the **Ford flywheel magento**—Price $15.00—Both distribute current to the spark plugs from but **ONE** coil by means of the **high tension distributor system** —The only method that insures perfect timing, uniform spark, and complete firing of any grade of gasoline. By eliminating the Timer and all difficulty of adjusting Vibrator cells, **your car is transformed into the big car class. Ignition troubles are forever ended.** Perfect ignition means easy starting, more power, greater flexibility and better all around efficiency. We supply each outfit complete, cables, wire, cable carrying tube, all connected up, ready for use, with diagram and instructions, so plain and easily followed up that you cannot fail to successfully install—no machine work—A pliers and screwdriver are the only tools required. **Thousands of these Systems in use for six years,** insures you against an experimental, untried product.







NEW YORK COIL CO., 338-340 Pearl Street, New York, N. Y.

GRAY-HEATH COMPANY, *Mid-West Distributors*, 1440 Michigan Ave., Chicago, Ill.

New York Coil Co. New York Coil Co.

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Master Calorite Spark Plug. Regular Length, $1.00 each.

A Distinctive PLUG

MASTER CALORITE SPARK PLUGS

DISTINCTIVE—BECAUSE—

—Adopted for the entire requirements of the U. S. Post Office Department—
—Improved in design—yet retaining every quality characteristic which has made them nationally famous and popular.
—The Master Calorite Insulator is ultra sturdy.

Master Calorite Spark Plugs will endure not only the severest requirements of legitimate service—But also anticipate the possibility of mechanical carelessness.

And Because—

our plans for 1917 are designed to assist jobbers and dealers to the utmost. **You can take pride** in unreservedly recommending **Master Calorite Spark Plugs** to your customers as we do to you—

Because—

Every user is protected thus—

"We guarantee Master Calorite Spark Plugs against all defects of material or workmanship and will replace free of charge any Calorite Insulators broken by heat which are returned to us transportation prepaid."

The Master line provides a plug for every style and type of engine—Six styles—Half-Inch Regular, ⅞" Regular, Metric, ⅞" Long, Half-Inch Long, Model "F" for Fords and Reos.

The New Master Calorite Spark Plug Display Stand is ready—It is a silent salesman—placed on the window or on the show case.

It will pay you to handle Master Calorites this year—The already heavy demand **is rapidly increasing**—Do you want your share?—

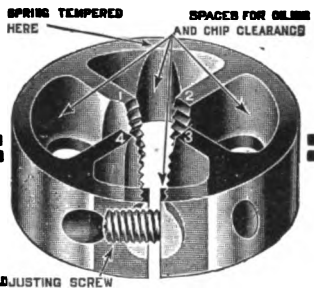
Write us *now* for full particulars, prices and our proposition to jobbers and dealers.

MASTER CALORITE SPARK PLUGS Made in U. S. A.

Manufactured and Guaranteed by

HARTFORD MACHINE SCREW COMPANY

514 CAPITOL AVENUE, HARTFORD, CONN.



THE O. K. DIE—Patented Dec. 31, 1912.

O. K. Dies and Screw Plates

Are designed to secure great strength with minimum weight. They are hammered from flat bar steel and subjected to our special hardening treatment which insures exceptional toughness and durability.

Plenty of room for oiling and chip clearance insures smooth accurate threads and ease in operation

O. K. Screw Plates are the result of forty years practical experience in making Thread Cutting Tools.

The Adjustable Guide Jaws used in these plates can be easily set by turning the cam plate to fit any size iron, thus eliminating the changing of bushings.

The Tap Wrenches are strong and durable, made from Drop Forgings of our own manufacture.

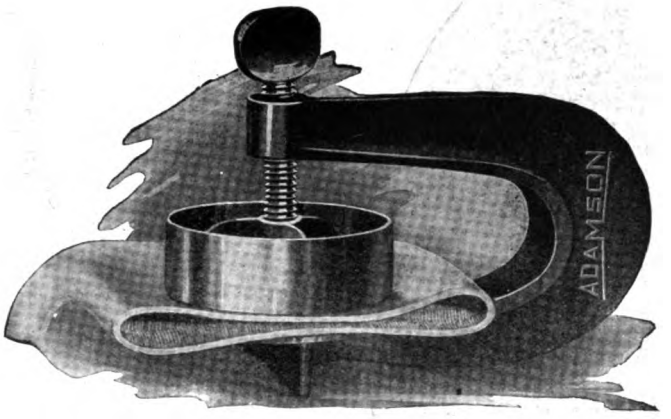
F. E. WELLS & SON CO.

GREENFIELD MASS., U. S. A.

F. E. WELLS & SON COMPANY — Wells — GREENFIELD, MASS. U.S.A.

Catalog 7-A for full details.

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ANNOUNCING THE NEW

ADAMSON

5-MINUTE VULCANIZER

MODEL E

Meets the demand for a light and handy outfit for the quick repair of tube punctures.

Uses common gasoline—the most convenient and dependable fuel. Will vulcanize your tubes **anywhere** in five minutes.

Designed on the same proven principles that have made **ADAMSON** Vulcanizers the most practical and largest selling line in the world.

Sells complete with box of a dozen "Adamson" 5-minute Repair Gum patches, for $1.50. Extra box of 12 patches only 25c each.

DEALERS!

This outfit will be a tremendous seller —
Order now from your Jobber.



For larger tube injuries, tire and tube blow-outs, tread cuts, etc., the old reliable "Adamson" line is complete with several models for car owner and garage use.

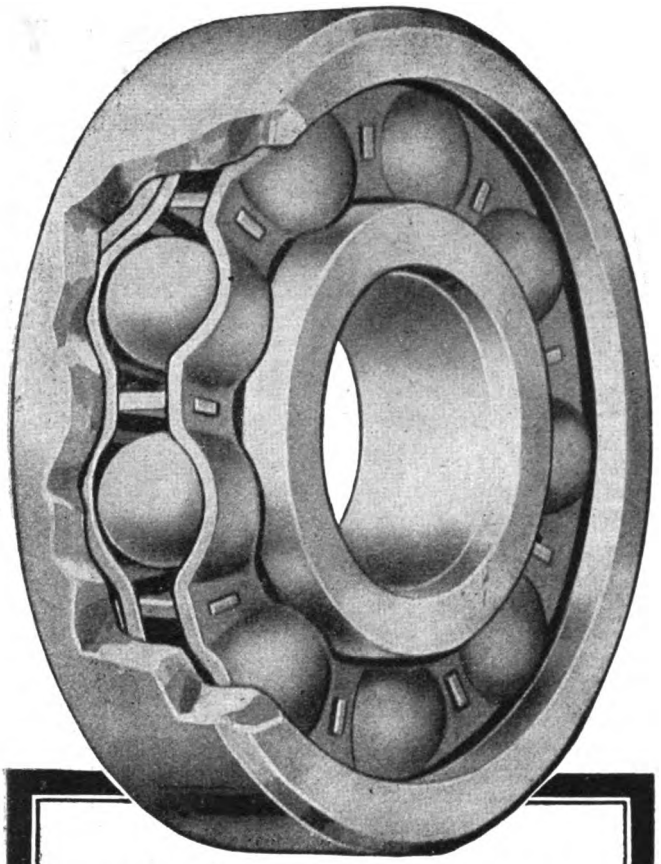
"Adamson" Repair Gum is essential for best results. Its exclusive qualities and advantages are a guarantee against failure.

Sold by All Jobbers

ADAMSON MANUFACTURING CO.

EAST PALESTINE, OHIO

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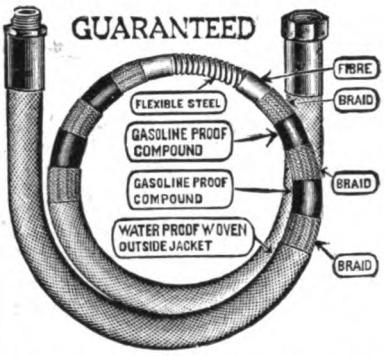


THE NEW DEPARTURE may not be the only ball bearing which gives satisfactory service in the highest types of automobiles, but there is a reason why **more** New Departure ball bearings than any other are used in American motor cars.

The reason why the demands for New Departures have persistently increased, so that this company is the largest manufacturer of ball bearings in the whole world, can be summed up in one word—quality.

THE NEW DEPARTURE MFG. CO.
Conrad Patent Licensee
BRISTOL, CONN. FORD BLDG., DETROIT

NEW DEPARTURE BALL BEARINGS



GASOLINE FILLING STATIONS ATTENTION

EQUIP your pump with EVERLASTING GASOLINE HOSE, and stop that leak. In purchasing Everlasting Hose you get guaranteed service and satisfaction. Note the illustration! See the steel core covered with two plys of gasoline proof compound protected by a heavy woven cotton jacket. The genuine EVERLASTING has one year guarantee tag attached. Ask for EVERLASTING, not just gasoline hose.

Made in two sizes, ¾ and 1¼ inch.
Sold in standard lengths, by all jobbers.

CHICAGO TUBING & BRAIDING CO.
CHICAGO, ILL.

Stop Carbon

it wastes power and money



Pat. Mar. 2, 1915, Feb. 29, 1916.

Pressure Proof Piston Rings

permanently prevent oil leakage
(the cause of all carbon)

Their construction is so mechanically perfect that oil cannot leak by the piston. One ring to a piston is usually sufficient. If the cylinder is badly worn two may be used. More are unnecessary.

Install these rings now and you will increase the power of your motor, eliminate carbon and cut your oil and gasoline cost—not for a limited time only, but permanently.

"New Facts About Piston Rings"
tells you about this super-piston ring.
IT'S FREE TO YOU.

PRESSURE PROOF PISTON RING COMPANY
167 Massachusetts Avenue Boston, Mass.

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A BIG tire for a big load. That is the "why" of Firestone Giant Truck Tires.

Extra wear, greater traction, smoother riding qualities, protection to truck and comfort for driver. These are the features that distinguish Firestone Giant Tires. You need these features. Call in the Firestone Transportation Specialist.

FIRESTONE TIRE AND RUBBER CO., AKRON, O.
Branches and Dealers Everywhere

The Business World Rides Best On

Firestone
TRUCK TIRES

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The New 1917
Reversed Action
JOHNSON
Shock Absorber
For Semi-Elipptic Type of Spring

The following 1917 models have semi-elipptic spring:

Abbott 6—44	Hupmobile
Allen	Liberty 6
Ben Hur	McFarlane
Bour-Davis	Marion Handley
Chalmers	Mercer
Chandler	Moon
Cole	Oakland
Daniels 8	Owen Magnetic
Elcar	Rauch & Lang
Franklin	Ross 8
Hal	Standard 8
Hudson Super 6	Stephens 6
	White



The only coil spring type shock absorber which can be successfully and directly applied to to the semi-elipptic type of spring without the use of special attachments. There is a style for three-quarter elipptic and platform types of spring, also without the use of special attachments.

The Only Coil Spring Shock Absorber With a Recoil Check

When a Johnson Shock Absorber is installed on your car, the spring shackles are removed, which usually consist of a bar of steel, averaging from one to two inches in length. When that bar is taken out for Johnson's Shock Absorbers it is replaced by 115 inches of highly tempered coil steel. That's why a Johnson equipped car rides so easy.

10 Days' Free Trial

If we have no nearby service station, you can install them yourself easily by following our directions. Drive your car 10 days, and if you are not entirely satisfied with the way the Johnsons perform return them. We will refund your money.

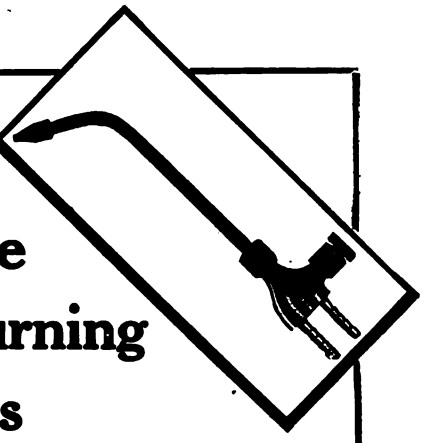
Your Guarantee

We guarantee every set of Johnson Shock Absorbers both as to quality and material, and against breakage for one year from any cause except collision.

Triple Action Spring Co

55-57-59-61-63-65-67 East 28th Street, Chicago

No More Lead-burning Troubles



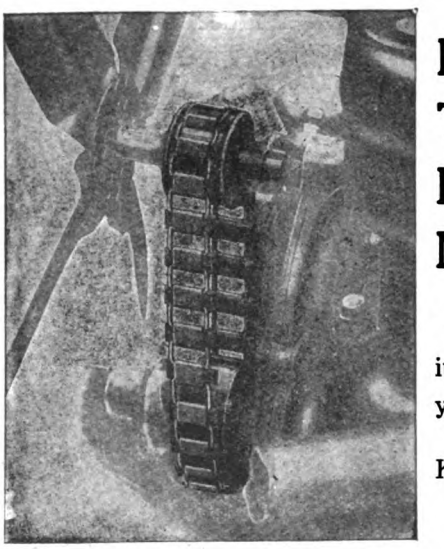
Burning storage battery plates is an easy proposition with the IMPERIAL LEAD-BURNING OUTFIT. You can also do custom lead burning of all kinds at a profit. The point of advantage lies in the fine needle-point flame secured. Easily manipulated and just right for the purpose. Uses either acetylene and oxygen, oxygen and hydrogen, hydrogen and compressed air, or illuminating gas and oxygen, whichever is the most available. It is an inexpensive outfit and a great little helper around the shop. Does light welding.

We also manufacture the well-know Imperial Oxy-Acetylene Welding and Cutting Equipment, which welds anything in metal and cuts anything in wrought iron or steel.

Send for Full Particulars and Prices

Imperial Brass Mfg. Co.

520 So. Racine Avenue :-: Chicago, Ill.



PITY THE POOR MOTOR!

Remember that it works while you ride.

KEEP IT COOL WITH A

CROWE MECHANICAL FAN BELT

Leather Tread, Chain background.
Strong, silent, durable, easily installed or adjusted.

For Sale by most Auto Accessory Dealers.

Regular Ford Size, 24 inch }
1917 Ford Size, 27 inch } *$1.00 each.*

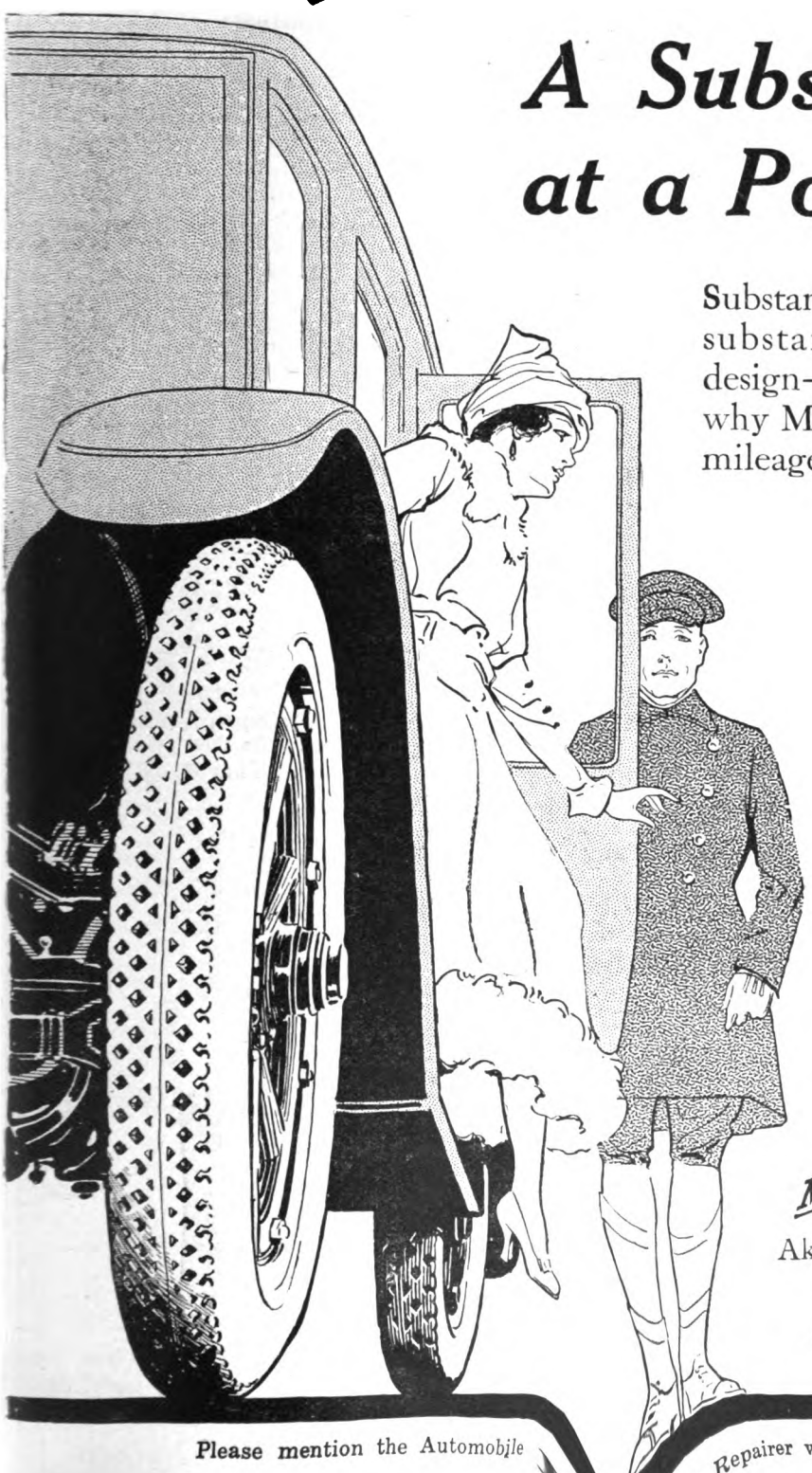
MECHANICAL BELT CO.

1202 Frederick Avenue, St. Joseph, Mo.

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MASON MEANS MORE MILEAGE



A Substantial Tire at a Popular Price

Substantial quality in raw materials; substantial workmanship, sensible design—these are the simple reasons why MASON is really "meaning more mileage" for car owners.

And MASON is sold at popular prices. Is it any wonder that the MASON factory is already overtaxed to meet dealers' demands for this substantial tire?

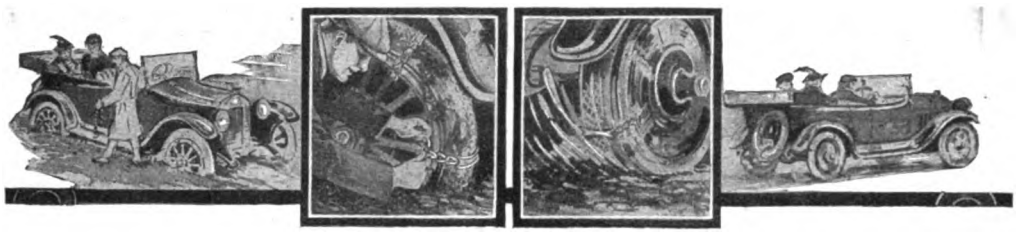
MASON has established itself in the automobile world in remarkably short time. Sturdy MASON quality and the frank MASON dealer proposition are making us hosts of friends in the trade.

Are you acquainted with this MASON plan? Some few distributing territories are still open.

MASON Tire and Rubber Co.
Factory, Kent, Ohio
Akron suburb

Direct Factory Branches in Kansas City—Cleveland—New York

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In Ag'in—Out Ag'in—Gone Ag'in

Easyon Chains really solve the safety-first problem—and solve it simply and easily. Can be carried on tires like ordinary chains, to prevent accidents on slippery streets. Better than any other chains in an emergency because they can be put on in a moment. No matter how deep the mud-hole, ***Easyons*** fit right on the wheels—*and they get the car out.*

Easyon Chains

"On or off in a Moment"

"Grip like a Mud Hook—
Ride like a Bare Tire."

Easyons are the latest idea in tire chains because—first, they are so easy to put on or take off—and second, they serve a double purpose—as skid-preventers and mud-hooks.

Packed in a small bag—8 to a set—four for each rear wheel.

MADE IN THREE SIZES:

Size 3½ fits 3" or 3½" tires	**$3.00** per set
Size 4½ fits 4" or 4½" tires	**$4.00** per set
Size 5½ fits 5" or 5½" tires	**$5.00** per set

Easyons are the chains the motorist has been waiting for—the simple, dependable chains that do not interfere with easy riding. ***Easyons*** don't bump on pavements because the middle link lies smooth on the tire. They won't mar paint on spokes or rims.

We also make Truck Chains for Solid Tires

WOODWORTH MANUFACTURING CORPORATION

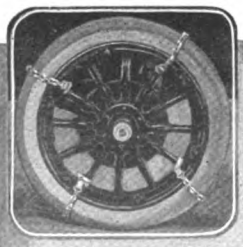
(Successors to LEATHER TIRE GOODS CO., Est. 1905)

2000 Whirlpool Street, Niagara Falls, New York

CANADIAN FACTORY:
Niagara Falls,
Ontario

NEW YORK DISTRIBUTORS:
Rose Auto Supply Co.
1765 Broadway

CHICAGO DISTRIBUTORS:
George B. Carpenter & Co.
436 Wells Street



DEALERS:

The demand for these chains is big. It is being encouraged by our advertising campaign. A glance at the recent issues of the Saturday Evening Post, Country Gentleman, Literary Digest, Farm Publications and Motor Publications will convince you of the importance of the publicity ***Easyon*** Chains are getting.

If you are interested in sales, fill out coupon opposite. We'll send booklet and quantity prices.

DEALER COUPON

Woodworth Manufacturing Corporation
2000 Whirlpool Street,
Niagara Falls, N. Y.

Gentlemen:
Please mail me literature regarding ***Easyon*** Chains, together with a quotation of your Quantity Prices.

Name.....

.....

.....

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

Registered in the U. S. Patent Office

VOL. XXIII, No. 2. NEW YORK, APRIL, 1917. PRICE { 10c PER COPY $1.00 PER YEAR

SHORT CUTS.

Quick and Labor-Saving Ways of Doing Repair Work.

From J. N. Bagley, Nebraska.—In many shops there are a number of short cuts in repairs used by the workmen that saves much time, and if these workmen would take the time to send the little kinks to some good repair journal they would be welcome. In making my calls about the State I find many little kinks used and many times I have asked why they were not sent to some publication, but the reply was that they did not figure them worth space. This, however, is a mistaken idea, for all such information is valuable. Every reader of this journal some time or other has been helped with some little kink that a brother mechanic has taken time to send in, and he well might give something in return.

There is a class of mechanics who are sort of inventors. What I mean by this is that when a difficult job comes in they set to work to figure out some short cut method to do it quicker and better, and then on the other hand we have the fellow who goes about it in the hardest possible manner. "Necessity is the mother of invention"; this is as true in the repair shop as anywhere else.

One of the annoying things when working at the bench is to have the handle of the vise keep slipping back and forth with its own weight, especially if the hands of the operator are trying to close the vise and at the same time hold the work in position to clamp. To overcome this little trouble is very

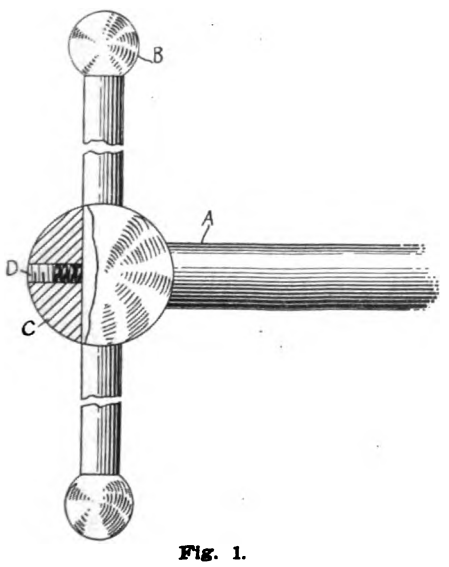


Fig. 1.

simple, and done in the following manner: the bolt from the vise as shown in Fig. 1, at remove the knob from the end of the cross shown at B. Now drill a hole into the head of the bolt or screw, and thread it in for say, ⅜ of an inch. Fit a screw flush at the head. Make a small compression spring that will slip into the hole and just about come flush before the screw is placed in position. Assemble the entire device as before, place the spring in the hole and screw in against it. The pressure on the sliding bolt will keep it in any position it is wanted.

In Fig. 2 we have a simple mandrel that can be used about the shop to a very good advantage in turning small pieces of tubing on the lathe as well as turning and grinding the wrist pins for the motor in case of overhauling the motor and oversized pins are to be placed to make a tight fit. It

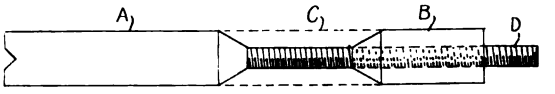


Fig. 2.

consists of a piece of shaft one end being turned down as shown in diagram, leading the other end as shown at A. The end that is turned to the desired size must be threaded as shown at D. Now take the second piece of shaft and turn and bore it as shown at B until it will screw over the threaded end of the shaft A, after which both ends should be tapered sufficiently to handle any tubing from the size of the bolt D, to the size of the stock of which the device is made. To use the tool it is but necessary to remove the adjustable end B, and slip the tubing on to the mandrel and adjust the end until the tubing is held firm. Now place the entire make-up between the centers of the lathe and work can be done as desired.

Another kink that does not particularly apply to the repair shop can many times be used to good advantage. A rubber boot may leak and still the leak may be hard to find without filling with water, which plan is not good because of slow process of drying it out afterward. Take a small tin bucket that will fit very well in the top of the boot A, Fig. 3, as shown, and into it solder a valve from either an automobile or bicycle tire, as shown at C. Now slip this upside down into the top of the boot and tie a band securely around the top of the boot as shown at D. Then pump air into the boot and submerge it in water as you would the inner tube to find a leak. The bubbles will appear where the leaks are and they can be repaired in the usual way. In case the boot is wet inside and cannot be dried easily, I have found a very good plan as follows: Take a sufficient quantity of oats to fill the boot and place them in the oven and get them quite hot after which place them in the boot and allow them to remain for some time, and the oats will take the moisture out of the boots so they can be worn.

In Fig. 4, we have an essential tool for grinding

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in the valve cages of the overhead valve motors such as the Buick, etc. These cages should be ground into the head of the cylinder just the same as the valve into the cage, for if they are not, there will be a leak around the cage and a loss of compression. This tool can be made easily and quickly from scraps about the shop. Take a small rod, say ⅜ inch, and bend one end of it in the shape of a brace as shown at A, and on the end place a head that revolves to allow of the hand to hold it steady while the operation is going on. Now thread the

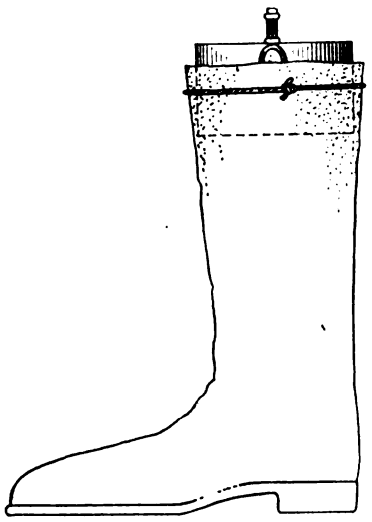


Fig. 3.

other end as shown at B, and place a nut or collar as shown at C, to make a stop for the cage when it is pressed against it with the locking nut D. Place the cage on the threaded end and tighten the nut D, sufficiently to hold the cage from turning and grind it into place just as you would grind the valve into the cage. Care should be taken that the emery used for grinding does not find its way down into the cylinder or it will play havoc with the rings and the walls of the cylinder of the motor.

To remove the nuts that are stuck, without damaging them, or the bolt on which they are screwed, is many times annoying or difficult. When some-

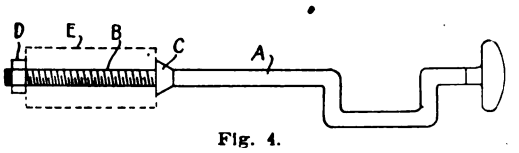


Fig. 4.

thing of this sort comes up, take a small vial of ether and soak it well and the nut will come off readily. This not only applies to nuts but will answer equally well for removing pulleys, collars, etc. To remove a pulley that is stuck on a shaft remove the set screw and fill the hole with ether and it will soon yield to pressure. Many times a spark plug will seem to stick in the cylinder and to remove it will take all the threads off the plug or damage the threads in the cylinder. In this case manage to get the ether around the plug and it may be removed with very little trouble and neither the cylinder nor the plug will be damaged. There are many places that this method can be used to good advantage.

Car owners should always carry a suitable tow line in case of emergency.

MOTOR TRUCK LIFE.

How to Give It the Length It Deserves by Intelligent Use.

(Copyright, 1917, by The B. F. Goodrich Co.)

By S. V. Norton, Manager Truck Tire Sales.—The motor truck of the present is not a speculation, but an investment. The time has gone by when the truck was sold with extravagant but vague promises, and bought with mingled misgivings and hopes. More and more the motor truck is becoming understood, and is being assigned to its proper place in the field of transportation. It is neither a worker of miracles, nor an extravagant and unprofitable piece of machinery. It is a carrier with known possibilities, distinguished from the horse-drawn vehicle by its greater speed and power on the one hand and its greater cost on the other. Under certain conditions it cannot economically replace the horse and wagon, but in most circumstances its greater speed and strength can be employed advantageously, so that a single truck may replace from three to ten, twenty, or even thirty horse units.

With the increasing knowledge of the truck as an efficient carrier, has come a better understanding of its limitations as a piece of machinery. When it is realized that a truck with proper care may last two, three or ten times as long as one that is neglected or abused, it will be seen that truck maintenance is one of the most important factors in the whole problem of motor truck transportation. It is our purpose in this article to point out the more important abuses to which the motor truck is commonly subjected, and to show how by avoiding them, its life may be lengthened and its value as an investment greatly increased.

Overloading.

Perhaps the most common abuse to which the motor truck is subjected is that of overloading. It is hard to resist the temptation to "put on a little more" and get the same returns that another is securing from a more expensive investment. The truck will carry it,—it does not groan or cry out and the power plant seems well able to move the overload at the same speed as a capacity cargo. Moreover, didn't the salesman say, "Our truck, although it's rated as a three-tonner, will walk away with five tons as easy as not. It has a big factor of safety!"

It may be pointed out that the factor of safety is for emergencies only, not every day use. It can be shown that well known manufacturers design different models for different capacities, even though these capacities are separated from each other by only one-ton or even half-ton intervals, and that a truck designed for 4 tons, for instance, may cost $500 more than the 3-ton model and a similar amount less than the next size above. The average person, however, is not satisfied by these general statements. He requires a more specific account of the matter. He wishes to know the reason why. And since good and sufficient reasons do exist, it ought to be possible to furnish them to the truck owner. He is really anxious to hear them.

Trucks are manufactured by concerns in competition with each other. In order to survive, a truck maker must design a truck that will deliver the most service for the money invested. This does not mean that the truck must be made as cheaply as possible. It means that strength and economy must be con

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sidered together. It will not do to build a truck that is enormously strong for the work intended, because such a truck would be unduly expensive whereas a lighter truck, having a much smaller factor of safety, would handle the work just as satisfactorily and at much less expense. There comes a point where increasing the factor of safety does not pay—does not pay either the purchaser or the seller. Moreover, the designer must constantly work to keep down the weight of the chassis. This has been the constant effort of pleasure car builders and it holds true in greater measure for the truck maker. Extra weight means extra expense, both in selling price and operating cost.

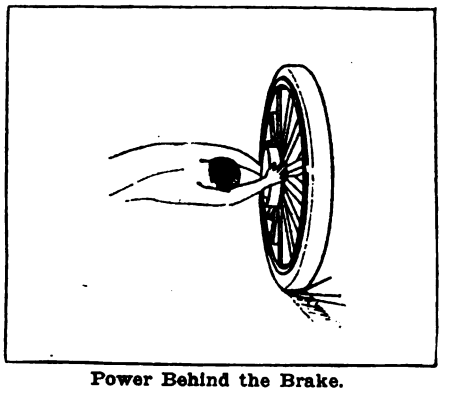
What is factor of safety? The factor of safety in a motor truck, then, is large, but not boundless. It covers the maximum strains which a truck may encounter when used according to its rated schedule of speed and capacity, and provides a wide margin besides. It covers some of the abuses to which a truck is commonly subjected. It does not cover all. It could not cover all. There are conditions and combinations of conditions under which a truck five times as strong as those built today, would be smashed. The designer despairs of building a truck that will stand overloading and overspeeding over rough roads. Such a truck would be monstrous in weight, and extravagant in price. Factor of safety is provided because of man's confessed ignorance as to the precise effect of various strains and shocks. Tests of materials result in an average only. Two bars of steel identical in size and apparently the same in stock may test, the one far above and the other far below the average for that kind of metal. Factor of safety is the best guess we can make to provide for these uncertainties.

Again, factor of safety is computed with reference to the breaking point. But metal can be injured long before the breaking point is reached. Metal is subject to fatigue, in much the same manner as animal tissue. It can be worn out internally before showing any signs of strain on its surface. Thus



Who Wins?

drawing on the factor of safety, when it does not result in immediate harm is sure to cause a gradual and progressive damage which shortens the life of the metal by years. Moreover, it reduces the factor of safety. A piece of metal that originally had a factor of safety of six may, by repeated strains, be reduced to a factor of safety of four, then two, then one, then nothing. In that way a truck may fail with only a slight overload, or none at all, leaving the owner still to be convinced that there was no flaw in the metal. In one case, the owner claimed that the spindle gave way when the truck was traveling along a smooth road with a capacity load. An examination of the damaged part showed that the metal was uniform, and contained no flaws. The appearance of the break told the story. There is a band or zone in the middle having the granular appearance of steel that has just been broken. Above and below this band the surface is smooth, almost polished. The case is plainly one of progressive fracture. The original fracture was either above or below the middle zone, or it may have been both above and below. A severe overload, coupled perhaps with momentary overspeeding, strained the



Power Behind the Brake.

outer fibers of the steel beyond their elastic limit. The owner did not know that the axle was damaged. The two surfaces of the fracture rubbed together. A second overload on some later trip widened the break, and further weakened the axle. Further strains spread the fracture. Still the axle held on. This is proved because the fracture existed long enough for the surfaces to wear perfectly smooth. We know then that for some time the only thing which held the axle together was that narrow strip of metal in the middle. No better example of factor of safety could be desired. Finally, however, the inevitable happened. The factor of safety, having been reduced almost to one, gave way under only a normal strain. Overloading months before had weakened and finally ruined the axle.

The Twisting Strain.

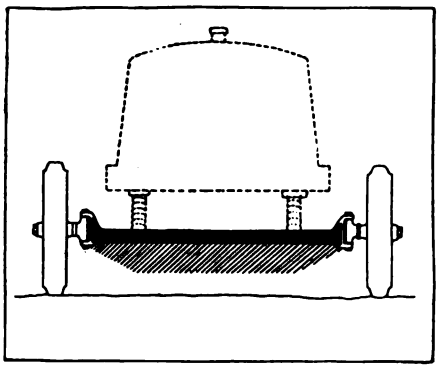
Bending strains, however, are not the only kind of strains which bear increasingly on the axles from overloading. The torsional strain is very important. When the brakes are set firmly, the wheels and the rear axle become, as it were, one piece. The action of the road tends to cause the wheels to continue to revolve. The brakes, however, bind the wheels to the axle, and it is thus the axle which resists the turning of the wheels. This is a tremendous strain on the axle, because the force of the road is applied at the rim of the wheel and has a lever arm as long as the distance from the rim to the hub, whereas the axle is much smaller and resists with a leverage only about one-fourth as great. A good driver of course will not apply his brakes so hard as to lock the wheels. Not all drivers are good drivers, however. Let us suppose that the driver does jam on the brakes and locks the wheels. Let us suppose that in addition the truck is heavily overloaded. The truck being overloaded possesses additional momentum, and being much heavier increases the friction or grip of the tires on the street. The torsion on the axle is enormous. It is a double abuse, yet the engineer must design to take care of it and provide a factor of safety besides.

End Thrust.

There is still a third kind of axle strain which

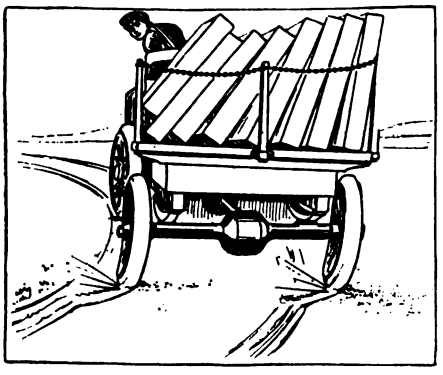
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is increased by overloading. It is end thrust on the axle bearings. This occurs when the truck swerves from its straight path, and especially when it rounds a corner. Some hint of the magnitude of this force is felt by the passenger in the rear seat of an automobile. When rounding a corner briskly a person may be slid clear across the seat and brought up sharply against the side of the car. The momentum of the body of a 150-pound man is, of course, nothing in comparison with the tremendous impulse with which a 5-ton load of merchandise plunges sidewise to the new direction of travel.



Shaded Diagram Showing Nature and Extent of Normal Bending Strain in an Axle.

This is sometimes called the "skidding" strain. The term, however, is inaccurate. It is the resistance against skidding which sets up the strain. Skidding is the safety valve, the mechanical way of showing that the strain is too great to be endured. When the tires finally slip and permit the truck to take a crab-like diagonal course, part sidewise and part straight ahead, it means that the tremendous momentum of the truck has triumphed over the grip of the heavy wheels which are trying to force it to take a new course, and that it is following, in a measure at least, the original course along which the great inertia of its momentum strives to carry it. As a matter of fact the degree of skidding often indicates that the strain is light instead of heavy for, if the road surface is slippery, the wheels will not hold at all. But on a dry, roughened surface, the tires will hold true to their path, forcing the wheels and axles to take the full 100% of the side thrust.



Skidding Strain.

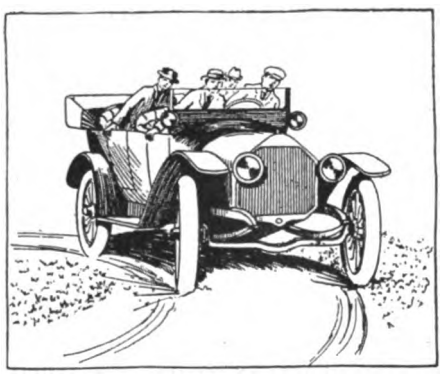
The tendency of this strain is to push the axles through the hubs of the two outside wheels. In addition, there is a bending strain which tends to snap the spindle of the axle in two. Thus two strains are operating at once, the end thrust resisted by the bearings, and the bending or snapping strain resisted by the axle stock itself.

Overload on the Wheels.

This end thrust acts with special violence upon the wheel. A wheel, whether of wood or steel, is tremendously strong in resisting vertical strains. It has the enormous strength of an arch, and is further reinforced by its spokes, which not only support the arch but support each other. A test conducted on a 36 x 4" dual wood wheel showed that it would bear a weight vertically of 114,000 pounds, or 57 tons. It is quite different, however, when a strain is imposed laterally at its rim. The wheel is not built to defend itself against pressure from that direction. Moreover, strains applied laterally at the rim act with great leverage against the hub, tending to "dish" the wheel even under normal conditions. What happens when the truck is overloaded? Let us consider that the weight is doubled. It is the same as multiplying these enormous strains by two. Double weight means double momentum, and therefore double end thrust. Not only that, double weight means double wheel traction on the road, and double grip. The tires cannot slip or skid, the wheels cannot escape; they must stand up and meet the double strain. The two outside wheels with the axle spindles and axle bearings must take it all.

Overload on the Springs.

Next, let us consider the effect of overloading on springs. This can be measured almost exactly by the extent to which it is practiced. In fact, whil certain other parts of a truck yield only to extraor dinary strains, the springs suffer a gradual an progressive deterioration from any overload, an generally, in exact proportion to its duration an amount. The fiber stress in material caused b bending can be illustrated by the behavior of me marching in a column which is turning a corner. A the corner is being rounded the men on the insi shorten their steps while those on the outsi lengthen their strides considerably. If the colum is a narrow one, consisting of men marching thr abreast, the difference in strides is not great, b if the column is very wide, having fifteen or twen men marching side by side, the men on the insi become almost huddled together, while those on t outside are obliged to increase their strides great in order to keep abreast on the turn.



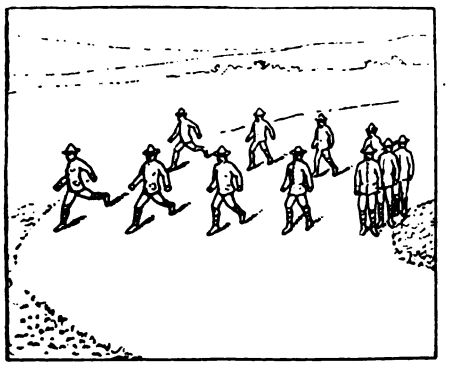
Rounding the Curve.

The same thing, in terms of fibers instead of me happens in material that is being bent. The fibers the outside of the curve become stretched, thc in the middle remain neutral, those on the insi become compressed. In a thin piece of mater the fibers suffer a relatively small amount stretching and compression in bending a giv number of degrees. If the thickness is increas the fibers suffer greater distortion in bending t

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same amount. A strip of steel one-quarter inch thick may bend a certain distance a thousand times without breaking, while a piece one-half inch thick may snap on the first attempt.

Two more facts in this connection may be mentioned here. The ultimate object of the spring de-



A Mere Matter of Circumference.

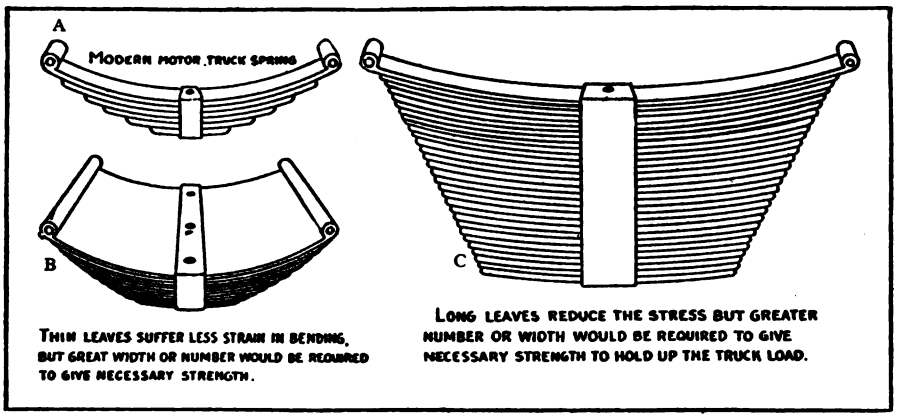
signer is to secure so many inches of spring deflection per thousand pounds carried. This is the measure and the only measure of the effect of spring action. A spring that deflects one inch under a thousand pounds, will deflect two inches under two thousand and three inches under three thousand pounds, and so on until the elastic limit is reached. The same is true of a bar of metal not designed in any way for use as a spring. Such a bar might be used in place of a carefully designed spring and give substantially the same results, but it would be heavy and uneconomical in point of material used, and would probably fail early from fiber stress concentrated in two or three points instead of being distributed evenly along its entire length.

With the foregoing facts before us, let us consider how the spring designer is influenced and limited in building a spring. Let us suppose that he is designing a spring to carry, as its part of the capacity load, a weight of 2,000 pounds. In springs for pleasure cars a deflection of one inch per 100 pounds is often figured on. If this were applied to the truck, the springs would deflect 20 inches under capacity load. Manifestly this would be excessive—not only would it cause undue fiber stress in the spring steel but it would permit too much bounce or vertical motion in the chassis. The spring designer must cut the deflection under load to about one-fourth that amount, or nearly the same as with the pleasure car. This does not mean that the springs will act as easily as those on the pleasure car for although the total deflection under its load is about the same, it requires four times as much load to compress the stiffer truck spring, and road shocks will thus be resisted four times as much.

Having determined the proper deflection for the capacity load, how can the spring maker build a large factor of safety into his spring? It will not do to make the spring stronger, because that will make it stiffer, too. To anyone claiming that a certain truck is guaranteed to carry half as much again as its rated capacity, it is a proper retort to say: "In that case the springs must be too stiff for the rated capacity and consequently they must resist unduly the jolts and jars of the road, throwing a greater strain on the axles, and transmitting a greater shock to the mechanism of the truck. If they are correctly designed for the rated capacity, however, then this added load must have the effect of causing a greater stretching and compressing of the fibers of the spring steel than was ever intended, and although this may not cause an immediate fracture, nevertheless it must be wearing out the fibers of the steel at an undue rate and may have the effect of shortening the life of my springs by half."

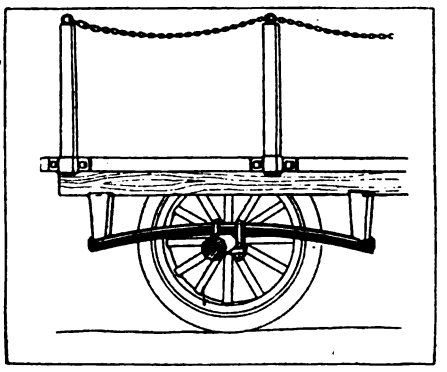
Overload on the Frame.

The effects of overloading on the truck frame



Springs "B" and "C" would last indefinitely, but would ride no better than spring "A" and would cost and weigh eight or ten times as much.

are not so serious as with springs. There is no such strict limitation on the factor of safety which may be built into a frame, and with modern pressed-steel construction, there are not many cases of



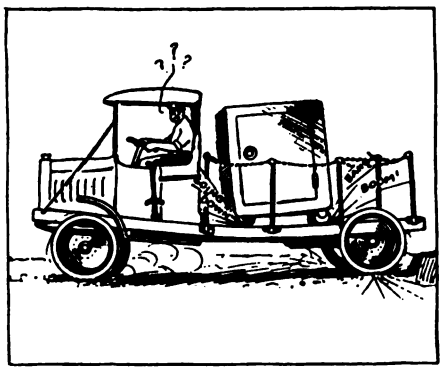
An Iron Rod Might Serve as a Spring.

frame fracture. Nevertheless, there are certain points in a frame which are particularly susceptible to undue strains. These are the holes bored through the beams of the frame for attaching the mechanism of the motor and transmission. In modern practice these holes are made as few as possible.

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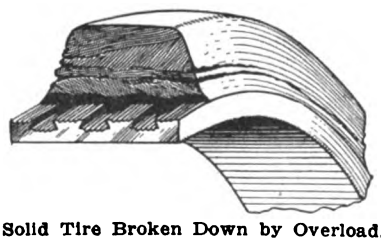
They cannot be entirely avoided, however, and they do constitute points of weakness which are the first to give under exceptional stress. This weakness is guarded against by engineers by building the frame out of stronger material than would otherwise be required.

Let us suppose that a truck carrying a capacity load drives over a beam or curb having a drop of some five or six inches. Such a condition is found in every city; it is by no means rare. Let us see



Two Times an Extraordinary Strain Equals an Accident.

what happens to the frame. The load, which was previously static, is given a downward motion. It acquires momentum, and forces the frame downwards with great power. The springs must yield, for if they resisted such a force they would be too stiff to protect the truck against normal shocks. Finally, the frame is brought up against the bumpers, if there be any, or directly against the axles. Without estimating the effect of this blow on the axle, let us consider the stress on the frame. It is almost as if the whole weight of the load were dropped on it from a height of three or four inches. The stress mounts up immediately to four, or five times that of the static load. It may break, or at least bend the frame. Now let us suppose that the truck is carrying a load of twice its rated capacity. The shock is increased not by addition but multiplication. The strain of five is multiplied by two, making the enormous product of ten times the normal stress on the frame. It would be useless to design



Solid Tire Broken Down by Overload.

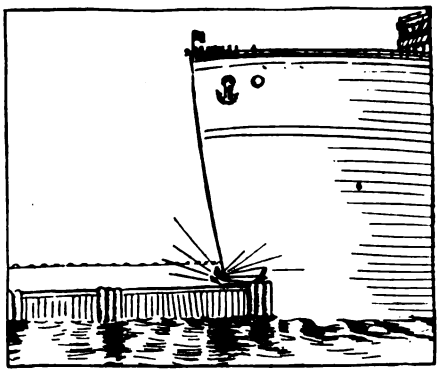
a frame to resist such strains, since it would have to be excessively heavy.

Overload on the Tires.

Consider next the effect of overloading on solid rubber tires. Perhaps the best way to explain this is to compare it with the behavior of a rubber band under tension. When you stretch a strong, properly vulcanized piece of rubber and then release it after a moderate strain it will snap back into its original shape. You can do this indefinitely and it will continue to "come back." But if you stretch it until it breaks it can never be restored to its original form. The damage has been done, and the rupture is permanent. In the same way you may within certain limits compress a piece of properly vulcanized rubber if it is not confined, and when it is released it will spring back to its original shape and size. But what is this compression? In reality, it is only another way of stretching the rubber. In the case of the tire, the force of the load merely tends to displace the gum immediately between it and the road. This rubber, in turn, pushes aside the adjacent particles. When the force of this distortion, now exerted in a lateral direction, becomes greater than the ability of the rubber to hold together, it will give way. The effect is exactly the same as stretching the band beyond its limit. In the case of the latter, however, the rupture extends completely across the section, and the band gives way with a snap, while in the tire the separation may not be apparent because the broken parts are held in place by others not yet noticeably affected. Nevertheless, the strength of the tire has been vitally impaired.

Overload on the Brakes.

The effect of overloading on the brakes should also be considered. This is direct and proportional to the degree to which it is practiced. While the cargo of a truck does not bear down upon the brakes, it increases the momentum of the truck in proportion to its weight. The effects of momentum are seen in every day life. An ocean liner, going at the rate



Heavy Bodies Are Hard to Stop.

of a few inches a second, may crush in a heavy pier if it strikes it head on. A long freight train, heavily loaded, often cannot be brought to rest within half a mile, but the same train empty, can be stopped in less than half that distance.

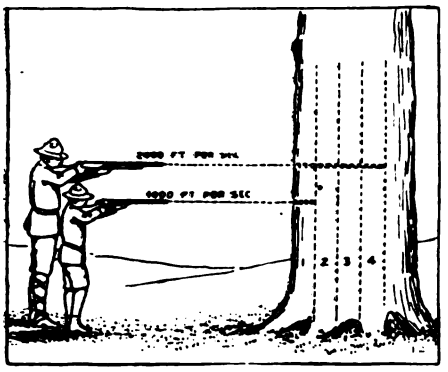
This same force is present in the motion of the overloaded truck. The brakes must be applied with greatly increased pressure in order to bring the truck to rest in a given distance. The skillful driver, in such a case, will allow a longer time in which to bring his truck to a standstill, but the average driver is used to seeing his truck slowed down at a certain rate, and if ordinary pressure on the brakes will not accomplish this, he will apply extraordinary pressure. Moreover, in emergencies the truck must be stopped within a certain distance, regardless of its momentum. There is nothing to do but to apply the brakes with grinding pressure, the effect of which is obvious.

Overload on the Transmission.

The transmission does not escape the effect of overloading. As the load does not in any way rest upon the gears and shafts, it is not always easy to see how overloading can affect them. The answer is found in terms of the increased work which

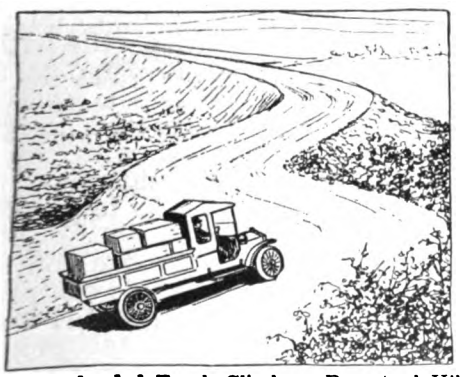
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is put upon them. Obviously more effort is required to push a heavy wagon than a light one. In an overloaded truck, the increased effort is transmitted by the various teeth of the gears of the transmission and differential. These teeth are in effect so many levers, each one of which transmits the turning power of the engine to the driving wheels.



Twice the Speed—Four Times the Blow.

Now, it may be said that the strain on the transmission is limited by the maximum torque or turning power of the motor, which is a fixed quantity and which is often reached without involving an overload, as when a truck with normal load is climbing a very steep grade. Triple the speed, and the energy is increased nine times. If one bullet has twice the speed of another bullet of similar shape and weight, it will penetrate a target four times as deep. If you drop a weight out of a first-story window it will develop a certain velocity in its fall but you will have to carry it up three more stories and drop it out of the fourth-story window in order to give it twice the velocity at the time it strikes the ground. If an object falls from a ninth-story window it will be traveling when it strikes the ground at a rate of speed only three times as great as if it fell from the first story, but the blow will be nine times as violent. And, similarly, if the speed of a truck is increased from ten to thirty



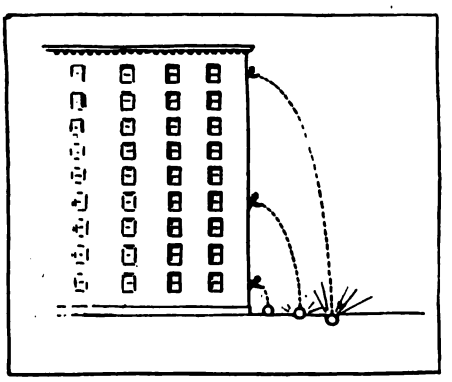
An Overloaded Truck Climbs a Perpetual Hill.

miles an hour, each irregularity in the road will strike a blow nine times as violent as before.

Engineering problems which are simple when low speed is involved, become enormously difficult when an increased velocity must be reckoned with. This is the reason why railroad trains running at eighty or ninety miles an hour have not proved a practical success. At such enormous speeds the slightest irregularity in the rails, or the wheels of the locomotive, or any of the wheels of any of the coaches, strikes a sledge-hammer blow which is destructive of the strongest construction in train or road-bed.

Some years ago a certain railroad put into effect on part of its system a train service involving a speed of ninety miles an hour. They experienced some trouble with broken rails and weakened roadbed. This was finally traced down to one locomotive, and it was found upon closer examination that one of the driving wheels was off center by one-eighth of an inch, so that the whole wheel had an eccentric motion, being slightly low during one-quarter of its revolution and slightly high during the opposite quarter. If this irregularity were to be expressed graphically and drawn to scale it would be represented by a line so nearly level that the eye could hardly discern the gradual sag in it. At moderate speed it would have caused no trouble. At the speed of ninety miles an hour, however, this irregularity was passed over in a small fraction of a second, and delivered a sledge hammer blow to the rail, and back again through the locomotive.

Let us consider what happens when a truck strikes a road hump when traveling at 20 miles an hour. We will take for example an irregularity measuring roughly, 6 inches on its slope and 3 inches in perpendicular height. At 20 miles an hour the truck wheel will pass from level ground to the summit of the



Energy Varies as the Square of the Velocity.

hump in 1/44th part of a second. The wheel and axle are thrown upwards at a velocity of nearly 10 feet per second. This, however, is a gentle rise in comparison with that shown at the right. Here the elevation of the wheel and axle is almost instantaneous, and the force of the blow is very much greater.

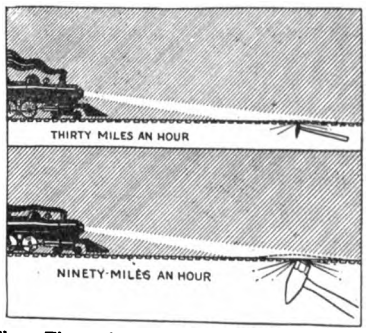
Not only does increase of speed greatly increase the violence of road shocks, but it changes their direction. A wheel passing slowly over an elevation delivers and receives a shock in very nearly a vertical direction, for the forward motion of the vehicle is small in comparison with its weight, which acts downward. As the speed is increased the truck wheel in addition to bearing down on road obstacles, strikes a horizontal blow at them, so that the reaction of the road thrusts backwards in a diagonal direction through the wheel and springs. Such a shock instead of meeting the full cushioning effect of the springs, passes to some degree lengthwise through them and strikes a dead blow on the axles and truck mechanism.

While increasing speed greatly increases the force of blows from road irregularities, it has another effect which it seems impossible to guard against by ordinary measures. This is the effect of suddenness of shock, due to the inertia of matter.

A few homely examples will serve to illustrate this fact. A door standing ajar on well oiled hinges can be pushed to by a gentle shove, but if you hit it a sharp blow with your fist the door will remain

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practically motionless while your knuckles will be severely bruised. If a rod is laid upon a desk so that part of it overhangs, and is struck a sharp blow on its projecting end, it will bend and perhaps break, even though very gentle pressure at the same point would have been sufficient to lift the heavier end. The force is applied so suddenly that there is not

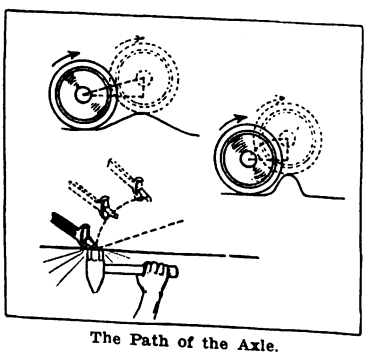


Three Times the Speed, Nine Times the Blow.

time for it to act throughout the whole mass of the object.

The axle of a truck may be aptly compared to the rod. That part of the axle to which the wheel is attached may be compared to the projecting end of the rod, since it is at that point that the blow is delivered. The rest of the axle corresponds to that part of the rod lying on the desk, because it is comparatively free to move, being held down by flexible springs which yield readily to gradual pressure. Going at moderate speed the wheel rises and falls, taking the whole axle with it, but if excessive speed is practised a blow may come so fast that there is not time to distribute it along the axle and through the spring. The axle suffers a sudden strain, and if it has been weakened by repeated strains, may even snap off, precisely as the rod in the experiment.

From this we may discover the reason for the most destructive effect of speed,—namely, vibration. Anyone who has ridden in a truck knows that when the speed is increased the vibration becomes very

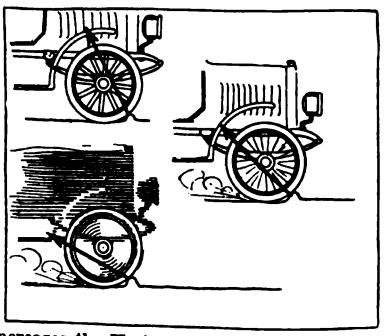


The Path of the Axle.

severe. This is due not only to the greater violence of the road shocks, but to the fact that the truck springs and in fact, all parts of the truck cannot absorb the blows as fast as they are delivered, but receive them rigidly and transmit them unsoftened to neighboring members.

There is no question that vibration is the most serious agent of ruin to which the motor truck is subject. It is a multiplication of the dreaded hammer blow, the most destructive force which can attack machinery. It begins at the axles and fills them with fatigue, which acts upon them much as a disease. It attacks the springs, which are tuned for heavier and slower shocks. It climbs through the springs into the mechanism of the truck and there it works its worst havoc. It attacks every moving part. It seizes with special delight on loose parts, because looseness means play, and play means room to swing the hammer and greatly increase the hammer blow. It is everywhere. It is as pervasive as rust. It skips nothing, but brings about a general deterioration in every piece of metal. And it is caused by speed,—blows that come too fast for the truck to absorb. Thus a truck driver who constantly overspeeds his truck, even though he does it so skillfully as to avoid direct breaking strains, cannot escape the consequence, for he is bringing about a general deterioration, a premature old age of all the parts, so that the time may soon come when it is possible to say: "Last month the truck worked perfectly; today it is beyond repair."

It is here that the rubber tire performs a valuable service. Unlike the spring, which must yield in every fibre of its several leaves throughout their three or more feet of length before it can be said to have responded to a blow, the rubber tire receives



Speed Increases the Horizontal Component of Road Shocks.

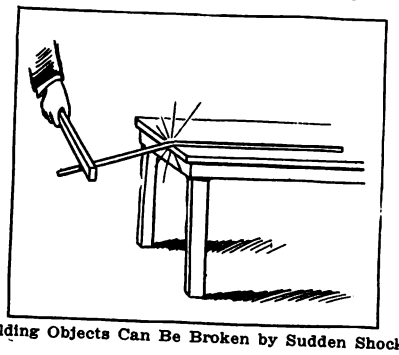
the whole shock in a comparatively small section scarcely larger in area than that of the road hump which causes it. The experiment with the spring when tried with a solid tire, produces far different results. It is impossible to strike a tire with such a rapid blow that there is not time for its fibres to yield and respond to it. Therefore, as truck springs cannot be modified from their present design, extra cushioning must begin and end with the tire, in which a wide range of shock absorbing qualities may be obtained according to the resilience of the rubber and depth of cushion.

This discussion may serve to give some hint of the many variables which enter into the problem of truck design when the factor of speed is introduced. Truck manufacturers have made the point that a truck correctly designed for use in New York or California might be entirely too weak for service in parts of Colorado or New Mexico. This is due not to the factor of load but to the factor of speed. A speed of ten miles an hour might be considered slow on some roads, and might be reckless overspeeding on others. A speed of double or triple the normal might be practiced with safety on a boulevard, while a speed of five miles an hour on an uneven road surface in connection with an overload might wreck the truck. If the tires are allowed to wear down so that there is very little depth of cushion between the wheel and the road, a speed of six miles an hour

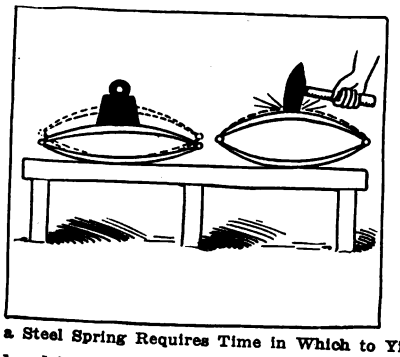
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may cause more serious shocks to the vehicle than a speed of twelve miles an hour on new tires.

The problem of the motor truck engineer is immensely difficult. The bridge builder knows his maximum load; the locomotive designer reckons with smooth rails and a definite speed; the erector of skyscrapers has his weight and wind strains within reasonably certain bounds. But the motor truck builder stands with reference to his problem as a man surrounded by mountain peaks, some of which pierce the clouds. The motor truck, equipped with solid tires and relatively stiff springs, traveling over the roads of the present may encounter strains ranging from the normal to ten, twenty, or even thirty times the normal. A truck can be smashed to bits in a stretch of road only twice its length. The terrific impact which strikes it under certain conditions can only be compared to the force of a projectile. These strains can be largely avoided by avoiding overload, which breaks a truck down and



Yielding Objects Can Be Broken by Sudden Shocks.



Even a Steel Spring Requires Time in Which to Yield.

overspeed which smashes it to pieces. Both are harmful, both cause strains which test severely the factor of safety of the truck, but taken together they represent more than a severe strain, they constitute an accident.

Errors in Driving.

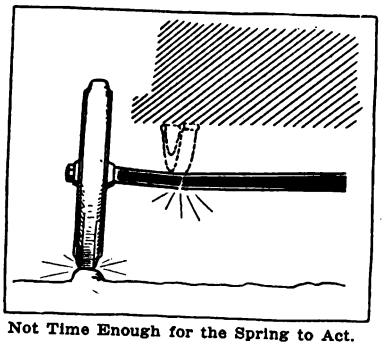
Besides overloading and overspeeding, there is another important cause of truck breakdown. This is bad driving, especially with reference to the selection of gears and management of the clutch. The principles underlying gear selection are rather widely understood because of familiarity with pleasure car practice in this respect. Most truck manufacturers publish excellent instruction books on this subject, which are available upon the request of the truck owner.

The function of the change-speed gears is that of levers, used to multiply the power of the engine. The motor is an infant with respect to the load which it must move, and is no more capable of starting a heavy truck under its own power than a boy is capable of moving a freight car. A boy, however, by means of a long lever, can start the car in motion and after it is in motion he can use a shorter lever and finally dispense with levers altogether, keeping the heavy freight car moving by his own exertions unaided by mechanical power.

Gears are levers made in circular form for the sake of compactness. Proper selection of gears consists in choosing the right leverage for the work in hand. The skillful driver knows by the behavior of the engine whether or not he has selected the proper levers for the task. On the other hand, more than one driver has attempted to start his truck on high speed gear.

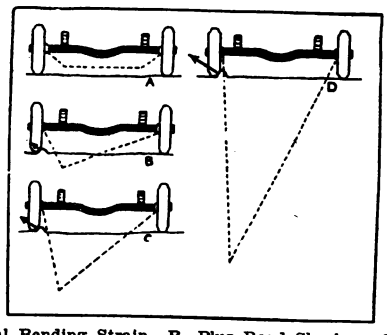
Management of the Clutch.

Inseparably bound to this problem is the proper



Not Time Enough for the Spring to Act.

management of the clutch. It is the management of the clutch which determines whether this strain shall be sudden or gradual. If the clutch is thrown in sharply the full momentum of the engine with its heavy fly wheel is brought up suddenly against the lever or train of levers in the transmission. Even when these levers or gears are set in their proper ratio the impact of the engine is so sudden that there is scarcely time for them to act. The engine stalls, or the clutch finally slips, but in the meantime the gear teeth are strained, but not so severely as the driving shaft, which is subjected to an enormous torsional stress, as also the crankshaft of the engine. These strains are even more severe if the wrong gears are in mesh. The more serious fault, however, is the sudden engagement of the clutch,



A—Normal Bending Strain. B—Plus Road Shock on Inside of Wheel. C—Plus Overload. D—Plus Overspeed.

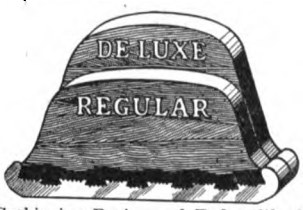
which does not allow time for the engine to stall before the impact of its momentum takes full effect on the transmission. This is the crux of the driving problem. It is possible for an unskillful driver to

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wreck the driving mechanism of a truck in a single forenoon. On the other hand, proper management of the clutch and proper selection of the gears prolong the life of the truck almost indefinitely.

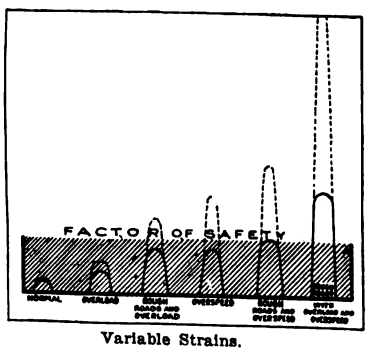
Lubrication.

A chapter instead of a paragraph might be written on the necessity of lubrication. It is possible to



Extra Cushioning Begins and Ends with the Tire.

burn out a truck in ten minutes' time by running it without oil. Steel, however polished and smooth to the eye and touch, has in reality a rough surface. Under the microscope it shows a jagged outline. If two pieces of steel are rubbed together, the minute

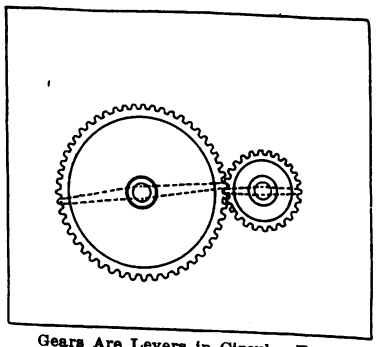


Variable Strains.

edges engage and tear each other, and as they are destroyed new edges appear, so that the process of destruction goes on rapidly and without interruption. Oil fills up these microscopic depressions and further places a film between rubbing surfaces which actually prevents them from coming into contact.

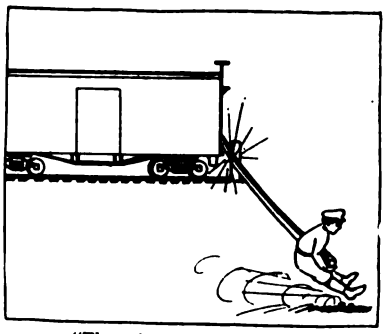
The Human Equation.

Even though the truck owner, however, under-



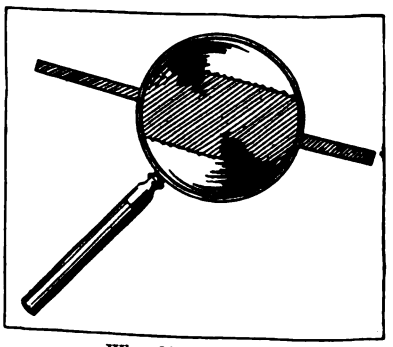
Gears Are Levers in Circular Form.

stands thoroughly these various mechanical principles which bear upon the length of life of his truck and is anxious to apply them intelligently, he is still confronted with the human equation which he must solve. This is the truck driver. How to make him understand what forces are at work when the loaded truck is in motion, and how to persuade him to hold these forces in proper control, is a problem not in physics but human nature. Various expedients have been tried. Perhaps the most successful is the bonus plan, by which the driver is made, as it were, a partner in the special business of keeping down the expense of truck maintenance. Records are kept of the cost of repairs, tires, etc., and based upon the showing at the end of a specified term, a bonus is paid to the driver. This plan has been tried out by several large truck owners here and abroad and has met with considerable success. Another plan has been to devote a whole day to training the



"Throwing in" the Clutch.

new or inefficient driver in the art of engaging and disengaging the clutch, starting, stopping, and shifting gears under all conditions of load, speed and grade. A new and interesting suggestion has come from a New York merchant, who has replaced young and headstrong drivers with gray-haired men. The caution and judgment which these men bring to their task is regarded as the most valuable qualifi-



Why Oil Is Needed.

cation the truck driver can possess. Truck manufacturers are giving more and more attention to the driver problem, and some of the larger companies have established schools to which drivers and traffic superintendents can go and learn the practical as well as the theoretical side of this art.

From long and extensive contact with it under all conditions, we believe the modern, well built truck is one of the most valuable instruments for building business, cutting costs, and meeting competition.

To Adjust Timken Bearings

To adjust Timken bearings in the front wheels, first put a jack under the front axle so that the wheel is clear off the floor, next remove the hub cap. With your pliers remove the cotter pin from in front of the outer lock nut. A thin lock washer comes off next. When this is done, grasp one of the spokes, directly below the hub, and with the right hand

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in a perpendicular position, grasp the upper rim of the tire. Work the wheel back and forth, in order to detect any play or looseness. When adjusting the wheel bearings in this manner you should be able to feel just barely perceptible looseness. If the shake is more than barely perceptible, tighten up the lock nut a trifle.

If there is no perceptible looseness, loosen the lock nut about one-quarter of a turn. The wheel should oscillate when you have the adjustment right. Now replace the lock washer outer lock nut and cotter pin. Again grasp the spoke and outer rim of the wheel with both hands and test for perceptible looseness. Tighten hub cap securely and the job is done.

TRUEING UP CYLINDERS.

Comparative Merits of the Various Methods Favor Reboring.

From Sam Nelson, Minnesota.—Being a reader of your valuable magazine, and finding it almost indispensable in connection with my repair business, I feel at liberty to ask you to confer a little favor upon me by allowing me to make a suggestion that I am satisfied is in keeping with the wishes and sentiment of a very large majority of your readers and subscribers.

The subject of trueing up automobile cylinders is becoming one of very active interest among the repair men, but I have never seen appearing in your magazine anything on the subject that could be regarded as of any important value or service to us repair people. I, as well as many others, subscribe for your magazine for no other purpose than that of securing light and information on the many perplexing subjects connected with the automobile repair business, and of late my attention has been especially directed to this subject of trueing up automobile cylinders from personal experience. In this town there are several concerns that are making a specialty of doing this class of work. Some of them are grinding, some reboring and others reaming out cylinders for the purpose of trueing them up.

Personally, I have made a very careful canvass of the situation and I believe that my experience would be of some service, if given to the readers of your magazine. I have tried regrinding, as well as reboring, and have made it a point to make a careful and unbiased analysis of the results in order to make sure that I was absolutely right in my conclusions. The automobile owners are the ones who must be pleased, for they are the ones upon whom I must depend for my bread and butter as a repair man. For that reason, I have made some tests that I am very well satisfied might be of service to others who are probably groping about in the dark on this one great perplexing question—trueing automobile cylinders.

At first I did all my automobile cylinder trueing with a grinding attachment which I attached to an ordinary lathe. I then thought I was securing very satisfactory results, but was not making the careful micrometer test and analysis that I was at a later date. The first jobs that I did apparently answered the purpose for which they were intended, and I was fairly well satisfied in my own mind that I was giving my customers a square deal, inasmuch as I was trying to do the work as conscientiously and as faithfully as my mechanical ability would permit.

One day a man dropped into my shop and suggested the idea of boring my cylinders instead of grinding them, in order to true them up. At first this thought seemed so absurd that I absolutely refused to discuss the subject with him. I had never given the subject of re-boring cylinders any thought and when he suggested it, I at once saw that I had developed quite a prejudice against anything except re-grinding. However, the persistence of the man finally made its impression upon my mind and I finally yielded to the extent that I agreed to allow a device for that purpose to be installed in my shop with the distinct understanding that I was to be given plenty of opportunity to not only try it, but test out the relative advantages of one over the other. This was readily agreed to by the agent and after having the boring device installed in my shop, I reluctantly bored out three or four blocks but could not get the consent of my own mind to allow them to go out without finishing them with the grinding device on my lathe. I found that this method of trueing up cylinders was consuming more time than I could afford to allow for this class of work in view of the price that I was getting for some of my Ford work. After boring four or five blocks, I found that my men were becoming more proficient in the use and handling of the boring machine and were getting some very remarkable results.

If I should have relied upon the general appearance of the cylinder walls after re-grinding and reboring, as the best evidence of superior work, I should probably still believe that re-grinding was superior to re-boring. However, I was still quite skeptical and refused to believe it was possible to re-bore a cylinder and secure the same results as far as compression efficiency was concerned as could be secured by re-grinding.

I determined to test the matter out by taking one cylinder block and grinding it, exercising the same amount of care and attention that I did in boring out another block, then I placed the blocks in their respective automobiles and took the compression test before the machines were taken out of my shop. With the results, that there was nearly two pounds higher compression in the bored job than in the ground job, with less inclination to indicate rapid escape of compression. Then, I allowed the owners to drive their cars for three months, and requested that they drive into my shop again in order to give me an opportunity to test out the compression with the result that at the end of three months, the compression in the bored cylinder block showed nearly three pounds better compression than in the ground cylinder. This proof was so overwhelming that I adopted re-boring exclusively. I have now abandoned the use of the grinder entirely and I am doing nothing but re-boring in trueing up cylinders.

I was also quite skeptical on the question of whether it would be necessary to lap in my pistons after re-boring in order to secure satisfactory results, and at first I lapped the pistons in by hand, but I found as my men became more proficient with the boring device that the lapping in of the pistons was unnecessary. I immediately discontinued lapping and I am now fitting my pistons just as I finish them without any lapping. I am satisfied that there are many other repair men who are debating the same question, and may not go to so much trouble in

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determining the relative difference and I feel sure that my experience may be of some service to them. There are many devices designed for the purpose of boring out cylinders, some better than others. I have made a very careful study of the different devices on the market and I believe that I have succeeded in securing the best device that I know of for that purpose.

There is another very important feature connected with this class of work that we repair men cannot afford to overlook and that is that this class of work yields us a better profit than any other class of repair work connected with the automobile repair work. I have also found that being able to do this class of work has had a tendency to develop a general equilibrium in the amount of work that I have on hand for my men to do at all times. In other words, it brings my work in so that I can keep my men busy nearly all the time. In this respect, the introduction of the trueing up of cylinders, has contributed more to the profit side of my bank account than any other medium or influence I have ever endeavored to introduce in my shop. I have also found the advertising following as a result of trueing up of automobile cylinders and fitting with oversize pistons, has done more to create a favorable impression for my shop than if I should have spent hundreds of dollars in display or classified advertising.

If any brother repair man should chance to read this article, I hope it will give him more courage and more hope that it is possible for him to earn a respectable living in the automobile repair business. But, he must be up-to-date and progressive and able to do any class of automobile repair work he may be called upon to do.

A Novel Coal Truck.

From George W. Grupp, New York.—One of the most vexing problems to people who take pride in their lawns is the coalman. Yet it is no fault of his because the cellar opening to the coal bin can only be reached by crossing it. Planks are usually laid on the grass to keep it from being ruined by foot prints or wheel-barrow ruts.

Then on the other hand, the coalman is not the most pleasant one for some pedestrians to meet.

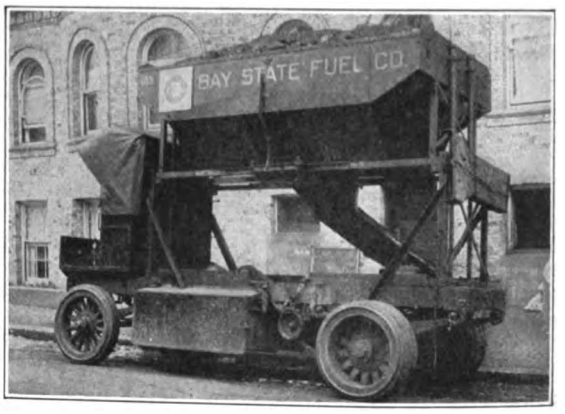


G. V. Electric Truck, made by the General Vehicle Company, Long Island City, New York, loaded with five tons of coal.

Often when the coal hole to the basement is just across the sidewalk it necessitates his climbing over the shoot or he is obliged to walk around the truck to reach the street. This obstruction not only endangers the pedestrian but an automobile, truck or wagon might easily run over him.

The Bay State Fuel Company of Cambridge, Mass., have made an attempt to solve this problem. They are using a heavy duty 5-ton G. V. truck with a novel body as shown in the illustration. The body is of reinforced steel construction, the height when light being 7′ 9″. On both sides are openings to which shoots can be attached to the rear of the body when not in use. These openings are easily operated with a hand lever.

The body, which lifts on four heavy screw pins, is adjustable to any height up to its limit of 39



Load Raised for Discharging.

inches. All operations, lifting or lowering, are controlled from the driver's seat. The 2 horsepower motor for this purpose which is located in the rear of the chassis is able to lift 5½ tons of coal in 1½ minutes at an expense of only 26 amperes of current. The body may be lowered in 1 minute. The same battery is employed to operate the drive and lifting motors. The truck does not obstruct the sidewalk to pedestrian traffic because the shoot is sufficiently high up so that they can walk under it. The shoot can be extended from the truck, across the lawn, to the cellar opening, thus preserving the lawn. And lastly, it is more safe and clean than the older methods of unloading coal.

RAILWAYS ARE AFFECTED.

How the Automobile Is Cutting Into Their Business In an Increasing Ratio.

Four or five years ago it was stated in this magazine that transportation by automobile would soon rapidly cut into the receipts of the railways, and this seems to be now borne out by a recent article in the Wall Street Journal, in which it is stated:

"A more striking measure of the development of the automobile and its use could hardly be cited than the fact that motor cars are now performing a greater transportation service than the passenger traffic of all the steam railroads of the country. While there are naturally no exact statistics of the passenger mileage achieved by motors, the most conservative estimates show that gasoline already does more than steam in the transportation of persons and that it may next year do nearly twice as much.

"Incidentally, these figures contain the verdict of experienced railroad officers that the automobile is depriving the railroads of a serious part of their former revenues. Due allowance must be made for

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the fact that a great deal of 'traveling' done by motor would not be done by railroad if the former did not exist. Nevertheless, motors do displace a considerable volume of railroad passenger traffic and the fact appears in the statistics of railroad earnings.

"Automobile trade authorities agree that the opening of 1917 will see no less than 3,000,000 passenger automobiles in use. The same authorities put the average annual mileage per car at 6,000 miles as a minimum. Neither of these figures appears to be at all inflated. On that basis the motor car mileage for next year would be 18,000,000,000. If the average load for all cars, all trips, is three passengers, the passenger mileage by motor for 1917 will be 54,000,000,000. The traffic of the railroads now amounts to about 35,000,000,000 of passenger miles annually.

"If the average motor car load be put as low as two passengers, the accomplishment of next year's motors would still be 36,000,000,000, a trifle more than that of the railroads. It is probable that two passengers is too low for the average motor load.

"For two or three years railroad men have recognized a relative decline in passenger traffic and earnings, despite the fact that this business does not ordinarily fluctuate as widely as freight traffic between good and bad commercial periods. The automobile has frequently been cited as a factor, but until recently its importance in this regard has nowhere been fully recognized. The enormous increase in motor output since the middle of 1915 is now beginning to reveal its logical consequences for other modes of travel.

"In the year ended June 30, 1916, the railroads enjoyed record gross earnings, but the passenger revenues, although they were well above those of 1915, were below the level of two previous years, whereas the freight earnings were far ahead of those of any previous year.

"Large-scale production of automobiles began in 1911 and was first reflected in the June 30 total of automobiles in the country for 1912. It is significant that railroad passenger earnings for 1916 were only 4.2 per cent. above 1911 and 5.3 per cent. above 1912, whereas the expansion of freight earnings was 28 per cent. over 1911 and 26.9 per cent. over 1912.

"In the eight years from 1908 to 1916 railroad passenger revenues gained 21 per cent. as against a gain of over 48 per cent. in freight. In the eight years to 1909 the gain in passenger revenues was 60 per cent. and in freight 51 per cent. Here is another clear indication of the recent drag upon the passenger business of the steam railroads.

"Automobile competition affects chiefly the railroads serving the thickly settled eastern portions of the country, the big cities and recreation regions. Little actual commuting is done by auto, but the commuters' family uses the motor to and from town by preference and the family's movements make two-cent business, as compared with about a seven-mill rate on commutation. A really tremendous volume of summer tourist travel is now done by automobile, especially on the good roads of New England, New York, New Jersey and Pennsylvania."

But the impetus to increased transportation by automobiles is just beginning, and will soon be far more than at present, both as to commercial work and passenger traffic. The truck is the coming vehicle for freight, and when good roads are practically universal it will carry much express, commercial and general freight, both for long hauls and for short.

Double-Deck Garbage Trucks.

From George W. Grupp, New York.—At Miami, Fla., the only two electric driven double-deck garbage trucks operating in the United States were recently installed. While no cost figures are available at this writing, yet their owners claim that thus far they have proven them to be big time and money savers over horse-driven vehicles.

The Miami Electric Garage Company are under contract to haul the city's garbage. The body of the truck is 13 feet long and 7 feet 6 inches wide and cradled on the two-ton G. V. model. The deck will amply care for sixty cans 44 inches in circumference, 21 inches high, weighing 12 pounds empty and 35 pounds full. This is the city regulation sized



G. V. Garbage Electric Truck, made by the General Vehicle Company, Long Island City, New York.

can. On the average, each truck carries about eighty filled cans and forty empties.

The method of collecting garbage with these trucks is unique. Each family must provide itself with at least two of the standard-sized cans, and by city regulation, the top of each can must be first covered with a piece of newspaper or the like before placing the metal cover on the can. This done, the owner is permitted to place the can on the street curb, on the day which the trucks are scheduled to collect the garbage. When the truck arrives the filled can is loaded onto the truck and an empty one left in its place. No emptying of garbage cans is permitted in the streets. They must be taken to the rendering works with their covers on. This not only means that the trucks are kept clean as well as the streets and sidewalks. Nor are the people annoyed by the obnoxious odors of open dump garbage trucks or wagons.

Farmers Using Motor Trucks.

A farmer writing to Farm and Fireside, says: We have been operating a 1½-ton motor truck on our stock and grain farm since April 1, 1915, and consider it a success, in spite of the argument that a truck to be a paying investment has to be used every day. We feel that this is offset by the fact that the actual depreciation is not so great and the life of the truck is lengthened that much more.

Our nearest market is seven miles away, and I have delivered six loads of wheat to the elevator in one day between 8 A. M. and 6.30 P. M. Those are hours of leaving and getting home from the last load, and also includes an hour out at noon. On the same day one of my neighbors delivered six

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loads to the same elevator, but used three men and three teams.

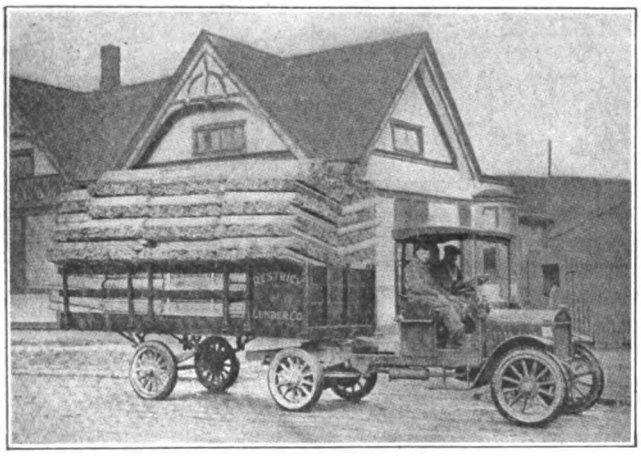
Since we have had the truck we have not had to call on anyone to help in our hauling, and have had more outside cash work offered to us than we could possibly do. This was rather a surprise, as we had not supposed there would be any truck business in the country.

In hauling hogs by wagon the shrinkage, I am told, may be as high as eight per cent. I have personally seen a 300-pound hog shrink 20 pounds. The first carload of hogs that we delivered with the truck gave a shrinkage of only 40 pounds on the load at Chicago. We are located in north central Illinois. On another occasion we received $1 a hundred more for some heavy hogs, owing to our ability to deliver them promptly by truck. This alone netted us $35. One of the hottest days last summer I hauled 50 hogs for a neighbor in five loads, and did not lose a hog. In fact only one got hot at all. I have hauled about a thousand head of hogs since buying the truck, and persons for whom we have hauled do not care to go back to the wagon for hauling their hogs except in cold weather. The same trip that takes two hours with a team I can make with the truck in forty minutes.

Truck Economy.

Here is a specific example of a lumber company extending their business radius with a GMC truck. The Restrick Lumber Company of Detroit operates with a 1½ ton truck made by the General Motors Co., Pontiac, Mich., with a Freuhauf semi-trailer. Their letter here tells the story:

"We have thirty-two thousand hemlock laths on this load, which weighs about nineteen thousand pounds, or nine and a half tons. We have no difficulty whatever in hauling this sort of a load—in fact, we do not think we have a load unless we have about this weight. If these laths were hauled by teams it would make two two-horse wagon loads, and as the truck can make a delivery in about one-half the time required by a team, you can see that under such conditions, the truck is doing the work of four teams.



Nine and one-half tons of lath on a Model 31 G. M. C. with semi-trailer. The Restrick Lumber Co. says: "We have no difficulty whatever in hauling this sort of a load—in fact, we do not think we have a load unless we have about this weight."

"We have found the truck to be of great assistance to us in delivering material to jobs at a considerable distance from our yard. During the past two months we have accepted orders for over $20,000 worth of material which we would not have attempted to handle if we did not have the trucks for delivery."

REPAIR WORK.

Something About the Common Jobs, the Charges and the Account System.

The automobile repairman must know how to adjust any part of the car. To know how to adjust he must first know the principle of the construction of the parts and must know when and where to look for trouble. About one-half of the work of the automobile repairman is in making adjustments and fitting parts. A machine shop is not necessary, unless there is sufficient work to keep more than one machinist busy. A great number of small repair shops only put in just the tools needed for the average repair work, and when they have a job of machine work to do they take it to a machine shop. In other words, a machinist and an auto repairman are two different trades. The auto repairman need not be a machinist—one who can turn all kinds of metal parts out on a lathe and do actual machine work.

When beginning work on a car or engine, system and order mean success. There is nothing more disgusting to a man who walks into a repair shop and finds a careless workman dumping nuts and bolts and parts here and there on the floor. That customer will say to himself, "If that workman is as careless as that, he is careless enough to leave a nut in my crank case and ruin my engine when it is started up, or he will leave off lock nuts or lock washers and cause me expense and damage. A little piece of metal, such as a piece of a cotter pin or the like, accidentally dropped into a can or pail of grease, and subsequently put into the gear case of a motor car has been known to cause much damage, and give the driver or owner of the car considerable trouble and expense. If you do your work thoroughly and carefully and always do a little more than you agree to do, you will be sure to make a success. It's the careful man the auto owner wants to handle his car; not the fellow he can't depend upon.

In the matter of charges, it pays to be liberal. Automobile repairmen generally have a reputation for exorbitant charges. Make it a rule to do a little more than you agree to. It is well to comment on your work in talking with an auto owner like this: "I noticed that some of the nuts were loose around the springs, so I went over all the nuts on the running gear and found that they needed attention. You want to watch those little things, and then you won't need me so often." The owner may not say anything, but he will comment to himself: "There's a good repairman," and that is the most profitable reputation you can establish. You are building a business for the future when you do your work right and treat your customers fair.

Automobile repair work may be divided into two classes: First, the repairman who works in a shop under a foreman. His work is laid out for him and he is advised just what to do. Second, the mechanician, who will generally be found in the position of a foreman or operating his own shop. We also find him doing work at the homes of automobile owners. Suppose we call the "auto mechanician" the one who makes a specialty of doing work at the home of automobile owners, in the owner's private

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garage. Many men have found this work profitable and it has been the stepping stone for a future.

A Car Overhaul.

The following enumerated list gives a detail of procedure in giving a car a general overhauling where the automobile owner keeps his car at home and cares for his car himself. Nine chances out of ten his care and engine needs cleaning, greasing, valves ground and carbon cleaned. All of the work mentioned can be done in the owner's garage. This work then would require but a few well selected tools and chances are the car owner would have most of them. Supplies, as oil, waste, etc., would be furnished by the owner.

Cleaning Engine.

Cleaning engine outside with gasoline. Clean engine with kerosene. Clean drip pan. Clean all other grease and oil from engine. Clean and adjust spark plugs. Clean the gasoline strainer.

Lubricating Engine.

Put fresh oil into engine after cleaning. Oil other parts of engine, as magneto, fan, etc. Screw down on all grease cups and refill.

Cleaning Car.

Wash car. Polish body with body polish. Clean clutch. Clean transmission and underneath car. Clean steering device.

Lubricating Car.

Screw down all grease cups and refill. Grease universal joints. Fill transmission with lubricants. Fill differential housing. Grease steering device. Grease front wheels. Lubricate the springs.

Inspection and Adjustment.

Inspect all nuts and tighten. Inspect gasoline line and tighten all joints. Inspect the balls of front wheels when greasing to see if there are any broken balls. Jack wheel and listen for clicking sound. Inspect and tighten all loose water connections. In-

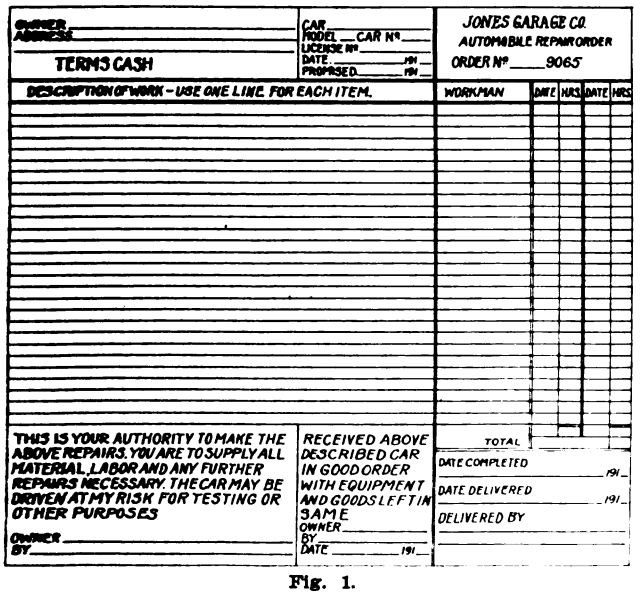

OWNER
ADDRESS
TERMS CASH
CAR
MODEL CAR No.
LICENSE No.
DATE 191
PROMISED 191
JONES GARAGE CO.
AUTOMOBILE REPAIR ORDER
ORDER No. 9065
DESCRIPTION OF WORK - USE ONE LINE FOR EACH ITEM.
WORKMAN
DATE HRS. DATE HRS.
THIS IS YOUR AUTHORITY TO MAKE THE ABOVE REPAIRS. YOU ARE TO SUPPLY ALL MATERIAL, LABOR AND ANY FURTHER REPAIRS NECESSARY. THE CAR MAY BE DRIVEN AT MY RISK FOR TESTING OR OTHER PURPOSES
OWNER
BY
RECEIVED ABOVE DESCRIBED CAR IN GOOD ORDER WITH EQUIPMENT AND GOODS LEFT IN SAME
OWNER
BY
DATE 191
TOTAL
DATE COMPLETED 191
DATE DELIVERED 191
DELIVERED BY

Fig. 1.

spect the tires and see if properly inflated. Inspect the steering device and connections and tighten and grease. Inspect the springs and fenders and nuts, tighten and remove squeaks. Inspect rear wheels, see if loose, if so draw up on the nut. Inspect the differential; if noisy, take up loose motion. Examine brakes; if loose, adjust them. Tighten spring bolts and nuts.

Adjusting Engine.

Inspect water hose on engine and replace with new hose if required. Inspect gaskets on engine and draw up on water head. Inspect bolts and nuts holding cylinder to crank case and tighten. Inspect nuts and tighten on crank case. Inspect lubricator and draw up nuts. Inspect the nuts holding exhaust manifold and inlet manifold and tighten. Inspect gasket where carburetor is attached intake manifold and tighten. Inspect all nuts and cotter pins

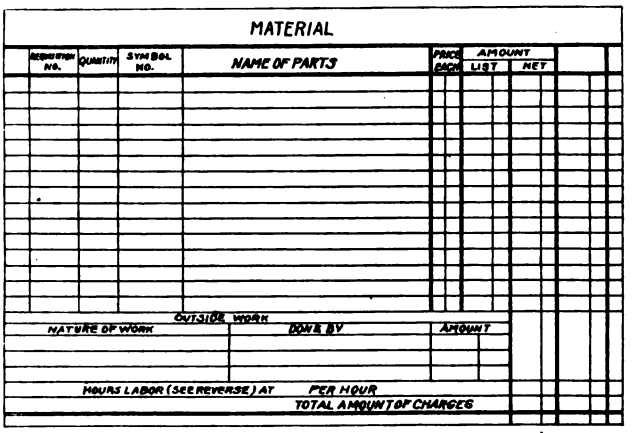

MATERIAL
DESCRIPTION NO. | QUANTITY | SYMBOL NO. | NAME OF PARTS | PRICE EACH | AMOUNT LIST | AMOUNT NET
OUTSIDE WORK
NATURE OF WORK | DONE BY | AMOUNT
HOURS LABOR (SEE REVERSE) AT PER HOUR
TOTAL AMOUNT OF CHARGES

Fig. 2.

and tighten. See that lock washers are under all nuts. Inspect the muffler and clean if necessary and tighten up. Inspect the timer or magneto and see if connections are tight. Inspect horn, magneto, switch and coil connections; see if there are any loose binding posts or connections. Inspect battery; see if all terminals are tight. Inspect and test the storage battery with a hydrometer. Inspect starting motor and generator to see if there are loose connections.

Engine Adjusting.

Clean carbon from cylinders. Clean and adjust spark plugs. Test cylinders for compression. Grind valves. Adjust valve clearance. Test for weak exhaust springs. Test engine for knocks. Take up on any loose bearings. Fit piston rings if necessary. Check up the valve timing.

Prices for Car Overhaul.

The price usually charged is from 50 to 75 cents per hour. Quite a number make a flat price; for instance, after handling a few jobs, the work would come easier and systematic and you could then make a flat price of, say, $25 to $50. To give an idea for charges where you must make a flat price and where only certain parts of the list are used, we give the following scale:

Carbon removed, per cylinder	$1.00
Cleaning and adjusting spark plugs	.75
Oiling and greasing car	1.50
Cleaning car and polishing	1.50
Cleaning engine and drip pan	.75
Tightening loose nuts and cotter pins	.75
Tightening water and gasoline line	.40
Adjusting carburetor and vale tappets and tuning up engine	2.00
Grinding valves	$5.00 to 10.00

Keeping Accounts.

Careful records of every transaction are absolutely essential. Not only for the purpose of computing your charge correctly, but for future reference. Time slips cannot be dispensed with, but complicated time-keeping systems are not necessary.

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Requisitions should also be provided for obtaining parts from stock in order that stock records may be kept clear. By numbering these consecutively and entering this number on the stock record card, you are supplied with a check upon all the parts used. Some sort of repair order form, which carries com-

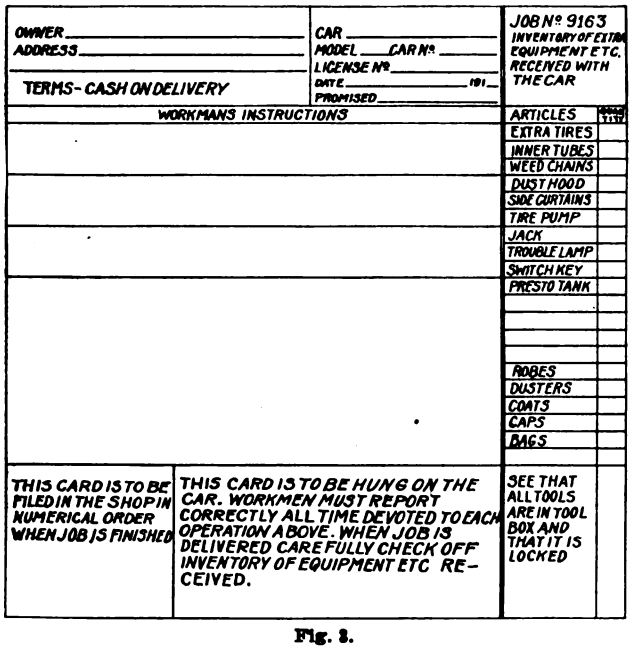


Fig. 3.

plete information of each individual job, and from which the invoice is made out, should also be used. An ideal form for this purpose is made up of a sheet, a card and an envelope. The sheet is an itemized list of the work done and parts used; the card to be attached to the job and the envelope to show a summary of the work and costs; to contain all requisitions and time tickets and to be filed in the office.

The card, Fig. 1, gives the name and address of

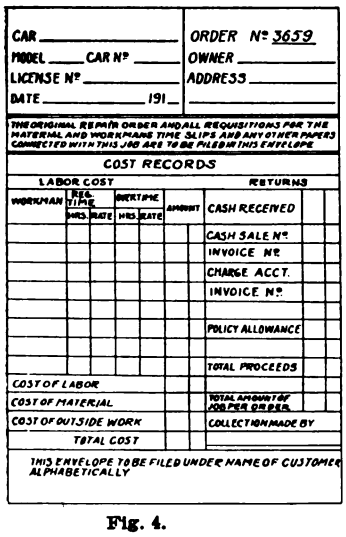


Fig. 4.

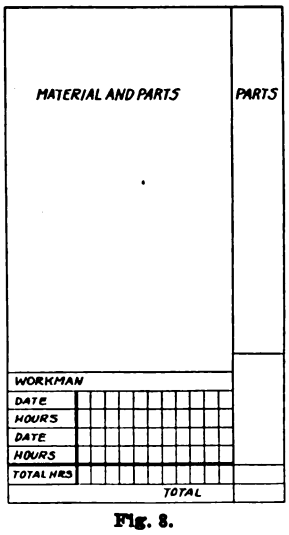


Fig. 8.

the car owner, description of the car, date job is received and approximate date promised, also constitutes an order by the car owner to do the work and furnish material. Provision is also made for a record of the delivery of the completed job. This is a full release by the owner. The other four columns are filled in from the workmen's time tickets.

The reverse of this card, Fig. 2, lists all of the material used, giving cost and requisition number.

Any work which you are not equipped to handle and which is done outside is listed at the bottom of the sheet and the total amount of charge is computed. This is not meant to be an invoice, but a record to be retained by your bookkeeper. The invoice is made out from this sheet. Part of the card, Fig. 3, registers with the first sheet and is made out simply by using a sheet of carbon paper. This card is the workman's instructions to make the repairs. It is hung on the job and is not removed until the customer has signed the release on the face of the first sheet. Space is also provided for a check-up of the equipment of the car. This card is filed in the repair

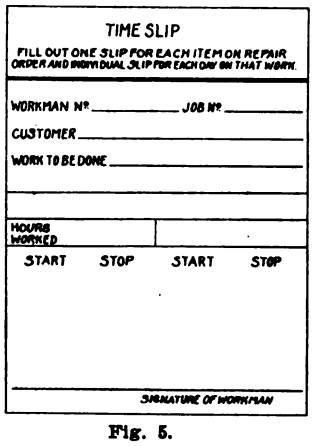


Fig. 5.

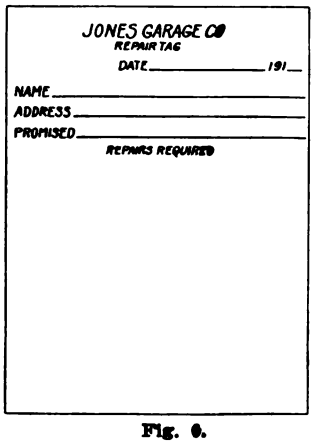


Fig. 6.

shop when the job is completed and is the foreman's record. The envelope, Fig. 4, is a summary and cost record for office use and is convenient for filing. The forms are numbered in triplicate, and the envelope with the original order is filed alphabetically under the customer's name in the office. The card of instructions for the workman is filed in the repair shop numerically. Fig. 5 is a time slip to be used in connection with the repair order, forming the basis for the time charge and also for the pay-roll. These

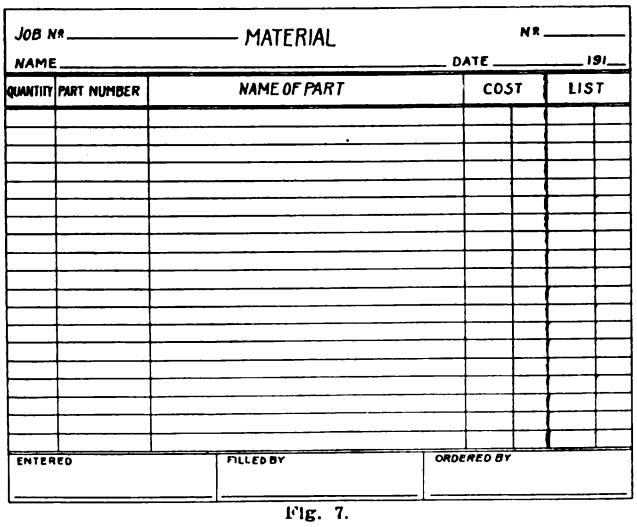


Fig. 7.

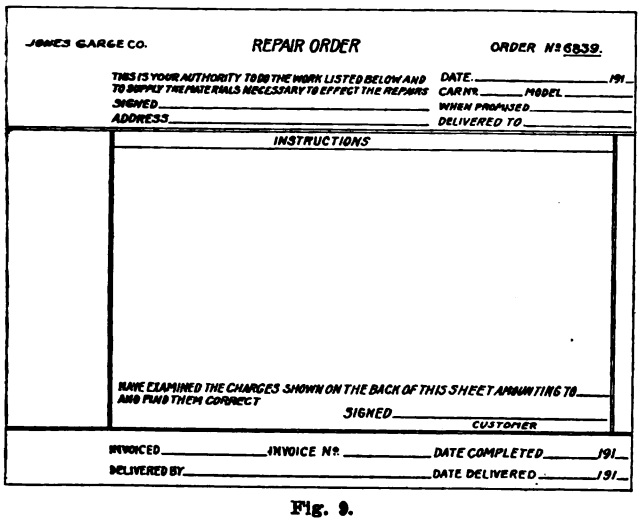
slips are filed in the envelope or with the repair order. A material requisition for this system is shown in Fig. 6, one copy being retained by the stock keeper and the other going to the bookkeeper for recording and filing with the time tickets. Fig. 7 is a tag or card which constitutes the repair order, on the back of which, Fig. 8, time and parts cost are totaled by the bookkeeper when job is completed. Figs. 9 and 10 are more elaborate, but not so de-

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tailed as Fig. 6. After the foregoing explanation this card should be self-explanatory.

Gasoline and oil should be handled in the same manner as the stock. A considerable sum of money may be lost by loose methods in handling these two items. No gasoline should be given out except by written order. Various methods of checking this will suggest themselves to the garage owner.

Many garages have found it profitable to maintain a complete card index of their customers, listing thereon various information about their cars,


JONES GARAGE CO. REPAIR ORDER ORDER No. 6839.

THIS IS YOUR AUTHORITY TO DO THE WORK LISTED BELOW AND TO SUPPLY THE MATERIALS NECESSARY TO EFFECT THE REPAIRS
SIGNED
ADDRESS
DATE 191
CAR No. MODEL
WHEN PROMISED
DELIVERED TO

INSTRUCTIONS

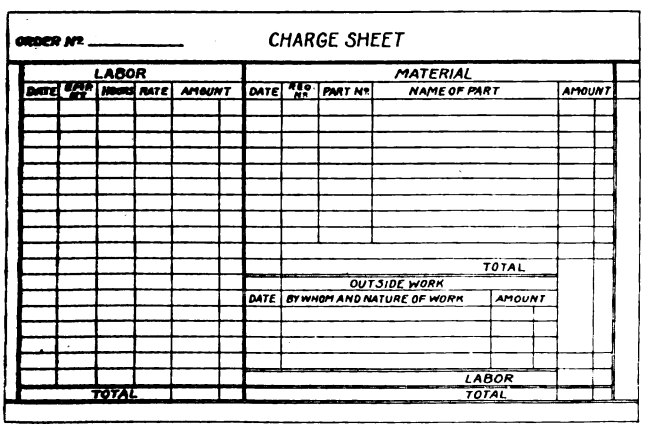
HAVE EXAMINED THE CHARGES SHOWN ON THE BACK OF THIS SHEET AMOUNTING TO AND FIND THEM CORRECT
SIGNED CUSTOMER

INVOICED INVOICE No. DATE COMPLETED 191
DELIVERED BY DATE DELIVERED 191

Fig. 9.

and, of course, noting also all work done. This is an idea borrowed from the modern physician, who keeps a record of his patients in this manner. However, as it entails quite an amount of additional work, and is not absolutely essential, its use is open to question unless a complete record is desired.

Careful records along these lines will keep bookkeeping down to a minimum. Run your business on a cash basis. The fewer accounts you open, the less bookkeeping you will have to do. The less bookkeeping the lower the overhead expense. The lower


ORDER No. CHARGE SHEET

LABOR: DATE | CAR NO. | HOURS | RATE | AMOUNT
MATERIAL: DATE | REQ. No. | PART No. | NAME OF PART | AMOUNT
TOTAL
OUTSIDE WORK: DATE | BY WHOM AND NATURE OF WORK | AMOUNT
LABOR
TOTAL
TOTAL

Fig. 10.

the overhead expense the greater the profits. Then, too, by following this method you do away with all collection expense, and in the long run you will hold your customers better. It will undoubtedly be necessary to open some accounts, as you will have regular storage accounts and some monthly service accounts. But in your ordinary business, insist on cash.

A GASOLINE TEST.

Described by L. C. Voyles, Service Manager of the Marmon Car.

There is no question that some grades of gasoline are superior to others, but none of the common properties of appearance, odor or even weight is conclusive as a test of merit. When gasoline was of uniform grade the weights of equal units of volume represented a fairly accurate check on relative qualities. Thus "72 degree," "gravity" or "test" simply represents a certain relative weight or density, while "60 degree" is somewhat heavier.

The fact is that by buying gasoline by the gravity test alone is hardly any better as an indicator of gasoline quality than buying coal by its weight a cubic foot would be a test of coal. A "60 degree" gasoline might be either a pure, equal distillation, excellent for motor car fuel, or it might be a combination of "80 degree" gasoline with "40 degree" kerosene in equal parts by weight.

The real test is to determine the lowest temperature at which the fluid will boil, the percentage that boils away at different temperatures as the heat increases, and finally the temperature at which the fluid is all boiled away. A gasoline that boils at from 100 degrees (Fahrenheit) to 150 degrees, and boils away entirely at from 350 to 375 degrees, makes an excellent motor car fuel.

Eight or ten years ago gasoline was hardly more than a distiller's by-product, and the gasoline distilled averaged about twenty per cent. of the crude petroleum. The increased use of automobiles forced the distillers to obtain the largest possible percentage of gasoline from the petroleum, nearly 1,250,000,000 gallons of gasoline being consumed annually in the United States for pleasure cars alone. If gasoline distilled were only twenty per cent. of the petroleum, 6,250,000,000 gallons of crude oil would be needed to produce the gasoline for these consumers only.

To understand how the increased percentage of gasoline has been obtained, it is necessary to remember that crude oil is a mixture of a large number of chemical compounds of carbon and hydrogen. In most of these compounds hydrogen forms a large part, and they are gaseous, volatile fluids that boil at low temperatures. By applying a gradually increasing heat these vapors come off successively and being condensed give the various grades of fluids, from the lightest to the heaviest. This so-called fractional distillation is accomplished by steam distillation, or by combined steam and fire distillation, and produces a uniformly high quality, but relatively small quantity of gasoline. Fire distillation, however, breaks up the heavier hydro-carbon compounds into more volatile constituents, yielding a larger per cent. of gasoline.

Designers of high grade motor cars have provided many features to produce economical running, for the car itself has an important bearing on the gasoline problem. As for the gasoline itself, if the motorist can he should obtain the information on the boiling range, and then by observation should determine whether increased efficiency in the fancy grades make them economical to buy.

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WOMEN DRIVERS.

Advice From a Well-Known and Experienced Expert.

From Mrs. A. Sherman Hitchcock, Rhode Island.—A good motto for the motor woman who aspires to drive her own car is the old one, "Be sure you are right, then go ahead." I have been frequently asked by some women, "Do you really understand all about the motor of your car and could you make a repair if it was necessary?" Understanding all about the motor is really not so difficult a matter as it may appear to the uninitiated. The details of the gasoline motor may sound very complicated at first, but it is easily mastered, especially if a woman has any inherent tendency toward things mechanical, and very many of them have. Any faculty undeveloped is of no practical value to us and there are many women who are fitted temperamentally to find the study of mechanics an easy one. A few hours of proper diligence, provided you are determined to learn, and the woman soon becomes proficient.

I have always made it a rule that no one should drive my car except myself, and I think the best results are obtained in this way by any driver. It is a good rule for the woman motorist to follow if convenient for her to do so. Every motorist knows that motor cars have their own individual idiosyncrasies, and if no one drives the car but yourself, you soon learn to understand each and every sound. If, however, others are allowed to drive the car, you, of course, are quite ignorant of what strain the car has been subjected to. I have found that a strange hand on the wheel of my car and another person operating the levers seems to have the effect of putting the car out of tune, a thing always to be avoided.

Before starting out for a ride always see that the gasoline tank is well filled. Nothing is more unpleasant than to be stranded on the road, perhaps far from town or city, and have your car come to a standstill from lack of gasoline. A few days ago I was driving out in the country, and found a woman motorist halted by the roadside, awaiting the coming of someone who could help her out. She was on a road far from trolleys, and about ten miles from the nearest place where gasoline could be obtained. It was nearly evening and darkness was fast approaching. She was very much worried and was almost reduced to tears, fearing no one might pass that way before night. When I asked her how it happened that she was so far away with so little gasoline in the tank, she said: "I didn't know how much there was. You see, I never do these things myself and I supposed everything had been attended to before I left home." If a woman is so extremely foolish as to drive a motor car into the country, choosing a lonely road, and not know positively that her car is ready in every way for the drive, one can have but little sympathy for her if she meets with misfortune.

In filling the tank one may put a piece of stick in to see how much gasoline there is, but in doing so care should be taken that there is no dirt on the stick. The slightest bit of dirt in the gasoline will cause trouble. It is, probably, quite unnecessary to warn the woman driver to never take a light near the gasoline tank while it is being filled, although various instances of wrecked cars have come to my notice from this very thing. It should be remembered that it is not alone the gasoline that catches alight, but also the vapor that arises from it.

The carburetor is the chamber in which the gasoline and air mix and vaporize. From there the vapor is carried to the cylinder head by means of a pipe, and is there exploded by a tiny electric spark from the sparking plug, the explosion forcing down the piston and causing the crank case to revolve.

Another very important thing for the woman driver to attend to is filling the water tank. It is also important that there is plenty of oil, for it is lubrication that keeps the machinery in good working order. If the supply of oil gives out the motor and gears will overheat and probably seize.

Few motorists, except those of long experience, realize the strain that is put upon the steering mechanism by twisting the wheels around by means of the steering wheel when the car is stationary. I have often noticed some women drivers who have a habit of doing this while the car is stopped. Where this is done an unnecessary amount of wear is put upon the steering mechanism and sometimes even the steering connections may be bent.

Patience is of more value to the woman beginner than anything else. If she possesses the virtue of patience she can become a skilled motor car driver, enjoying to the full the delights of this greatest of all outdoor sports.

MR. DURYEA ON FLYING.

Believes We Are On the Eve of Its Final Successful Development.

From Charles E. Duryea, Pennsylvania.—In relation to the recent remarks of the editor concerning flying, the unexpected objection to flying also applies to sailing on large bodies of water. When one gets so far from land that only the sky and sea are visible there is a sameness that palls on some tastes. But the airplane of the near future will carry several people and doubtless house them so that some liberty of movement will be permitted. If not, then they will be fitted with telephones so that conversation will be easily possible while travel over land should offer some variation in scenery that cannot be found on the ocean. There is almost a certainty that after the war the airplane factories and enthusiasts will turn to the sport side of this wonderful device and that we will see in a few years an unbelievable development. Transportation routes are a certainty and overnight sleepers between New York and Chicago and other important cities will be offered us before very long. How the bird soars is not a secret but has been known for perhaps a score of years. How to take advantage of the knowledge and duplicate it is the problem. That is still a secret. Yet I have no doubt a very small expenditure as experiments go in these days of big things would solve this also. The bird takes advantage of the up moving currents of air and floats on them just as a piece of paper often rises and is carried a long distance before it gets out of the rising current and falls. Any one who has had a whole fleet of kites fall because a cloud passed over them and by shading the air chilled it and caused it to fall bringing the kites down with it can understand that no soaring bird could remain in that descending cool air and continue to soar without descending. Prof. Langley's "Internal Work of the Wind" set the facts before the scientific world many years ago.

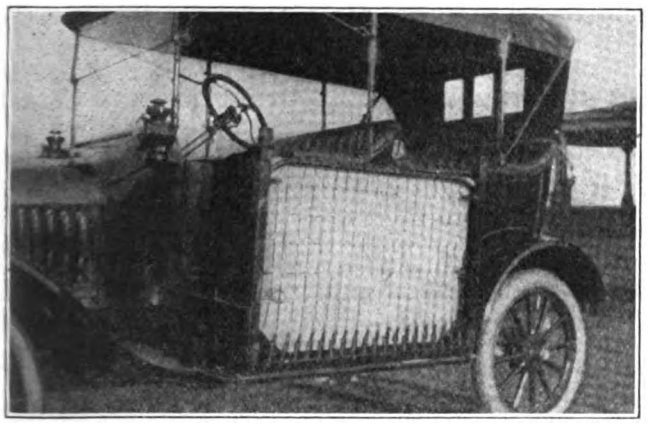
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In the early nineties I published a number of articles with cuts proposing a method for safely hanging in the air by a rope from a captive balloon and getting used to a glider assisted by a pedal driven propeller. The matter was again brought up at the Aerial Congress at Chicago in 1893 and shortly after this Octave Chanute had gliders made and tested on the sand dunes along Lake Michigan. With a breeze blowing in from the lake and rising to pass over a dune it was possible to glide along the dune practically at will. With the experience of today it should be possible to make gliders having larger area in proportion to load and far less head resistance so that a much lower wind rise would suffice to carry the machine and load. Then by carrying a direction vane well to the front the operator could see and use the rising currents as long as he remained in them and quickly dive through the descending ones to the next riser.

Who will develop this next step?

Novel Camping Outfit.

Vacation by automobile and camping out is rapidly increasing and will continue to do so. It is at once the most delightful and healthful means of



Tourist Outfit.

taking a summer outing, and the expense is far less than by any other means unless one goes afoot and takes his meals at farm houses as used to be done



The Tent and Bed.

in the time of Bayard Taylor. The Tourist Auto Equipment Co., of Dahlgren, Ill., is manufacturing a camp combination bed and luggage carrier that seems to meet the needs of campers and tourists. It can be fitted to any car with a running board as much as 40 inches long by making four small holes through the running board. In the case of the Ford car the same holes are used as those put there at the factory. It forms a roomy space to pack away all kinds of tents, bedding, quilts, cooking utensils and suit cases. For sleeping purposes the bed is comfortable and ample. In fact, it comprises a bed and dressing room at night and a kitchen and living room by day. The illustrations will give an idea of the outfit. Its cost is small and it saves all hotel bills and garage charges. It is guaranteed exactly as represented or money refunded. Patents are pending.

Touring in Canada.

In our February issue some information was given about automobile touring in Canada which was not quite correct, we are courteously informed by the Motor Magazine of Toronto, which gives the following facts:

Briefly, the provisions provide that the American tourist must present his license permit or automobile identification card at the Canadian port of entry to give the residence or business address of the holder as well as the town or city. Each automobile must have its own license, of course. Where the owner wishes to remain in Canada for twenty-four hours only, the license card will be accepted. This will be retained by the Collector of Customs until the owner re-crosses the boundary. In this instance, the automobile owner will be required to return by the route in which he entered Canada.

When the tourist desires to stay in the Dominion for any period from one to thirty days, a bonding certificate will be issued to him by the Collector of Customs at port of entry, and this will be cancelled at any port through which he passes in leaving the country. A guarantee company's bond will be required from any tourist who desires to remain in Canada for any period up to six months, over the thirty-day period. This bond will also be cancelled at the point where the non-resident motorist leaves and the cancelled copy will have to be returned to the port of issue.

If a tourist, whose residence is in one of eighteen States which reciprocate with Ontario in the matter of license recognition, wants to stay in the Province of Ontario for less than twenty-one days, he may do so without taking out an Ontario license. This free period will probably be increased to thirty days, however, so that the license exchange period will correspond with the free customs privilege of thirty days.

In any event, an Ontario license must be secured for all commercial trucks, business cars or demonstrating models driven into the Province for any period of stay. A blanket license covering a number of machines, such as used by automobile dealers, cannot be accepted for touring purposes by the Ontario authorities.

Only one thirty-day certificate or one six-months' bond will be accepted for any one car by the Canadian Customs Department. In other words, a non-resident motorist cannot remain in the Dominion for a whole year without paying the 35 per cent. duty and 7½ per cent. war tax on his car by simply taking out a six months' bond twice during the year.

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A. A. HILL, Editor

F. R. WHITTEN, Advertising Manager

F. M. DAMPMAN, Eastern Representative — H. F. LUDINGTON, Western Representative

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK APRIL, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

WAR FOR HUMANITY.

The declaration of war with Germany came neither too early nor too late. We have not been carried away by our impulses into a rash or unjust decision, nor was that decision delayed on account of fear or indifference. If national security and honor are still to be maintained only by force of arms, we must pay the price for them, and recent events prove that there is no reluctance on the part of the nation to act upon it.

The response to the President's noble call has been as patriotic, inspiring and unanimous as any righteous cause has ever been answered. The advice of Old Polonius, "Beware of entrance to a quarrel; but being in, bear't that the opposed may beware of thee," has been and will be followed to the letter.

Patriotism now means something more than the waving of the flag—more than verbal fervor. It means sacrifice, and nothing less than sacrifice. From every one according to his means; to every one according to his deserts.

A STEP FORWARD.

Whether we approve it or not—whether it gives us an impulse to anger or strong opposition, or whether we view it with complacent welcome—immediately following the close of the war in Europe, there will ensue some of the most momentous social, economic and moral changes the world has ever witnessed.

In Russia a throne has just been razed. Of course it was the most autocratic of any that existed in a civilized country, and that is the reason why it fell so pitifully. In Germany and England the sovereign power is fast weakening if not absolutely tottering. Whether they will really come down with a crash when the war ends is uncertain. Possibly the "powers that be" may catch the muffled discontent and avert the crash by giving the people just what they want.

In any event, the public will take just as active a part in their governments as they choose, whether it be little or much, although possibly the less part they take, the better will they be governed. But they will get just as good as they deserve, and that is something they do not now get. Woman suffrage will be universal. The labor question will be solved to the extent that employes will be peers and not vassals. This will put the visionary socialists out of business and dispel the vicious I. W. W. and other lawless organizations, for the public will not submit to disorder when things are as they should be. The land question will then be settled. The production and consumption of food will be placed upon a scientific basis. Opportunity will be so widened that the present tendency to relieve distress by charity or benevolence will seem as ridiculous as it really is. Every man's material condition will depend entirely upon his industry, effort and intelligence, as it should of course, and not upon pensions, "uplifts" or public benevolent institutions.

The existing hatred and envy in certain quarters of great riches and other material success will be largely dispelled, the cause for such feeling having been removed by the knowledge that success can be obtained only by superior industry and real merit. There will be a further tendency toward government ownership of public utilities, and not because such a condition will not be attended by evils, but rather because the present situation is attended by still more evils. There will be continued progress in the movement to have workingmen own stock in the companies where they are employed. A gratifying instance of this is shown by the recent step of the Firestone Tire & Rubber Company, 11,000 of their 12,500 employes now being stock-holders and getting their stock at $100 per share when the market price is $140 a share. Although such a step would not be practicable in all cases, it will go a long distance toward solving the labor problem.

All this will not bring about the millenium by any means, but it is all in the direction of progress and for the improvement of the public welfare. It is true it is often far easier to pull down than to build up, and to destroy than to preserve. One man may stir up a trouble that an army can scarcely quell. But this peaceful revolution is even now in progress and gathering force as it proceeds. It is not our purpose here to either commend or condemn all its features. But it is as useless for any one to stand in its way as to stand before the car of Juggernaut.

ALL MAY HELP.

He also helps in this war who prosecutes business as energetically as possible.

It need hardly be recalled that we have often emphasized the importance of encouraging the consuming power and natural inclinations of the people to take care of normal production. This at present does not apply. Today we should encourage production and urge economy in consumption. Men em-

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ployed in war or military activities do not produce; they consume even more food and clothing than when employed in private life. Production then is the present need—production of food, of clothing and of munitions of war. Of these there can scarcely be a surplus.

Let the business of manufactures and of agriculture go on with redoubled zeal and enterprise, and without an over-weening itching for big profits. It may not be possible for all business men to directly assist our country in its hour of need, but any one can indirectly do so by producing as much as possible and being satisfied with as small profits as possible. Let all contribute as freely as possible of their means. Let us all wear our clothing a little longer, live more frugally, and cut off all luxuries.

By doing this, the war of humanity against military ambition and predatory aggression will soon be over. Let us hope it will be followed by a harvest of perpetual peace.

OUR FOREIGN CRITICS.

Is it not about time to call a halt to the charges, commonly made abroad, and often echoed at home, that the people of the United States and the government of the United States are "dollar worshippers?"

This nation is the most generous, the most benevolent, the most broad-minded, the most free from bigotry, and the most justice-loving of any on earth. The writer of this can lay claim to some knowledge of this, for he has lived in most countries that have any claims whatever for comparison—not merely passing through them as if shot out of a gun, so to speak, but spending time to note resemblances and differences.

We have long made this country "an asylum for the oppressed" for the entire civilized and half-civilized globe, welcoming the down-trodden and destitute with open arms, putting them on their feet, and quickly making prosperous citizens of them. And in some respects these forlorn immigrants have been of decided advantage to us. They have taught us lessons of thrift that were and are still needed. Most foreign-born workers will easily live on half the expense of the "to the manner born" worker. As a result they soon become fore-handed and prosperous.

But unfortunately, they often seem to forget the source of their good fortune. From their ranks are recruited most of the lawless organizations which boast of their lack of patriotism rather than feel ashamed of it. They seem to have forgotten that in many cases they are simply guests of the nation, and like guests in the private home, they may well refrain from fault-finding and censure. Otherwise let them return to their own homes.

Understand, it is not representatives of one nation we refer to, but to all, for the tendency is noticeable among all, although less among some than among others. Objectionable as he may be in many respects, the "heathen Chinee" seems to best mind his own business, and return to his own country without complaint when he no longer finds things here to his liking.

It is true, we have heard Americans when in Europe express criticisms of foreign customs or institutions, but this is less objectionable. It merely indicates a lack of breeding. They were merely travelling through those countries or temporary sojourners. They were not there because they found it difficult to get a living at home, or because of the restraints of their own government. They were helping to support such countries, not getting out of them a better living than they ever had before.

Our advice to all, whether native or foreign born citizens, is that when they find life objectionable in another country, simply get out of it. This is not only the best policy but it is the highest wisdom.

During the present war in Europe this nation of alleged "dollar worshippers" has given tens of millions to the distressed there beyond anything ever before known. This at least might silence all criticism whatever.

STARTING AND LIGHTING.

Will readers bear in mind the fact that early and late models of electric starting and lighting systems together with the variations of the same system on different automobiles, number scores? No single individual or corps of individuals can solve all the difficulties that they involve.

This should be considered by those who ask information of our Trouble Department. Requests for the solution of troubles and for wiring diagrams, or both "by return mail" are frequent, although as can easily be seen, such requests are most inconsiderate.

Requests of this sort should invariably be sent either to the manufacturers of the systems involved or to their service stations. Even in such cases, it will often be difficult to secure the information sought, and whenever possible by far the best plan is to take the car to the service station which makes a specialty of that particular system.

But better than all else is to acquire a practical working knowledge—a clear insight into the reasons for the various actions and reactions of electric lighting and starting—before attempting to run or care for a car having such an installation. If this be done, the system is likely to have at least intelligent care, and this will obviate all trouble save that which comes from legitimate use or inherent faults of the system.

SERVICE THE WATCHWORD.

With the aid of the tractor and other modern farm machinery this country can raise enough wheat and corn to supply the civilized world, and we have automobiles enough to deliver it to railway stations quicker and at less cost than ever before.

But back of this result there must be the will, the effort and the knowledge of productive efficiency. The old regime of thoughtless, take-it-for-granted farming has passed away. In its place has come scientific farming, and the modern farmer requires a higher and a more specialized skill and knowledge than either the business man or the professor in other departments of effort.

Unfortunately, this issue will reach its readers just too late to be of the highest service in urging the initial work for food production. Though we be car owners or editors only, we can each and all do something toward supplying the home and the world with food. Today, the man who produces food for market is contributing to the highest public service.

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Hats off to him! And he who produces enough food for his own need is likewise promoting national welfare.

Get that garden under way now! It will contribute to health, to happiness and prosperity. Away with complaints of the high cost of living! Think of the sacrifices others are making. Produce! Drones and do-nothings are now a public menace. Let service be the watchword.

THE CARE OF MOTOR TRUCKS.

Every truck or commercial car driver or owner should carefully read the article on truck driving which is printed elsewhere in this issue. It was published by permission of the B. F. Goodrich Rubber Co., Akron, O., and the trade in general owes this great firm much for their enterprise in printing something that is of far greater value to manufacturers and owners than to the firm itself. The author is an unusually clear thinker. He understands the subject both from a practical and a scientific view-point, and it is readable "like a tale that is told" rather than as the most comprehensive article that has yet appeared on a most important subject.

A far greater number of trucks are destroyed through ignorant or indifferent driving than from use. It would abundantly pay manufacturers to have this article placed in the hands of every owner of their product. A truck or commercial car is too valuable a piece of property to be destroyed by misuse long before its term of usefulness would expire by rational treatment.

Pleasure car owners might also be made to see their sins of omission and commission if its practical truths in relation to the handling of automobiles were impressed upon them.

EYES AHEAD.

About the most uncertain thing in this world is the cost of running an automobile, and estimates of this cost are more uncertain still. But by far the most important element entering into this cost is the way the car is used. Men are driving cars today who are fit only to drive sheep. Nor is the speed, the handling of the clutch, the speed lever, the carburetor, or the lubrication the only elements that enter into the question. Two men may be equally proficient in the qualities named, and yet one will damage the car twice as much as the other in going over the same road at the same speed. The driver who keeps his eyes fixed ahead and takes account of the depressions and other obstacles in the road uses his car far more economically than the one who runs blind, so to speak.

INCONGRUOUS LAWS.

There is no reason whatever why automobile license fees should not be worth the same in one State as in another. But the charges vary for registration fee from $2.50 to $10 in Colorado and $10 to $40 in New Hampshire, and from 25 to 50 cents per horse power. For driving license the prices are from nothing to $5, and for non-resident license from exemption to 10 days.

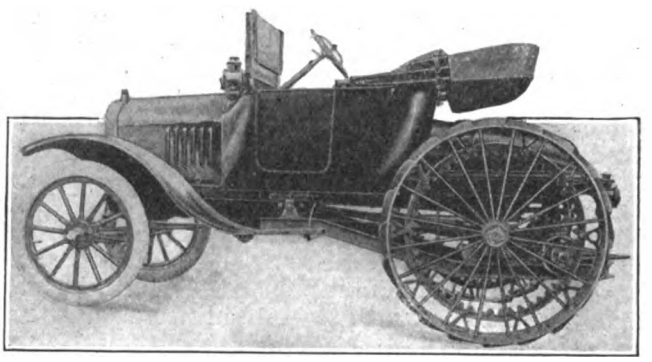
It would be decidedly advantageous and sensible if the entire slate of automobile laws were wiped clean and a general law passed that was concise and simple. Then tourists and other inter-State drivers would know what to expect. Fully half the automobile laws in most States are wholly unnecessary. Many of them are as out of place as laws governing the keeping of pigs or horse-drawn vehicles. Common law would cover most questions that come up for adjudication.

TRACTOR AND TRAILER.

Will Pull Any Farm Machine or Load When Attached to a Pleasure Car.

The Knickerbocker Motors, Inc., 170 Broadway, New York, has made plans for the building of a comprehensive line of tractors and tractor attachments, in addition to the line of trucks already announced. The tractors will range from an attachment for the rear of a pleasure car and selling at $178 to heavy units of 10 tons capacity. Instead of turning out the trucks and big tractors first, however, the tractor attachment has come first. It is planned to build 10,000 of these machines in 1917. In the design of the tractor attachment much ingenuity has been shown in making existing constructional features do duty without alteration when the car is converted into a tractor. While the rear axle is used as a sort of jackshaft, as is the case with a number of attachments of other makes, it is not moved from its place and the ordinary pleasure car wheels can be replaced and the car again used in its original capacity, the change requiring but a short time.

A frame extension is provided that extends from a point just under the front door of the car, where



Can be applied to practically any pleasure car and can be removed when it is desired to use the car on the road. Has a pulling power of three horses. The price is $178.

it is bracketed to the car frame, to a point a little back of the rear end of the frame. The extension frame is dropped so that it passes under the original rear axle of the car, and it carries bearings for a pair of large steel-rimmed, cleated tractor wheels with broad surfaces adapted for work in soft ground. Each wheel carries a large internal gear, and these gears mesh with pinions mounted on the ends of the rear axle driving shafts after the road wheels have been removed. The dimensions are so worked out that the relative positions of the original car axle and the big internal gears are exactly correct for the engagement of the gears. Suitable brackets are provided for bracing the car axle in place on the extension frame, so that it will not move out of line under the heavy pull when power is applied. The car rides on its own springs exactly as if the attachment were not applied.

The large diameter of the internal gears and the small pinions give a total reduction of 44 to 1, which

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reduces the speed of the car greatly and correspondingly increases its pulling power. The makers state that the attachment takes all the extra stress, due to the increased leverage or multiplication of power, leaving the original parts of the car to take only the stresses for which they were designed.

It is the idea of the company that the attachment makes it possible for the dealer to greatly increase his field of activity, not only by selling attachments for cars in use, but by placing them on used cars and making combination prices that, in many cases, can be made very attractive. The fact that the attachment can be removed with little loss of time and the regular wheels replaced, so that the car can be used for ordinary road driving, is greatly in its favor.

The Knickerbocker Forma-Tractor weighs only 650 pounds, and delivers a pull at drawbar of 1,200 pounds. The average steady drawbar pull of a horse is 150 pounds. Every Ford owner can now obtain for $178 a complete power farming unit that answers every tractor requirement for preparing the soil; tending the crops; harvesting and hauling produce to market; and in addition he can have a pleasure car available for touring purposes. There are no changes made in the Ford or other car to which Knickerbocker Forma-Tractor is attached. Every part is utilized except rear wheels and rear fenders. Once the frame is attached to car it need never be removed. Remove the tractor wheels and replace pneumatic tired wheels in fifteen minutes.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Tire Came Off.—While a truck was going at a high rate of speed near Houston, Texas, a tire came off. Four men were thrown off and one landed beneath the truck and received injuries from which he soon after died.

Backed Auto on Track.—At a point where the track is visible for at least a mile, at Hickory, N. C., a driver backed his car onto a crossing and it was hit by a westbound train. The driver's neck was broken and he died instantly; two women were injured.

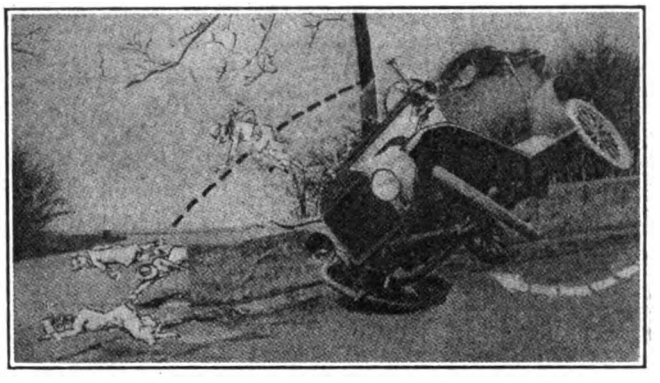
Intoxicated Driver.—A young woman, at New York City, while under the influence of intoxicants was speeding her car and failed to stop when she hit a man. The police fired two shots at her before he succeeded in bringing her to a stop. The victim sustained a broken leg, contusions of the face and probable fracture of the skull.

In Effort to Miss Dog.—One person was killed and two mortally injured at New Haven, Conn., when in an effort to miss striking a dog the driver swerved the machine while going at a fast clip and it turned over.

Couldn't Find the Brake.—At Portland, Oregon, an automobile driven by a youth who was not familiar with the car plowed through a group of pedestrians fatally injuring one. Two others were less injured. The car was coasting and the driver stated that he "couldn't find the brake."

Wheels of Two Cars Locked.—Four persons were killed at Seattle, Wash., when two automobiles locked wheels, crashed through the trestle and plunged into the water. The driver of the car in the rear speeded up and attempted to pass the car ahead when in some manner the wheels became locked and both cars crashed through the railing together.

Front Wheel Slipped.—At Chicago, Ill., a woman was killed and two others injured, when the front wheel of the car in which they were riding slipped and the machine struck a retaining wall. The woman who was killed was hurled against the wall and



The fatal result.

her skull was crushed. One woman received a broken leg and another a broken shoulder. The police say that a bottle of whiskey was found in a hand bag belonging to one of the party.

At Fifty Miles an Hour.—A young man was knocked down and killed at Yonkers, N. Y., by a large touring car that was racing with a smaller car on one of the principal streets. Neither of the cars stopped after the man was struck but continued the race. The man's skull was fractured, both arms broken and his body was badly lacerated.

Could Not Manipulate Car.—While fleeing in a stolen automobile at New York City, a thief ran down and killed a man who was pushing a car in front of him. He was trying to escape the police but could not manipulate the car and after killing the man crashed into an electric light pole, and jumped from the car and disappeared.

Swerved to One Side.—As the result of a recent automobile accident at Laramie, Wyo., one woman is dead and four seriously injured. The lady driving the car, with four friends, was returning from a funeral, and while speeding down a street saw another car approaching on a cross street. The advancing car had the right of way, and the lady to avoid collision swerved to one side, causing the car to turn completely over, and with the engine still running, it ran into the curb and stopped.

Speed to Blame.—A car while going at the rate of from forty to fifty miles an hour while in a rut attempted to turn out but the speed was too great and the machine turned over. One man received a fracture at the base of the brain and never regained consciousness.

Closes Eyes and Struck Pole.—A driver admitted closing his eyes while driving near Chelmsford, Mass., just before an accident occurred. The machine was running at a good clip when it struck a pole, snapping it off and upsetting the car. The car was a wreck but the man was not injured.

Let Go Wheel to Button Curtain.—An automobile skidded into a ditch and upset at New Brunswick,

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N. J., when the driver let go of the wheel to button the curtain flap and lost control of the machine. All four occupants were crushed underneath the car and one woman will probably die. The others were painfully injured.

Attempted to Make Curve While Speeding.—A car turned turtle at a sharp curve near Charlotte, N. C., when the driver tried to make the turn while going at a fast rate of speed. One man was almost instantly killed as he was thrown from the car and landed on his head. Two other men were uninjured. It is stated that all three had been drinking.

Turns Turtle and Skids.—Ten persons were injured, two of whom will probably die, at Los Angeles, Calif., when a big touring car, traveling at the rate of 50 miles an hour, skidded about 150 feet and turned turtle.

RATHER SENSIBLE.

A New Automobile Driving Bill Which Has Few Objections.

The Knight-Welsh traffic bill, which provides for the "uniform regulation of vehicles, animals, and pedestrians" on every public highway throughout the length and breadth of the State is likely to become a law in this State before this issue appears. The bill is in consonance with the idea we have urged for several years.

"Reckless driving" is defined by the bill as "driving or using a vehicle or street surface car or any appliance or accessory thereof in a manner which unnecessarily interferes with the free and proper use of the highway, or unnecessarily endangers users of the highway." It is true a speed limit is imposed, more than 30 miles an hour being considered presumptive evidence of reckless driving. It is not worth while objecting to this, although we can conceive of instances where much faster speed may be driven and still not endanger any one or anything unless it be the neck of the driver himself, which will enforce a self-imposed punishment. The following are some of the traffic rules which will be enforced all over New York State if the new measure becomes law:

Pedestrians crossing a street at a street intersection shall do so at right angles to the general traffic, and shall not cross diagonally except to address a police officer who may be directing traffic.

A vehicle turning into another street to the right shall turn the corner as near the right-hand curb as possible.

A vehicle turning to the left into another street shall, before turning, pass to the right of and beyond the center of the intersecting street, provided, however, that if directed by a traffic officer the vehicle shall pass in front of instead of around the point of intersection.

A vehicle, on overtaking a street surface car which has stopped for the purpose of either receiving or discharging passengers shall not pass or approach within seven feet of such car while it is receiving or discharging passengers, except that in a city having a million inhabitants or more the vehicles shall not approach within eight feet of such car.

Two vehicles which are passing each other in opposite directions shall have the right of way, and, except in cities and villages, no other vehicle to the rear of either of such two vehicles shall pass or attempt to pass such two vehicles.

Except in a city of a million or more population, every driver of a vehicle approaching the intersection of a street or public road shall grant the right of way at such intersection to any vehicle approaching from his right; provided, that wherever traffic officers are stationed, they shall have full power to regulate traffic.

The driver of an overtaking vehicle shall signal his desire to pass an overtaken vehicle by a blast or stroke of the horn or other signalling device, and when he does so it shall be the duty of the overtaken vehicle, if possible, to turn to the right so as to allow the overtaking vehicle a reasonable space in which to pass, or to warn by signal the impossibility of such passage.

The use of a vehicle is prohibited when it is so loaded with iron or other material as to create loud noises while in transit.

A vehicle unless confined to tracks shall not tow another vehicle except a trailer, and the connection between the two vehicles shall not be longer than sixteen feet.

No motor vehicle shall be operated in such a way as to emit unnecessary smoke or unnecessary offensive vapors within the streets of any city, town, or village.

A vehicle when loaded with any material extending beyond its rear shall be provided with a clean red flag by day and a red light by night on the extreme rear end of such load.

Any vehicle when stopped parallel to the curb shall stop as near to the curb as practicable, with wheels, both front and rear, not more than six inches from the curb.

Reckless driving is prohibited. Every person violating this provision shall, upon conviction thereof, either upon confession or competent testimony, be guilty of a misdemeanor and shall be punished by a fine not exceeding $100 or imprisonment not exceeding six months, or by both such fine and imprisonment in the discretion of the court.

Engineering Publicity.

W. F. Schaphorst, M. E., advertising engineer, and author of technical articles that have been published in Automobile Dealer and Repairer, has established an engineering advertising service with office in the Woolworth Bldg., New York City. He solicits business with manufacturers of high grade engineering products. It need hardly be stated that Mr. Schaphorst is thoroughly reliable as well as practical in his line of work.

Overheating.

Many motorists storing their cars in an unheated garage draw off the water at night and refill with hot water when getting ready to use the car. If this last operation is not carefully watched, an air-lock may form in the cylinders or piping, especially in old cars whose water system contains considerable grease derived from the pump. The car will run for some miles on a cold day before the water gets hot enough to boil and break the air-lock and the reduced quantity of water left will boil.

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This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2102 **Poor Lights.**

From Levi Martin, New York.—Last year we bought a used Overland car, model 79, which is in good running order, but has poor lights. We got a new 3-cell, 6-volt, 80-ampere Willard storage battery and had it recharged but this did not improve the light much. I have cleaned all connections and do not find any short circuit in the wire. The car is equipped with Gray and Davis lighting system. We use 6-8 volt c.p. bulbs. Can you tell me how to get more light?

Reply.—Test the electrolyte of the battery to see that it registers 1275 or 1300 specific gravity. See that the ammeter registers a charge when the engine is running, otherwise the battery may become discharged. The lamps may be out of focus. By unloosening a set screw back of the reflector, the bulbs may be moved forward or backward and a better concentration of light obtained. If using carbon bulbs, replace with Tungsten, nitrogen filled.

2103 **Connecting for a Spot Light.**

From Geo. Walrath, New York.—Please tell me how to wire Maxwell No. 25 car for a spot light, so as to have light without turning on the other lights?

Reply.—Mount a single switch on the dash and connect a wire from the left hand terminal on the back of the ammeter to it. Connect another wire from the switch to the spot lamp and ground the other terminal of the spot lamp. You may procure a spot lamp with a switch incorporated in it. In this case it will only be necessary to connect a wire from the ammeter to the lamp and ground the lamp.

2104 **Oil.**

From C. E. Lampman, Oregon. — What is generally the effect of oil working into the breaker box? Would it be likely to cause occasional misfiring? What oil is best to use with oiler? Should the wicks come in contact with the journals? I am using a Briggs magneto which has oil receptacle with wick feed and in opening the breaker box I find considerable oil on the parts inside and as I am bothered more or less with skipping, especially when I press the accelerator pedal well down rather suddenly. I am at a loss to know whether to blame the carburetor or the ignition so any information will be gladly received.

Reply.—Oil in the breaker box gets on the contact points and burns, leaving an insulating deposit. This would cause misfiring. Ordinary engine oil works well with wick oilers. The wicks should come in contact with the journals. This oil receptacle has a 6-ounce capacity. If more than this is put in it might flood into the breaker box, especially if the bearings are badly worn. Worn bearings, well lubricated also may give a poor return ground.

2105 **Probably a "Gas Knock."**

From Leo G. Fritz, New Jersey.—I have driven a Willys-Knight about 3600 miles, and to date have found it to give excellent service. It has been a great motor for power and flexibility, and its quietness of operation has been fine until lately I have noticed a very pronounced knock such as one striking a piece of metal with another tool—a very dull thud, noticeable only when running idle. For our own satisfaction we had the motor taken down by a competent repairman, our local agent, and there was not the slightest wear on the main bearings, push rod bearings, wrist pins, and in fact the motor was the same as new—everything tight and in good condition. The carburetor has not been bothered in any way, and the ignition which is furnished by a Dixie magneto seems to be all right. There was only one thing about the magneto that I noticed, and that was that one of the four platinum points of the distributor seemed to be weak, so that if it were pushed in with the finger it would not spring back properly. Do you think this could cause it? Or would that have a tendency to make it miss? Understand, the motor runs fine, pulls well and does not miss. It is merely that disagreeable knock which I know should not be in that motor. I hope you can solve this puzzle for me, or perhaps some of our readers have had such experiences with the Knight sleeve valve motor that would be of help to me.

Reply.—This is probably one of those mysterious knocks which repairmen term a "gas knock." This means it is not caused by wear or looseness of any of the mechanical parts. Other owners of these cars have had the same trouble and the service men have not removed or explained it. To eliminate other possibilities, we would suggest putting a drag on the magneto shaft, between the universal joint and the magneto. There are certain points in the rotation of the armature when the armature is pushed forward by the action of the magnets. This sometimes causes a decided knock if there is play in the universal joint or if the chain in the timing gear case is slack. Other manufacturers of the Knight engines have provided a brake at this universal joint to overcome this slight sound which seems very loud with other parts of the engine so silent.

2106 **A Slight Click.**

From Dr. Arthur M. Trivett, District Columbia.—I have an Oakland six, model 32, 1916, which from the time I purchased it last March has given me trouble in cylinder No. 1 by fouling the spark plug and throwing oil. After running it about 1000 miles I took it back to the agency and complained about the matter and they put in new piston rings and put felt packing under them, so they said. That helped it greatly but did not stop it entirely. My car has never shown as much power as other cars of

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the same model and year. Recently the car has developed a slight clicking sound which seems to be in the front cylinder, and that cylinder now throws oil very badly, so that if I drive at a speed of 20 or 25 miles per hour the oil works up through the exhaust valve and will stand in a puddle on top of the motor. Of course this makes the motor miss and gallop very badly. The garageman says that the clicking in the motor is a "piston slap" and that the best thing for me to do is to have larger pistons fitted in. Says that will cure all my oil trouble, give me more power and more miles per gallon of gas. The car has run only 5000 miles. The ignition seems good. I have only run it about 300 miles since I had the carbon removed and the valves ground. The slap is gradually becoming more distinct and on a hard pull the car knocks considerably. Will you please give me your advice as to what is best for me to do? Is it likely to injure the motor running it in its present condition? I had forgotten to tell you that when the motor is running slowly, and I remove the cap from the oil breather pipe I can hear a hissing sound in the crank case. The garageman in the Oakland service department, claims that the pistons in all the 1916, 32 models had too much play, and that the 1917 pistons are much tighter, and therefore the additional horsepower claimed. Any information and advice will be greatly appreciated.

Reply.—The slight clicking sound you refer to may be due to a broken piston ring which would also allow the oil to work up more freely. 5000 miles of travel should not give wear enough to cause a piston slap but it is probable that the garageman is right and we would recommend following his advice. Running the engine in its present condition will not injure it to any extent.

2107 **Wants to Know Much.**

From G. O. Zoellner, Wisconsin.—What make of leak-proof piston ring do you consider the best? If you do not care to state the name of one as being the best, please explain the advantages and disadvantages of each. I think the "Pressure Proof Piston Ring" made by the Pressure Proof Piston Ring Co. of Boston, Mass. a good ring, because it not only has the features of other leak-proof piston rings, but it also expands in the ring groove, thereby preventing leakage of oil and compression under the ring. Make this reply with the understanding that the rings are to be used on a Saxon six, model No. 2. This car gets too much oil, making it necessary to clean out carbon about every 300 to 500 miles. When the head is removed the tops of the pistons are covered with oil but most of the carbon is formed on the valves and other parts of the combustion chamber. Some cylinders have more carbon formed than others, but this order varies. Sometimes cylinders Nos. 1, 3, 4 and 6 will have more than the others, then again cylinders Nos. 2, 4 and 5 will have more; that is, the order is never the same. This surplus of oil is not caused by any fault of the oiling system as the oil is carried at the proper height at all times. And it cannot be caused by wear as the car has only been run about 3500 miles and it has been this way ever since it came from the dealer. The motor has never been run with insufficient oil or been overheated at any time. As you know this car comes from the factory equipped with one Burd ring on each piston. Do you think that by adding another leak-proof ring this trouble would be avoided, also state in which ring groove you would place this second leak-proof ring? 2—What is your opinion of the "Wilmo Manifold"; do you think it would work successfully on the Saxon six and what would be its advantages and disadvantages? 3—How would you stop the leakage of grease from the rear axle housing of the Saxon six, this being on the top and bottom edge where the housing is joined together? On the next cars these halves are welded together, but explain some remedy or repair that could be done by the individual or at small expense. 4—How are the terminals disconnected from the Exide battery which is used on the Saxon six? These are fastened with a small bolt which screws into the end of the cable, but when this bolt is removed the cable is free to turn but it cannot be pulled out. 5—Is it possible to change the total of the season trip on the Stewart magnetic type speedometer? If so please explain how it can be done. 6—Under ordinary conditions how many miles can a car be run before the bearings should be adjusted, especially the bearings in the engine, transmission differential, rear axle and all others in general?

Reply.—1—We have no preference for any particular style of leak-proof ring. Leak-proof rings will help to keep too much oil from entering the combustion chamber but may not entirely eliminate this trouble. To overcome the carbon trouble, either have the oil level very carefully lowered or have grooves turned under the lower piston rings with holes drilled through the pistons to feed the oil back to the crank case. 2—The manifold in question will keep the gases vaporized and add power and efficiency and general satisfaction in the operation of the motor in cold weather. 3—We do not understand just where this leakage occurs, but if it is a bolted joint, a gasket with plenty of shellac should fix it; or, if a rivetted joint, it may be plugged with "Smooth-on." 4—Back out the bolt about one turn and force the wire out by using a C clamp, spanning the lug and the bolt head. Or, back up the lug carefully to prevent breaking it off and hammer on the head of the bolt. The connection on the end of the cable is tapered and once started it may easily be removed. It is probable that the cable is partly free in the terminal piece but this piece is wedged into the lug. 5—This can best be done by sending the instrument to the manufacturer, as any tampering with it voids the guarantee. If, for any reason you must do it yourself, drive in the three small pins found by very close inspection around the edge of the cover. The cover may then be removed and the pins recovered. Remove the speed indicating hand. Turn the instrument face down and the face will drop off. A loose key will be found at the inside end of the rod used to set back the trip recorder. This must be removed and the shaft partly pulled out of the case to clear the mechanism. Remove the three screws that fasten the mileage mechanism to the case and take it out. On the left hand end of the support for the season indicator will be found a key that may be removed by taking out a screw. This allows the shaft on which the cylinders revolve to be withdrawn. The cylnders may then be collected and all set to zero or whatever register desired and strung on the shaft

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as it is being replaced. Care should be taken to see that all of the half teeth of the little gears that drive the cylinders are in the same position when they are meshed. 6—This varies greatly in cars of different manufacture and much depends on the care. Normally, connecting rod bearings may need adjusting in 5000 or 10,000 miles and other engine bearings in 25,000 miles. Transmission, differential and rear axle bearings are usually of the ball or roller type and need adjusting or replacement after 25,000 to 50,000 miles wear.

2108 **A Boiling Battery.**

From D. B., Iowa.—I have an Oakland, model 36, car with Delco system and a Willard battery. 1—What makes the battery boil if water has been added? It boils nearly out of the filling holes when the engine is running. 2—Does it harm the battery if it boils? 3—What makes some of the acid come on top while the battery is idle? 4—What measurements are necessary for selecting a carburetor? 5—In putting leak-proof piston rings on a piston, two to each piston, on a six-cylinder motor, where would it be best to place the rings? 6—Could you suggest any remedy for a leaky radiator besides soldering? 7—What causes a motor to miss more on two cylinders than on the others? 8—What is meant by series, field and shunt in a generator?

Reply.—1—The boiling you speak of is probably gasing which is normal when the battery is being charged, but if excessive, indicates that the charging current is of too great amperage. 2—If the battery actually gets hot enough to boil it is harmful and requires immediate attention. 3—This may be either condensation of the gas given off through the vents or, if you put in too much water, it may bubble out. The electrolyte should cover the plates about ¼ inch. This leaves a space below the top of the jar through which the gases may pass off. 4—The inside diameter of the inlet pipe or manifold determines the size of the carburetor; as, if the manufacturer intended a 1¼-inch carburetor to be used, a 1¼-inch inlet pipe will have been provided. The carburetor dealer, also. will supply the proper size carburetor if given the bore and stroke in inches and number of cylinders on the engine. 5—In the two top grooves. 6—Satisfactory repairs are often made by plugging the leak with "Smooth-on." Do not put bran or other substance in the water as this effects only a temporary repair and is likely to clog the small passages and cut out large radiating surfaces. 7—When cylinders are paired, a leaky gasket where the inlet manifold joins the pair will thin down the mixture and cause that pair to misfire. Where two cylinders are fed from the same oil trough, too high a level will cause oil on the plugs or carbon under the exhaust valves. 8—The field of a generator is the winding of insulated wire around the stationary soft iron pole piece. When connected in series all current from the armature flows through the field and from there to the battery or other "load" and from thence back to the armature. In the shunt connection, the current flows directly from the armature to the "load" and back, a small amount of it at the same time flowing through the field and directly back to the armature. Series field windings are of comparatively heavy wire with few turns, while shunt windings consist of many turns of fine wire.

2109 **From Dan to Bersheba.**

From Emil Elmstrand, South Dakota.—1—What are lubricating oils made from? 2—In testing the horsepower of a hit-and-miss type of engine and using a Proney brake, is the engine supposed to be cutting out and in, or continually firing when the readings are taken? 3—Is it possible to charge an automobile storage battery from the battery of a home lighting plant and using only a part of the cells of the latter; and using lamps for resistance? 4—When gasoline contains water has it always been there or is it added after being distilled? 5—In rusting up a crack in a water jacket, using sal-ammoniac, is there any danger of it doing damage to the other parts of the water jacket?. 6—Is the Ford magneto strong enough to carry or furnish current for lights when they are in parallel? 7—It seems to me that the Edison storage battery possesses more advantages than other batteries; why is it not used more on automobiles than others?

Reply.—1—Crude oil or petroleum, sometimes castor oil for special purposes. 2—If maximum horsepower is to be determined, the engine should be continually firing. 3—Yes. 4—It is added after being distilled; either by carelessness, accident or condensaton inside of the container. 5—No. 6—Yes. Voltage and candle power will depend upon year of car. 7—Storage batteries on practically all cars are used to operate the starting motor. The Edison storoge battery, on account of its high internal resistance, is unsuited for this work. When connected to the starting motor the voltage falls off to practically nothing and the motor will not operate.

2110 **Carburetor Loads.**

From Michael P. Russo, Connecticut.—I have a K No. 2 Stromberg carburetor on my Jeffery 4-cylinder, 1916, car, and when I run the car at the rate of 10 or 15 miles an hour or let the motor run idle with the spark either retarded or advanced, it loads up. I had a No. 60 spray nozzle and I had a No. 62 put in, but still there's no improvement. I've had it adjusted and readjusted many times but with no success. I've asked the local agents about it and they say that it's because it's a high speed motor. Can you give me any light on the nature of the trouble?

Reply.—At low engine speeds the air velocity is not great enough to completely atomize the gasoline. This allows it to return to its fluid state. Supplying more heat to the mixing chamber or to the ingoing air would help to gasify it at this speed. Likewise a different carburetor with a smaller venturi would increase the velocity of air at low engine speeds and probably overcome the trouble.

2111 **About His Ford Car.**

From H. G. Neuhart, Nebraska.—I want to ask a few questions about my 1914 Ford car. 1—Has the magneto enough current to run an electric headlight with success? I have been using a spot light but am having considerable trouble burning out bulbs. 2—There is also a knock in the motor when going up hill or on a hard pull. The last cylinder misses in going slowly on high. I have had the valves ground down; also put a new cable on. No

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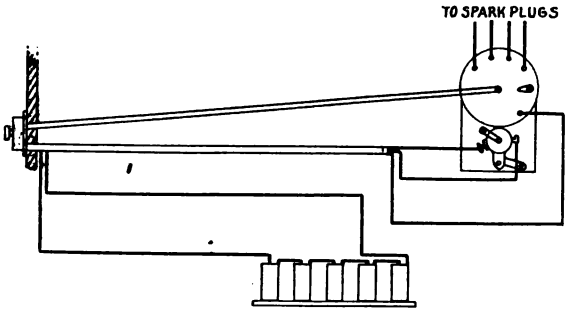
adjustments of the carburetor helps. It doesn't seem to knock as badly by giving less spark. Has been run 3000 miles.

Reply.—1—Yes. If single headlight is used, 12-volt bulb is required; if two headlights are desired, use 6-volt, 12-candle power bulbs wired in series. 2—The knock may be due to worn cylinders, in which event it may be overcome by having the cylinders reground and new pistons fitted. Loose wrist pin bearings, crank pin bearings or excessive carbon in the cylinders will also cause a knock that partially disappears when the spark is retarded. To locate cause of missing, see that the vibrator is properly cleaned and adjusted. If it sparks considerably that coil may have a punctured condenser. If compression is poor examine valve stems to make sure that there is clearance betwen the ends of the stems and the push rods.

2112 **Low Tension Remy Wiring.**

From R. E. Norris, Arkansas.—Please give wiring diagram for the Remy low-tension magneto such as was installed on the Buick 16 and 17, Great Western 1910 models.

Reply.—The following diagram answers the purpose.



2113 **Delco, Jr., Trouble.**

From W. T. Parker, Maryland.—My Delco Jr. will not rotate slowly when the starting pedal is part way pushed in and before the motor brush is dropped on armature. The battery is fully charged and it is not from this source. The closing of the contacts in the cut-out relay will not rotate the motor slowly as is desired so as to mesh with the gears on the fly wheel; it is necessary to push in this starting pedal full and allow the second brush to be dropped on the armature. Then the motor will crank the engine. The gears are not always in line, hence the slow turning of the motor allows the meshing of the gears without force.

Reply.—Your trouble is in the generator circuit. Either there is a poor contact on the cut-out relay points or in the generator brushes. The ground brush in the generator may not be in contact with the commutator. To remedy the trouble we advise that you secure the services of an electrician or take it to some service station of the Delco system. It is not a good plan to tamper with anything of this sort, unless you thoroughly understand it.

2114 **A Question of Load.**

From Reader, Maryland.—Suppose an iron bar, 16 feet long that weighs two tons is carried upon an automobile truck with a body 6 feet 7 inches long; how much weight rests upon the rear axle or body of the automobile?

Reply.—The weight that rests upon the rear axle would be two tons. Nor would it be more than two tons though the bar extended further beyond the rear axle and less on the body of the car.

This is assuming of course, that the vehicle or truck runs upon a level surface, and that the axles are integral with the truck, just as is one side of a platform scale with another. But if the two axles were separate and distinct, the rear axle would carry as much more than the whole weight of the beam as the amount of force required at the front axle to hold the beam down level.

2115 **Not Practicable.**

From O. O. N.—Is there a way of wiring a true high tension magneto so that the batteries could be used for starting, using only one set of spark plugs and if possible the distributor or magneto in place of the timer?

Reply.—This is possible but not practicable. It would be less expensive and more satisfactory to change the present magneto for one designed for this purpose. Several manufacturers make magnetos of this type.

2116 **Excess of Oil.**

From Geo. M. Bennett, Wisconsin.—I have a 1913 Cadillac car, 4-cylinder, which is being repaired. The engine was found in perfect mechanical condition but badly carbonized. The repairman suggests drilling a lot of 5/8-inch holes in the pistons. He says this will exclude an excess of oil from getting in the cylinders. The pistons were fitted with the regular 1913 Cadillac rings, but are now fitted with two leak-proof rings, with one plain ring in the center. I should like to know if it would be an improvement to drill any holes in the piston of this engine? If so, what size should they be, and how far apart from one another, and whether any of the holes should be on a line with or above the wrist pin? Any information you can give me for or against doing this will be much appreciated.

Reply.—The oil is drawn up into the cylinder mostly on the suction stroke when there is a vacuum in the cylinder and particularly when the throttle is closed and the vacuum high, as is evidenced by the fact that an engine running idle will quickly begin to smoke. When the engine is running, the oil is thrown up inside of the piston in the form of a fog and any holes in the piston wall will give a shorter path for the oil to the top of the piston. Turning a shallow groove directly under the bottom piston ring and drilling 1/16th inch holes through the piston wall will sometimes help, as the action then is a scraping down of the oil from the cylinder wall by the piston ring. The oil collects in the groove and works through the small holes back to the crank case. Large holes elsewhere in the piston do not give this action, as there is no provision for collecting and feeding the oil.

2117 **Too Indefinite.**

From Charles Johnson, North Dokota.—1—What size wire would give the best results for an armature made of punchings which have eight 1/2-inch holes for slots through which the wire is to be wound? The armature is 3 1/2 inches in diameter

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and 3 inches in length and is to be run at about 1,000 revolutions per minute. 2—What size wire could you recommend for the magneto?

Reply.—1—The question is too indefinite to give an answer. It would be necessary to know what voltage and amperage are desired. 2—What circuit of the magneto?

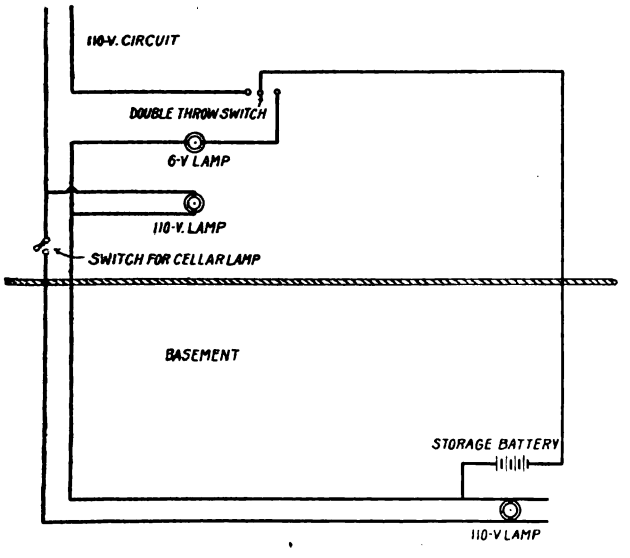
2118 **Wrong Connection.**

From H. A. Drake, Nebraska.—Some time ago the generator on a Reo 4, 1916, stopped generating and the owner sent it to the factory for repairs. When it came back I was called on to put it on, like it was before, but it charged the battery backwards and on testing out the generator I found that the current had been reversed. That is, there are three terminals below and two above on the Remy generator of those below. The left one goes to the lights, the center one is marked battery plus and the right one is battery minus. I found that the right one was plus and the center one was minus. In order to make it charge right and make the lights burn also, I changed the wires where they fasten to the starter cable. If I changed the wires that lead from the bushes to the cut-out relay, that is—put the positive wire on the center terminal—the relay would not work.

Reply.—Apparently, you attached the positive wire of the generator to the negative pole of the battery. This, when the cut-out closed, allowed battery current to flow in the generator and reversed its polarity. Changing the motor cables caused the ammeter to read correctly. Reversing the leads from the generator brushes to the cut-out terminals, connected each end of the shunt field winding to a negative brush and no current would flow through it. Therefore, no current would be generated and the cut-out would not operate.

2119 **Simple Wiring.**

From O. Ingmar Oleson, North Dakota.—This winter I am storing my 6-volt automobile storage battery in my cellar, at the same time charging it from the 110 D. C. current used to light the house.



I have wired according to the enclosed diagram, using a single pole double throw switch, allowing me to switch on a six-volt lamp at will or when the light plant is not running. My question is—if, when the switch is in position to light the lamps (110 volt) and charge the battery, the plant is shut down, there would be any chance for the storage battery to discharge itself through the circuit. My voltmeter shows a discharge of about one volt, at such times, but the amper-meter (ammeter) does not register any discharge. Can you suggest any simpler wiring, using only a single pole double throw switch, and only one wire leading to the cellar? The bedroom lamp and cellar lamp are on the same circuit and the current for either must pass through the battery. Can you suggest any simpler form of wiring?

Reply.—The wiring diagram shown is simple. The six-volt storage battery has its positive terminal grounded while the negative terminal is connected to the motor generator by a heavy wire which must first pass through the starting switch. The circuit is completed by a ground connection through the supporting bracket when the starting switch is depressed. There are two terminals on the cutout relay on the top of the motor generator; one of these is marked L, the other B. Terminal L leads to the negative of the storage battery, being attached to this lead on the battery side of the starting switch. Terminal B leads to the lighting switch. The remaining wires are easily followed, these leading to the various lamps, all of which operate on the one wire system.

2120 **Wants Pay for Repairs.**

From J. H. H., Delaware.—I have a motorcycle now in my place which was brought there for repairs. It is thirty days since it was finished and now the owner tells me he will not take it at the price charged for repairing it. The bill was large on account of having so many parts to replace. How can I get my money out of this? I don't want to go against the laws of my State, but I must have my money.

Reply.—The law gives you a lien for the amount of your labor and material performed on and furnished to the motorcycle and the owner cannot take it out of your place without paying the amount of your bill. On the other hand, you cannot sell the motorcycle without notice to the owner of the time and place of sale, as required by the statutes of your State. The statutes relating to the foreclosure of liens of this character are usually very strict and technical and in your case it would be very unwise to attempt to sell the motorcycle without consulting a local attorney and obtaining his advice. Without doubt, you would obtain your money by placing the matter in the hands of the local attorney and instructing him to proceed to foreclose your lien.

2121 **A Variety of Queries.**

From A. Stenason, Canada.—1—A friend of mine says a smooth tread tire will wear just as long as a non-skid, the only advantage of a non-skid being to prevent slipping. I claim a non-skid will wear longer as far as wear is concerned. Which is the cheaper to buy? 2—Is there any advantage of using non-skid tires on the front wheels? 3—Does it pay to put oversize tires on a car. A friend of mine has a car which weighs 2,150 pounds, with 30 by 2½ tires. 4—Is there any danger of an explosion in straining gasoline through a chamois? 5—Which are considered the best or brightest lights, Prest-

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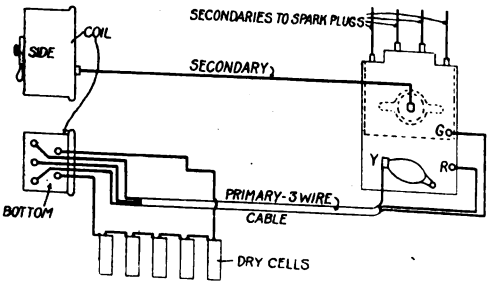
O-Lite or electric? 6—I am thinking of using a storage battery to fire a 3-cylinder, 2-cycle marine engine, speed 550 P. M., using an Apple dynamo; battery charger speed 1,050 to 1,200, or voltage 12 or 15 volts. Would you please give me a plan of how I could use it to get about 9 volts from the battery to the coil, and when the dynamo is charging the battery from 12 to 15 volts?

Reply.—1—Your friend is right. Probably non-skid tires are the cheaper to use. 2—No, under most conditions. 3—Most car owners think so. 4—Not much more than in being struck by lightning. 5—Electric lights are considered so. Most cars are now equipped with electric lights. The Prest-O-Lite Company is at present marketing a good lighting battery. 6—Write to the Splitdorf Electrical Co., Newark, N. J.

2122 **Wiring Connections.**

From Robert A. Tabor, Mass.—A have a Buick model 19A with a Remy magneto coil on dash. Is there any way to tell which way to connect the wires coming from the coil on the dash to the magneto? The wires are not marked in any way.

Reply.—A model 19 Buick is equipped with a Model S Remy. On this system the wires from the



coil are colored red, green and yellow. Connections should be made in accordance with accompanying sketch.

2123 **Wants to Add a "Spotlight."**

From Leslie E. Day, Vermont.—I have two inquiries to make which I wish you would answer in your next issue, if you please. 1—I have a 1914 model Overland car and I am desirous of attaching a spotlight. Now would it be injurious to plug through the dash with two copper bolts thereby enabling me to make the lamp connection from the inside of the dash? My point is: Would the two bolts coming in direct contact with the wooden dash be injurious or will it be necessary to extend the bolts through a non-resistable substance, such as rubber? 2—Would it be advisable to drive this 1914 Overland car with the battery removed? If not, why?

Reply.—1—The dash is entirely of wood and no other insulation will be needed for the bolts. 2—It would be possible to adjust the governor so that with all the lamps on, the generator will deliver the right current at all except at very low engine speeds. However, with such an adjustment, if the headlights are turned off the voltage would be raised and the other lamps burned out. The governor could be adjusted to carry side and tail lights, but this would cause dimming of all lights when the headlights are turned on.

2124 **Should Have Gone to the Manufacturer.**

From Edward C. Kern, New Jersey.—Will you write up the Genemotor made for Ford cars by the General Electric Co., of Lynn, Mass.? I would like an explanation as to how it operates. How do you know when the generator is charging properly? How do you know when it is charging too fast or too slow, or not at all? How do you know that it disconnects when the car is stopped? What is the box on the top of the machine for, and how is it arranged when it is all in proper working order? How can I put a small ammeter in the circuit?

Reply.—This machine is a motor generator positively connected to the crank shaft by a chain or shaft. It has one armature and two field windings, shunt and series, and is connected through a switch to a 12-volt storage battery. When the switch lever is operated it closes a switch mounted in a case on the top of the machine, which allows the current from the battery to pass through the windings and armature of the motogenerator. This causes the armature to revolve, and being connected to the crank shaft, to crank the engine. As soon as the engine starts the switch is released, and the engine continues to revolve the armature at a higher speed, causing a current of electricity to be produced in the armature, part of which is collected by a third brush and passed through the shunt field winding, producing the magnetism in the pole pieces. The larger amount is collected by the main brushes. When the voltage of the machine builds up to a pressure high enough to charge the battery, the automatic cut-out, also mounted in a case on top of the machine, closes, allowing the current to pass into the battery. The machine is prevented from producing too much current by the action of the third brush. When the engine slows down it causes the voltage of the motor generator to reduce, due to the slower speed at which the armature is rotated. When this voltage falls below that of the battery, the cut-out opens automatically, preventing the battery from discharging through the generator windings. As there is no meter installed with this system, there is no visible means of telling if the charging rate is too high or too low. However, a discharged battery would indicate too low a charging rate, while rapid evaporation of the electrolyte with short lamp life would indicate too high a rate. This could also be determined by disconnecting one of the heavy wires from the battery and connecting an ammeter to it and to the terminal from which it is disconnected. Crank the engine by hand, and with the engine running at a speed which would drive the car at 18 miles per hour, the meter should read 7 amperes. It is not practical to connect a small ammeter permanently in this system, as it would be destroyed by the heavy current required to operate the starting motor. The Weston Electrical Instrument Co., of Newark, N. J., may be able to supply you with a special meter that will operate under this condition.

2125 **A Strange Noise.**

From E. E. Carpenter, New York.—Last fall I purchased a new Dodge car and find that if I run it faster than 26 miles per hour, the engine makes a noise like a valve vibrating. Will you please tell me

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if it will do any harm; and could you tell me what you think the noise might be. I have never run the car faster than 35 miles per hour and only a few times that fast.

Reply.—We cannot determine from the description of the noise what is likely to cause it. It may possibly be the fluttering of the auxiliary air valve of the carburetor or it may be that at the speed indicated the rate of vibration is just right to make a dust pan, fender or horn rattle. If it is a vibrating sound it will hardly do the engine any harm.

2126 **Connecting an Ammeter.**

From W. C. Oquist, Connecticut.—I would like to ask you if an ammeter can successfully be connected to a system such as is used on the Dodge diagram of wiring enclosed. I tried an ammeter wired in series with the current indicator which was on the car. It worked all right, except when I pressed

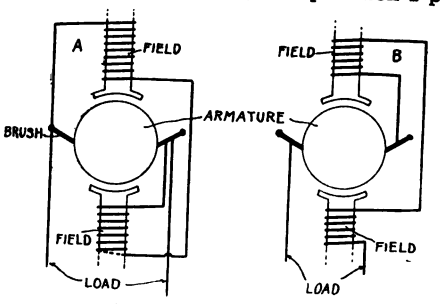


Diagram for Wiring.

the starter switch, the amperage was too great for the ammeter, which could only register 20, consequently bending the hand. Now, what I want to know is, if it is possible to wire it so it will not register discharge to the starter? Any information on this will be appreciated.

Reply.—It is not possible to connect an ammeter in this system so that it will not be affected by the discharge to the starting motor. We would suggest that you write the Weston Electrical Instrument Co., of Newark, N. J. They manufacture an ammeter with a high reading discharge scale and a low reading charge scale which may be suitable for this work. If so, they will advise you how to connect it.

2127 **The Front Cylinder.**

From Oscar Barnes, Wisconsin.—1—My new 1916 Ford lags on one cylinder. It does not miss except when driven slowly on high on a level road, with the throttle nearly closed. If the throttle is open a little, it immediately fires in all cylinders, but one is weaker than the rest. It will idle very slowly without missing. When tried by the crank the compression is not very good in the front cylinder. This cylinder gets too oily; the plug gets covered quite often with cylinder oil. I intend removing the cylinder head to clean out carbon and grind the valves soon. Is there a way to tell where my front cylinder leaks compression? It would seem to be the piston rings that allow the oil to get up, but they should not be worn with only 1500 miles driving. I always keep the oil level about half-way between the cocks. I would like to know if it is the rings or valves so I could remedy it while I have the head off and avoid removing it again. 2—I also would like your opinion on placing an air valve with ½-inch opening on the intake manifold. This valve to be opened when going down hill to relieve the vacuum caused when the throttle is closed. My plan is to take a common air cock ½-inch pipe size, and as the intake manifold is too thin-walled at the top for the air-cock, I would screw the cock into a flat plate and clamp this against the manifold with a piece of packing between to make an air-tight joint, first drilling a ½-inch hole in the manifold. I would attach a small rod to the handle of the cock and extend it then to the dash so it could be operated from the driver's seat. It saves the brake very much if the car is left in high when descending hills, but it pumps oil. I think my air valve would stop the oil pumping and clean and cool the motor. It would also save some gasoline as the same amount is used with the switch off and the car driving the motor as it takes to run the motor idle. Please give your objection, if any, to my plan; also any improvements you would suggest. 3—Can I use a "Regal light four" auto without the storage battery in the car? It has a Rushmore starting and lighting outfit. This is a combined generator and motor, gives 15 volts. They use a coil of iron wire as a regulator; this increases its resistance when it gets hot and reduces the current through the field coils and holds the output in the generator even. The lights are 14-volt bulbs. They ought to work from the generator alone. The main trouble is the ignition. This is a Connecticut distributor system and uses but half of the battery cells (six or seven volts). Could I use four dry cells to start on, and then switch the current from the generator on? I would use a resistance in series with the spark coil to keep the higher voltage (15 volts) from damaging the coil or breaker points. What should this resistance be? How many amperes would it be required to carry? If I wind wire in a coil form for the resistance I suppose the winding should be bifilar to keep it from acting as an inductance coil or kicking coil. This car will run nicely on four dry cells, but I think they will soon become exhausted. This car has no cutout in the circuit. When the generator voltage falls below that of the battery, it drives the engine as a motor.

Reply.—1—Many Ford owners complain of this trouble with the forward cylinder. The lubricating oil is fed into the forward end of the engine and apparently banks up a little higher than usual in the trough under No. 1 cylinder before passing on to the rear cylinders. This causes an excessive amount of oil to be fed and carbon quickly collects on the seat of the exhaust valve, causing partial loss of compression. This may be remedied by turning a groove in the piston directly under the piston ring, making it about half the depth of the slot and drilling from it three or four holes leading to the inside of the piston, so that the excess oil will be scraped down and allowed to run back into the crank case. Or, you may file off the crank pin bearing cap and bolts slightly, so that they do not dip quite so far in the oil. It is very unlikely that this piston is worn more than the others. 2—We see no objection to using the air cock in the manner described, provided all joints are made tight and kept tight. 3—This car may be run without the storage battery, provided the field fuse found in the control box on the dash is removed. This prevents the generator from giving any current and the ignition must be taken from four dry cells. The iron

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ballast coil is calibrated for use in conjunction with the battery. The ignition coil would not pass sufficient current to bring it into use. Neither would the coil draw enough current through the series winding of the generator, which is differential wound, to offset the current in the shunt winding and the voltage would rise and burn out the instrument.

2128 **Motor Overheats.**

From H. G. French, California.—I have a Chalmers Six, 1912, seven-passenger car. It was the first six the Chalmers Company made; L head motor, overhead intakes, caged, 4¼x5¼ bore and stroke, ball bearings on the crankshaft, Mea magneto, dual system. Only 300 of this model were manufactured—with an aluminum body. It sold in 1912 at $3,450. The following model, of which several manufactured, sold at $2,750, with the same motor except for the ignition, which was changed from the Mea magneto to the Splitdorf. I mention this because there is more chance that you are more familiar, or your readers, with the second car than with the first. The motors were identical.

Now for my troubles. This motor overheats. Not after driving, but five minutes after being started from cold and while idling, it boils furiously. I use Oildag in every drop of oil I use and it has saved this motor from cutting itself to pieces during 4,000 miles of all kinds of driving last summer, during which it boiled every minute it was running except the four or five minutes after a start from cold. At present a careful examination shows that not one bearing has suffered, so what the Graphite people claim is true, from my own experience, in not only this motor, but in marine motors as well. One of mine ran nearly three hours in inexperienced hands with no oil at all before a bearing heated enough to crystallize and let a connecting rod down. This Chalmers motor has been lubricated with the best oils I can buy, heavy, medium and light. Being desperate, we have tried everything we could reason out and a lot we couldn't. Previous to its last 4,000 miles and the heating troubles this car had gone 30,000 miles without doing anything unusual, although it always kept at a good, high temperature. It was overhauled by the most responsible garage in San Francisco, the work being done very poorly, however, on account of a mechanics' strike at the time; but whatever was not adjusted properly has been readjusted by a most careful and painstaking mechanic with my own help.

At the time of the overhaul all bearings were renewed, ball bearings reground, water system cleaned out, radiator scoured, new water pump installed. The water now circulates perfectly; after five minutes of running a big gush of it circulates right out through the overflow pipe. The oil pump is in perfect condition, and we have even tried raising the oil level in the splash pit. Just two things were changed at the time of the overhaul. The old Chalmers complete circle rings with a spring behind them were removed and each piston got three sets of Perfection sectional rings on the skirts and one Burd ring on the head, and the cylinders were set on the case with Tenox liquid gaskets instead of the customary thin paper gasket. I mention this because the Tenox may be slightly thinner than the paper was and so may have reduced the firing chamber an infinitesimal amount. I use Tenox in all my motors and it has saved me many hours of gasket cutting and never has blown out or burned out even on the exhaust connections. I can hardly think the possible slight reduction in capacity of the firing chamber, if it exists, could cause the overheating.

All of the usual causes of overheating have not been found to be in this motor, after exhaustive and exhausting tests. The timing of valves has been tinkered with in the hope of curing it; that is, the exhausts were timed early (and in this L head the intakes had to go with them on the single camshaft). The trouble was not found there.

I find that my installation of rings was bad—too many non-leak rings. The pistons and cylinders are slightly worn—the motor always was an oil-eater, doing about 40 miles to a quart. And now it can collect more carbon, and quicker, on the piston heads than any other motor I ever saw. This would account for pre-ignition after the carbon gets there—but even after a thorough scraping and before carbon has had a chance to form it overheats immediately upon being started. Last summer the car was driven in the high Sierras and on those long grades, with snow on both sides of the road, it pulled at slow speeds, as only those old-style motors can—until too much climbing would get it too hot and then power waned.

The magneto throws a regular flame of a spark, at the right time, the oil and water flow freely, the motor turns over without undue friction. The best lubricants I can buy are used, the fan is working overtime—and yet the motor heats, idling, after not over ten minutes' running. It will almost boil with a hose running cold water into the radiator. The water jackets are as clean as in any motor, the connections clear. If you can solve this problem for me you're wizards. I should have mentioned, probably, that our gasoline tests around 62 degrees Baume and that running with a large cut-out open has no effect on the heating. Everything I know or can read has been tried on this motor. The car is too good to throw away—has been in storage most of its life. Can the trouble be in too many non-leak piston rings? There is a slight piston slap.

Reply.—It seems as though every possible source of trouble has been considered. The non-leak piston rings should not cause overheating if the engine cranks freely when it is hot and carbon still forms in the combustion chamber. Water gushing out of the overflow pipe does not necessarily indicate that the circulation is good. We would suggest that you disconnect the return hose at the top of the radiator and run the engine to see that a good stream flows, at the same time supplying new water to the radiator as fast as it is pumped out. Also, to eliminate the possibility of any section of the radiator being clogged, feel the radiator all over after the engine has been running five minutes to make sure that it is hot at all points.

2129 **Battery Trouble.**

From L. G. Roth, Indiana.—1—I have an Oakland, model 37, 1915 model. The storage battery loses its charge as soon as the car stops. The electrolyte is strong enough and I have had the battery recharged several times without doing much good. I

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believe I could fix the battery myself if I could take out the elements and seal the rubber jar after putting them back. Is there any way to melt the jar together if I cut off the top to remove the elements? 2—Will you kindly let me know how leaky batteries are repaired?

Reply.—1—If this is the battery originally supplied with this car it is probably worn out. Batteries used for starting motors do not usually last more than two years. You might disconnect the ground wire and with an ammeter attached to it and the battery terminal from which it was disconnected. Note if there is a flow of current due to a short circuit. If so, all of the wiring will have to be examined until it is found. The cover of the jar may easily be removed without cutting if the sealing compound is scraped out with a hot knife. However, it would be very difficult to remove all the elements at once, making it necessary to cut the lead straps connecting the different cells which in this battery are burned on. Reburning these straps is usually too much of a job for the novice. 2—Leaky battery jars are usually replaced with new ones, as repairs of any kind very seldom prove satisfactory.

2130 **Wants Another Magneto.**

From J. R. Sager, New York.—Can I connect up an ordinary four-cylinder magneto to a Ford car? I have a good low-tension magneto with a coil box which I took off from a 1913 Overland car. I wish to connect up on a Ford car for the electric system from the plugs. Can you tell me where I can get gears to connect up the timer shaft with the magneto—or how would I connect it up? I can get a high-tension magneto if I could connect it up to same any easier. I also have a good two-cylinder magneto just charged. Could I buy special gears and connect it up on a Ford car? I hope you can tell me where I can get gears and a base to fit a Ford car to install a magneto.

Reply.—The Bosch, Eiseman and Splitdorf magneto companies manufacture magnetos and fittings to connect them to Ford cars. It is possible to run the engine with a two-cylinder magneto by using two spark plugs with both electrodes insulated; but this would probably be found unsatisfactory for general use.

2131 **Front Cylinder Misses.**

From Lewis Minch, Indiana.—I own a 1915 Ford model T car and have had considerable trouble with my front cylinder missing and fouling up. I also had a 1910 car which gave me the same trouble. I would be pleased to have some information on this, as it is very annoying.

Reply.—The most satisfactory way to overcome this trouble is to take out the piston and turn a groove directly under the bottom piston ring. Drill several one-eighth-inch holes from the bottom of the groove through the piston wall.

2132 **Generator Lighting.**

From O. C. Malmedal, North Dakota.—How many 12 c.p. bulbs will an 8 volt, 10 ampere, 80 watts, shunt wound generator light? What ampere bulbs must be used? Can one bulb or a number of bulbs be lighted without danger of burning one out?

Reply.—This generator will carry six 12 c.p., 8 volt, tungsten filament bulbs. These bulbs take about 1½ amperes each. If it is desired to use only a part of the bulbs at a time it will be necessary to connect a variable resistance in series with the shunt field wiring to prevent the voltage from rising too high and burning them out.

2133 **Knocks in a Ford Car.**

From Elmer D. Watts, Pennsylvania.—I have a 1914 Ford Car. I adjusted the bearings, replaced the rings, examined the wrist pin and the car still knocks when it runs idle. It will run well for a minute or so, then it will knock for six or eight times and then stop for a minute or so and knock again. On high gear it is not noticed very much, but pulling on low it is very noticeable. Please tell me what I should do.

Reply.—Intermittent knocking indicates a valve sticking in its guide. If not accompanied by popping in the carburetor it is probably an exhaust valve. This may be located by holding up each valve in turn so that it cannot operate. Frayed ends of primary wires attached to the commutator sometimes result in one or two strands becoming grounded and cause a cylinder to fire out of time. This also happens if the commutator is very dirty or has broken metal parts.

2134 **Clutch Trouble.**

From W. Robert Sanders, Washington, D. C.—I have a 1911 model Q Maxwell, four-cylinder, 22 h.p. machine, and am having trouble with my clutch, which is a multiple disc type. My engine runs very much faster than it should, while my car does not move proportionately, indicating the clutch is slipping. The cause must be from wear, or something else. What I should like to know is how to take up this type of clutch to overcome wear, and how long it would require to get it properly running, as I expect to move out of the city and wish to sell the Maxwell before I leave.

Reply.—If the clutch plates are worn it will be necessary to remove the yoke which engages and disengages the clutch. The upper end of the yoke rests against two cams, one operated by the clutch pedal, the other by the emergency brake lever. With the emergency brake in the "off" position and the clutch pedal in the "engaged" position, see that there is clearance sufficient to slide a piece of thin paper between the yoke and the cam. If there is no clearance, it will be necessary to take out the yoke and bend it to give the desired play. There is no adjustment to this clutch. This work could be completed in a day. It is possible that the clutch only needs washing out. If so, wash all the oil out of the clutch case, fill it half full of kerosene, and with engine running and gears in mesh engage and disengage the clutch a number of times to clean the plates. Then remove the kerosene and renew the lubricating oil.

The Seven Year Old Maxwells.

From Albert Chaney, California.—In the February number, C. F. Dilly, Indiana, is in trouble with his model Q, 1910, Maxwell. Your advice to him was all right provided that the clutch could be adjusted but I do not think it can be. I have had two model E's of the same vintage, 1910. The clutch

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is the same and the trouble the same as Mr. Dilly has. The first one which we bought new was all right until the car had passed 20,000 miles, then the clutch commenced slipping and no adjustment seemed to do any good. I finally got after it and found the heavy spring that presses the disks together brought up against the lugs on the shaft (the lugs that drive the driven disks). I made a washer that would pass over the lugs and go free inside of the sleeve, about ¼ to ⅜ in. thick. Then I put the spring in and the nut on as before, of course, putting the washer in ahead of the spring. About a year ago I bought another of the same model which was in far worse condition. The same trick fixed that part, but there were many other things wrong. The man said he had never been able to get over 7 or 8 miles to the gallon. Well I did some work on that engine and I put in No-Leak-O piston rings and a Sunderman carburetor and that old car is making 15 to 19 miles to the gallon. When I get her to average 20 I will be satisfied.

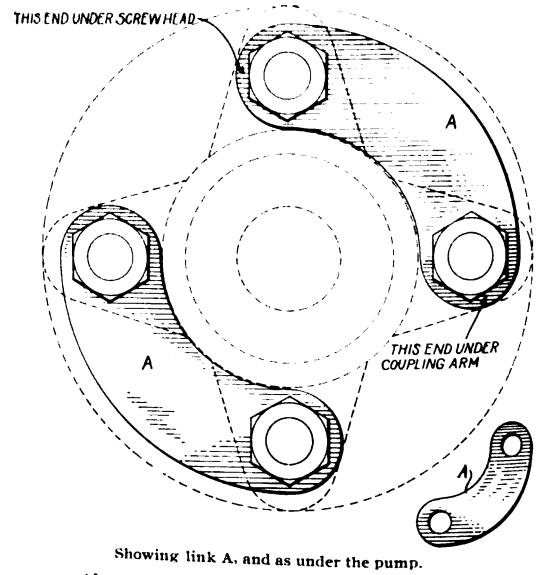
The Chandler "Chummy."

From Tom A. Seymour, Utah.—To Dr. John F. Spindler.—I noticed your questions about your model '17 Chandler "Chummy" and I believe I can help you as I have been a traveling service man for this company for some time. Your mileage as stated in the Automobile Dealer and Repairer is unusually bad, as your motor should make fourteen miles even under the worst conditions.

First, understand, that all carburetors with sensitive adjustments are affected more or less by weather conditions and altitude. The Rayfield in this case can be regulated to advantage by changing the nozzles and metering pin to suit the locality. This once done will be permanent. The factory shipping cars to all parts of the country finds it necessary to use a combination that will work fairly well everywhere. This can be improved on without much trouble by any good auto mechanic. You will probably find that your nozzle is a No. 52 with a No. 4 metering pin. Either of the following combinations will give you more mileage than the above: Try a No. 53 with a No. 2 or a No. 54 with a No. 3, or a No. 55 with a No. 4, or a No. 54 with a No. 4. The best of these combinations can only be determined by a test as I do not know your exact locality.

Have the motor hot when making adjustments. Screw in the low speed adjustment screw, making a rich mixture until the motor rolls unevenly, this with the throttle closed and spark retarded fully. Then screw back a notch at a time until the motor runs evenly. Now leave this screw alone. Back out the high speed screw as far as possible, turning to left. Now with the spark still retarded, open the throttle suddenly. The motor will probably backfire through the carburetor. If so, turn high speed screw to right a notch or two at a time until the motor will pick up speed without backfiring when the throttle is opened suddenly. Have dash adjustment clear in when working on adjustments. Now advance the spark fully and always run with the spark in this position. Try the car on the road and if it does not "get away" quickly when stepped on, give the high speed screw a notch or two more gas.

Nozzles and metering pins can be secured from the nearest Rayfield service station or direct from the makers. Your pump shaft couplings are not torn out from being out of line as this would be out of the question considering the accuracy with which the motor bases are machined. Your trouble is caused by ice forming in the stuffing glands of the water pump. The water is in a thin film along the pump shaft between the shaft and the bearings and will freeze much quicker than in places where there is room for more water. This sometimes happens even with anti-freeze mixtures in the radiator, due



Showing link A, and as under the pump.

to separating of water and mixture. The obvious course in this case would be to raise the hood and see if the pump shaft is free before trying to start motor. Do this if the motor has been standing some time in a cold place. If tight use a cup of hot water on the pump. If you have an air pump installed and working from the pump shaft, this may cause the leather to tear out. In any case, a safe and permanent cure is to install two links like the enclosed sample and put on as per enclosed drawing, being sure to have links so that they pull the pump instead of push it around.

I hope this will be of some help to you and will gladly answer any other question you may have to ask for the good of Chandler Service.

Cost of Upkeep.

From M. H. Sauser, Iowa.—I am now running an Oakland 6, model 32 car. The car I had before this one was an Everett. I ran this car just five years, then traded it in on the new car and was allowed $350 for the old car. I kept a strict account of all expenses while running this car and am sending you a list of them. Many people are harping on the high cost of running an automobile. The figures I am sending you will show where the main part of the cost comes from. I claim in this case that the cost of up-keep was light. I took good care of this car and it really had more power and ran better when I traded it off than it did when it was new. When I buy a car I must have it perfectly new, right from the factory. The way most of the cars are sold around this neighborhood is to run the life out of the car for 500 miles or so, and have it pretty well

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"shot" before they turn it over to the buyer. I like to skim the cream off myself.

First cost of car, $1,147.50 interest on first cost, $352.18; gasoline, $108.59; tires, $138,54; sundries, $189.28; making in all $1,936.09. I sold the car for $350, and this left a balance of $1,586.09, the entire cost of the car and expense of running for 5 years. This amount divided by 5 gives the cost per year, which is $317.22. The cost of up-keep only per year was $87.22.

A Veteran Favors Steam Cars.

From Geo. L. Whitaker, Ohio.—I am deeply interested in the steam motor, and fully satisfied in my mind that it will prove its superiority. Twenty years ago I ran a yacht equipped with a three-cylinder single action engine, and a porcupine boiler. The center tube of the boiler was 18 inches, and 320½-inch tubes screwed into the main tube in spiral form. For fuel, used for a time kerosene oil through an atomizer against a baffle plate, V shape, under a steam jet, which did pretty well. After the oil wells developed here I substituted the oil just as it came from the well, removed the baffle plate and took a tube 1 inch in diameter, filled it with dry sand, plugged the ends, built a long hollow fire and bent the tube one and a half turns in a circle; then carried the end into the center of the circle, and on the ends fixed small tubes with small holes as illustrated. I then arranged a pilot light inside the peep hole and extended the steam pipe in a spiral form on the upper end of the boiler, partway up the smoke pipe. I then attached a lubricator for the cylinders with the steam pipe. It worked perfectly. Inspectors would not permit the use of gasoline for fuel and for years thousands of gallons of gasoline was discharged into the river. The crude oil at that time cost $1.25 per barrel. Now the stuff used in motors is becoming almost prohibitive and will undoubtedly go higher, and in addition it fills the cylinders with carbon. The best of all is the perfect control of steam and economy in every respect. I neglected to state that I tapped the boiler, put in a small stop cock and used an air pump until I secured sufficient steam to work my blower, which consumed a very few minutes. Today crude oil is selling at $3.15 per barrel of 44 gallons. I also neglected to state that a porcupine boiler is an upright and I presume is entirely out of date and perhaps unknown to this generation, and of course we now have a light boiler that fills the bill much better.

I am an old man, 73 past, but I never think of losing interest in anything mechanical.

The Friction Drive and a Suggestion.

From Wm. F. Shipman, Kansas.—I notice that No. 2048 inquires how can the friction be perfectly lined on a Metz car? Now what does he want it lined up for? I have been running a Metz car for four years and have had some experience with it in that time. When I put on my second friction rim I discovered that the propeller shaft was out of line with the engine, so I lined it up and did a nice job of it, but when I went to start my car I found that it would not start on low gear, but found it would run on high provided I could get it started. I got stuck in a ditch and went to work and put that propeller shaft back just as I found it and had no more trouble with it. The propeller shaft is connected to the flywheel by a flexible connection that acts the same as the universal joint on other cars and doesn't need any lining up.

Another thing: Why don't these inquirers write to the manufacturers of their car about these things? I have always done so and have always received polite and explicit answer and instructions in every case.

As for the friction drive going out of use I hope that it won't for I like it and would rather have it than any other.

Priming Mixture.

From Charles E. Duryea, Pennsylvania.—Say to No. 2076 that sulphuric ether is quite commonly used with priming gasoline. While this is somewhat expensive the amount needed is very little. One part of the ether to five parts of the usual gasoline will start quite well. He can secure in many parts of the country what is known as gas machine gasoline which is about 88° Baume test. This will vaporize in the coldest weather and a priming can filled with it will help starting. Either of these primers should be kept where it is cool. Or else the priming can should have a screwtop so that the formation of vapor causes pressure which in turn stops further vaporization. Too often the priming can is carried in a holder near the engine where it gets warm.

Lighting the Ford Car.

From Charles D. Morrison, Maine.—Something that perhaps will help some of our readers is how I get good lights from the late Ford magneto (9 volts). I was getting very poor lights by using 9-volt bulbs so I experimented with some 6-volt ones, and found it very satisfactory. I don't care to drive over 25 miles an hour—20 miles is fast enough. I have used the six-volt bulbs continuously for about six months and have burnt out just one lamp, and as they don't cost very much the powerful light I get is worth many times the cost. I use the nitrogen 21 c. p.

A Liquid Starter.

From George W. Goldner, Kansas.—In your February, 1917, issue you advised No. 2076 (Geo. F. Stooke, Canada) that there is no liquid with which you are familiar that will help to start gasoline engines. If he will get a can of Polar gasoline engine starter, manufactured by the Auto Specialty Co., Milwaukee, Wis., I feel sure he will be delighted. I have used this liquid for two winters and with a half thimbleful in each cylinder, my engine starts as easy as in hot weather.

Did the Right Thing.

From G. C. Gilbert, Illinois.—In answer to query No. 2039, will say I know of a garage where they had the same trouble with a new Cole car. They called the factory service man but he was unable to do anything for it so the Cole Company gave them a new complete motor.

Misfiring Cured.

From G. C. G., Illinois.—In relation to the inquiry No. 2037, California, I will say I had the same trouble (misfiring). I found my trouble in the spacing of the points in the Atwater-Kent distributor.

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Battery Work Record.

From Z. R. Lindsay, Wagner-Hoyt Electric Co., New York.—We note you are at different times giving publicity to the matter of systems employed in garages, etc. We are enclosing a battery repair card, which we use at our service station. The writer has seen various systems employed, and got this card up because the others did not seem to be as simple as they might be, and still cover all requirements necessary. There are simpler systems in use, but many of them are too simplified in our estimation.

The first card is held in our stockroom where deliveries of batteries are made, and where the batteries are received for recharge or repair.

To distinguish batteries, we place a lead tag on every battery in work in our repair department. You will note that we take the name and address—the make and type and number of every battery that comes into our place. It is usual to have regular loan batteries numbered from say, 1 to 100, and in this case, of course, the number would simply be inserted and not the make and type. We also take the name of the car and the license number. This protects us from unscrupulous owners who are taking a good battery from us on loan, and leaving a battery that they feel is not worthy of repair, and forget to come back again. You can readily realize that it is very easy for us to follow it up and get the return of the battery.

If a battery is left for charging, we check the item "charge," and quote the customer a price and make a note of when we can promise them that they can have their work. If it is checked for repairs, we check the item "repairs," and go through the same procedure. If the battery is left for charging, and we find it will not take a charge, we notify the customer and get their O. K. to go ahead and repair the work, and make them an estimate, at the same time making note of when we have promised the work.

In many cases we loan batteries, and make a note of the number, make and type, getting a receipt of the party loaning the battery. The second

Wagner-Hoyt Electric Company
NEW YORK
BATTERY DEPARTMENT

Lead Tag No._____ NO. B 1027

Date_____ 191

Name _____

Address _____

Car _____ License No. _____

Make _____ Type _____ No. _____

Charge _____ Repair _____

Notified _____

Cost _____ Estimate _____

Promised _____ Promised _____

BATTERY LOAN

No. _____ Make _____ Type _____

Received _____

CHARGE	Amt.
Labor	
Material	
Loan	
TOTAL	

DELIVERY

Date _____

Received _____

Wagner-Hoyt Electric Company
NEW YORK
BATTERY DEPARTMENT

Lead Tag No._____ NO. B 1027

Make _____ Type _____ No. _____

Charge _____ Repair _____

MATERIAL	AMT.
LABOR Total	

Workman	Hours	Overtime	Rate	Amt.
			Total	
			TOTAL	

BATTERY CLAIM CHECK
No. B 1027

Make _____ No. _____

Type _____

Date _____

Name _____

Positively No Batteries Without Check

Loan Batteries 10c Per Day

If Loan Battery should be retained for a longer period than seven days, a charge of 25c per day will be made. An additional charge will be made for recharge if battery is left over 21 days.

Not responsible for batteries left with us over 30 days.

Wagner-Hoyt Electric Company
1902 Broadway
New York

CALL FOR YOUR WORK _____ 191

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card is given to our repair man for his record. The claim check is given to the owner. When the battery is called for, we make up the charge on the first card, and when the delivery is made, we make a note of the date and get a receipt from the owner. When the work is done, the three cards are attached, and sent to the office for entry.

THAT AUTO SALESGIRL.

She Concludes the Charming Story of Her Experience and Success.

Gladys de Haviland in Motor, England.—It was a week after I had returned from my End-to-End trip that I started my duties as saleswoman in the showroom of Bedford Motors, Ltd. After the hard work and excitement of driving from London to Land's End, from there to John-o'-Groats, and from that bleak spot via most of the important towns (in order to call upon editors and agents) back to London, I felt that I badly needed a few days' rest in the country. To my delight the Bedford people allowed me to take the 15-18 H. P. Bedford, on which I had done the trip, down to my home for the week, and I had a great time.

When I got back to town I found a little pile of letters waiting for me in the showroom, and they provided rather diverting reading. There was an offer from the press agent of a London musical comedy producer of a position in his chorus; a proposal from a man in Ireland who had read of my adventures in the papers; complexion creams and lotions, with a request for a testimonial after trying the same and a tin of the nerve tonic I had taken on the trip, with the same request!

I spent most of my first day diligently studying catalogues and the chassis that stood in the show room, and I watched, with the hope of picking up tips, the way the eight salesmen went about the business of selling cars to the people who came in. I remember how Mr. Coles, who was a salesman there, came and talked words of wisdom to me, and also told me of the "turn" he did at the Alhambra some years ago on a 3½ H. P. Benz. Without using his hands at all he drove it down a flight of steps with his feet! All the salesmen were very nice; in fact, being with men and noticing the good-natured way they work together has rather spoilt me for working with women.

I experienced all types of customers whilst there, and a certain number—mainly, I imagine, men engaged in the motor business—took delight in trying to score off men. For instance, a would-be-clever young man would enter the showroom and ask me a number of technical questions, finishing up with the query, "Why is a motorcar always called 'she'?" He would show great delight in quoting the answer, "Because it takes a man to manage her!"

On the whole, I preferred being "on the road"—a sort of commercial traveller—than in the showroom, for few people came in some days, and then it was very dull. One just had to kill time as best one could. I used to read the morning papers through from beginning to end, look out of the window (and Long Acre is not very entertaining for a woman!), add a chapter to the penny novelette I was reading, take a stroll down to Covent Garden and buy a basket of strawberries (once I borrowed a salesman's car to go in, had a skid, and knocked over a pile of baskets; I have never heard such language before or since!), take a long time over lunch, back to the showroom and watch the clock till six, then—home! Of course, when I had promising customers to attend to it was a great deal more lively.

Since then it has fallen to my lot as a woman "motor-noter" to interview one or two motor salesgirls—there have not been many since, and I was the first by some years—and I have felt half-amused and very sympathetic at the way they have pluckily tried to intimate to me what a good job they are making of it and what a number of cars they sell per week! As a rule, they have been unsophisticated girls of twenty or so—as I was when a saleswoman—without sufficient experience or talking ability to sell a cake of soap to a sweep. Always with the exception, of course, of that clever lady, Miss Marian Paige, to whom I was speaking only yesterday in her showroom in Great Portland Street.

Not many weeks had passed before I had come to the sad conclusion that I was not going to be a great success as a motor saleswoman. I remember I bought little American books on the subject of selling, and found them very amusing reading but not of much practical help. In one of them there was something like this: "In the first place, the best selling point for an article is to get it associated in the mind of the customer with success. The salesman should carry into a store an impression of success, prosperity and harmony. He should make it a point to drive home the impression that everything is perfectly lovely!" I found that very difficult to manage when at the end of a month I had not sold a single car and felt that I never would do so!

This is another successful salesman-writer's idea of the right way to go about things: "What I aim at is to get the customer in a frame of mind that he will wish to buy me a lunch. Sometimes I say jokingly, 'I wish you would steer me to a good restaurant and buy me a lot of expensive food!'" The nearest I got to that was to be presented with a box of chocolates from one of my customers!

Now, however, in the light of more experience, I know that car selling is not the hopelessly difficult job I imagined it to be when I was in the Bedford showroom. It is not so much brains that are required, but energy, push, and shrewdness. If you are lazily inclined, however, selling a car is an awful bother, unless the right person happens along at the right moment and in time to save you having to put yourself to the awful trouble of getting hold of the right person! I would rather sit in an armchair, scribbling words at so much per thousand, than go through the irritating trials and disappointments of car selling any day.

For instance, the other day I had a car known as the "Blue Egg." It was about the nuttiest-looking thing imaginable, just like a blue egg in shape, with black mudguards, no doors (you climbed over), and a bonnet reaching from about Piccadilly Circus to Long Acre. But, unfortunately, the engine that was encased in this alluring body was nothing to write home about, and I soon got fed up with crawling about at a low speed and an open exhaust, trying to appear as if I had a lot of power up my sleeve! So I decided to sell it. I put three advertisements (in which I most carefully explained the type of car it was) in different papers, costing me about 35s., and received 23 answers. Five were from dealers,

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which I merely put in the fire. And nearly all the rest proved to be from stout middle-aged matrons, a bishop, and others of that type! I cannot understand why people when answering advertisements use so little discrimination. Fancy a stout married woman of 45 or so imagining for a moment that a car with a sporting body and no doors would suit her! But when I read the bishop's letter I felt that I just must see his gaitered legs trying to climb in a dignified way over the door into the "Blue Egg." So I wrote him and took him for a run. He admitted, with a smile, that it was not quite the car for him. But he proved to be quite a pet of a bishop.

The way I ultimately sold it was rather novel. Several times I had noticed a "sub" gazing admiringly from his window at the car when I left it outside my club. His club happened to be near mine. One day I went to start up the engine, and caught sight of the sub's face straining out of the smoking-room window. I had a brain wave! I pretended I could not start it up. The porter of my club came flying out to help me, but I pushed him back. And then presently, to my joy, out came the sub, and, rather nervously, asked if he could help me.

"One minute," I said, and went round to the switch. "Why, I haven't switched on!" I exclaimed in surprise(?). In the course of the next few minutes conversation, I told him that I wished to sell the car. His face lightened up, and that very day, after a trial run, he wrote me a cheque for the amount I asked for.

During the last two years or so I have sold one or two cars quite successfully. For instance, last summer I did some driving and advertising for a firm, and they let me have a car cheap. I disliked the car, and in four months I decided to sell it. Opportunely, I met a woman at an hotel who wanted to buy a smart little car. Mine was dark violet with silver lamps. After a run she bought it, and I made £30 on the deal.

The next car I bought was a second-hand Ford. My taste does not really run this way, but at the time it was summer, and I had a cottage on the Thames and a little white-and-green motor boat in which I spent most of my time, so I merely wanted a car that would be useful and need no looking after. I kept the Ford in the garden with an old macintosh over it. The day I sold it—for £15 more than I gave for it—the buyer asked me if I would drive him to his home near the Crystal Palace, as he had not driven a Ford before. I agreed, and on the way the bonnet blew off!

When I look back to the time that I was at Bedford's, I must admit that I thoroughly enjoyed the experiences that I had on the road as a sort of travelling saleswoman. Generally they let me have a Baby Brooklands model, and, with a pound a day for expenses, I was perfectly happy.

But at last I gave up hope of ever becoming a clever car-seller, and I remember that I felt very depressed about it. To forget my troubles, in spare moments, I wrote a penny novelette in the showroom, and knowing cooks to be voracious readers of that class of literature, entitled it: "From Cook to Countess." I sold it! Then, to my joy, one morning, I received a letter from the managing director of the "Daily Chronicle," asking me to call and see him as he had a position vacant that he thought might suit me. I started work with the "Daily Chronicle" as motor advertisement canvasser at the largest salary I had yet received.

DISC WHEELS.

Said to Be Lighter, Stronger and Easier to Clean Than Wood or Wire.

The Detroit Pressed Steel Co., Detroit, for some time has been engaged in developing the pressed steel wheel and has obtained results that are exceedingly satisfactory. The field has been narrowed down to a form that the company has proved to its own satisfaction to be the most satisfactory and which it is recommending to automobile manufacturers.

The Detroit wheel is of the single disc type and simple in construction. The hub has a flange to which the single dished disc is bolted. To the outer edge of the disc is permanently attached part of the split rim—the larger part—while the other part is bolted in place through an inwardly projecting flange. Various other forms of construction are possible and have been tried out. An important feature of the wheel is the ease with which tires may be changed, even after having been in position for protracted periods. It is necessary only to remove the nuts from the ten holding bolts, in the case of a 36-inch wheel, when the narrower section of the rim comes away, and it is then only necessary to take the tire off the wide section. It is also pointed out that in replacing a tire there is no danger of damaging either tube or tire. Provision has been made for demounting the wheel. The four nuts on the flange bolts at the hub, which are self-contained with their lock washers, are removed and the wheel slipped off. There are no loose pieces. This is said to be only a few seconds slower than the removal of a wire wheel with a single nut.

The steel disc wheel carries its load in both compression and suspension, and the weight is distributed over such a large area of metal that crystallization is out of the question. All road shocks are taken indirectly, and the position of the disc with relation to the center of impact is such that there are no localized strains. In the event of excessive pressure the disc wheel will bend, but still will support the car, and may be straightened, after which it will be as good as ever. It is stated that the strain required to bend the steel wheel would be sufficient to break a wood or wire wheel. A wheel three times bent in testing and straightened is in constant use on a heavy car, showing no sign of weakness.

While the appearance of a disc wheel is novel, it is contended that in reality it is decidedly in keeping with the general appearance of the modern automobile, and that it is only necessary to get accustomed to the new form to appreciate it. The disc lies entirely inside the rim line and the appearance of the actual wheel is light. From the point of view of cleanliness the disc wheel has a great advantage in that it can be so easily cleaned and kept clean. Another advantage put forward is that the disc hides the brake gear and rear axle, which nearly always are more or less dirty and unsightly. A more practical advantage is that in going through mud, snow or sand there is nothing to catch and drag.

Preliminary work in bringing the Detroit wheel to a commercially perfect form was done with commercial steels, and with these satisfactory results have been obtained. Naturally it is expected that much better results can be obtained with higher grades of steel, heat treated, and it is also to be expected that in this way weight can be cut. Not

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only is it stated that these wheels can be built from 10 to 20 per cent. lighter than wood wheels, but that the cost, in quantities, will be not more than that of wood.

Trade Paper Support.

Pledging their support to President Wilson, the editors of the trade and technical press in New York have sent to him the following message:

"Resolved, That the editors of the New York Business Publishers' Association, Inc., representing class journals of America, at this time of national crisis are glad to pledge to the President of the United States their loyal support in his action for national defence. They will exert the influence of their journals in every possible way to promote unity of patriotic sentiment in the nation and effective action by every possible agency to aid the government military and naval forces."

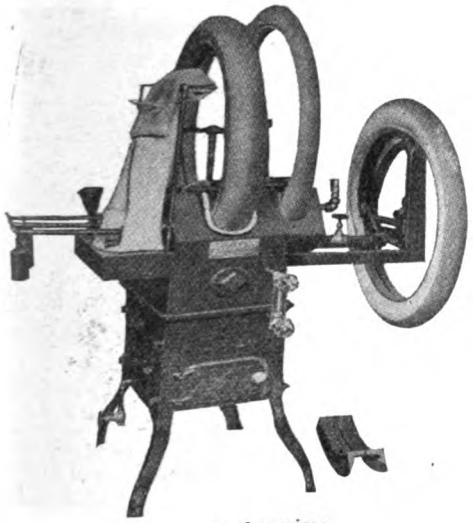
A Steam Wagon.

Over in England they are using a steam truck to good advantage. It is called the Sentinel Steam Wagon and for fuel it employs coke which at present is the only fuel at a low price for such purposes. The illustration shows the car and the engine. It is said to be unusually efficient and economical. It is powerful and reliable, and its chief faults are that it requires time to get up steam, if care and the right kind of fuel are not used it smokes, and its best speed is ten miles an hour. It is made by the Sentinel Steam Wagon Works, Shrewsbury, England.

NEW AND INTERESTING THINGS IN MOTORDOM

The Tip-Top Vulcanizer.

We illustrate a new type of vulcanizer which has recently been brought out by the Akron Rubber Mold & Machine Co., 917 Sweitzer Avenue, Akron, Ohio. This



Tip-Top Vulcanizer.

machine may well be regarded as a remarkable achievement in the field of tire repair equipment. It is a complete outfit, with a great range of adaptability, and is made to sell at the very low price of $125. This machine will enable any small shop to get into the tire repair business for spring trade with the expenditure of a limited amount of capital. Good dealers are wanted as agents for this outfit everywhere, and readers who are interested should write promptly, direct to the manufacturer.

Hawkins Electrical Guides.

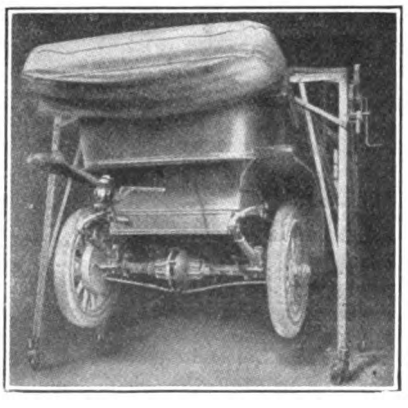
Many of our readers would like to learn more in regard to electrical matters, and such readers will no doubt be interested in the set of books called Hawkins Guides, which is published by Theo. Audel & Co., 72 Fifth Avenue, New York City. This work is in ten volumes, and covers all electrical matters connected with motor cars very thoroughly. The entire work has a total of 3,500 pages and 4,700 pictures, and the publishers are offering this valuable contribution to electrical science on the basis of $1.00 per month for ten months, which will thus put the work within the reach of every reader. Readers who wish to accept this offer should use the coupon attached to the advertisement of Audel & Co., which appears in the present issue of this magazine.

Charles F. U. Kelly Now With Dreadnought.

Charles F. U. Kelly, who has been nationally known for many years as a leader in the merchandising of pneumatic tires, has joined hands with the newly reorganized Dreadnought Tire & Rubber Company of Baltimore, to co-operate with the executives of that company in making it one of the potent factors in the automobile tire industry. Mr. Kelly's part in the organization will be to take full charge of the sale and distribution of the entire product of the new Dreadnought Tire & Rubber Company. The headquarters of the sales department will be located at 1834 Broadway, New York City.

The Miller Portable Universal Hoist.

Every public garage or repair shop should be equipped with a hoist of some kind. One of the best devices on the market in this line is the Miller portable universal hoist, which is manufactured by the Portable Tool Supply Inc., of Buffalo, N. Y. This is an inexpensive device, and it will soon pay for itself in

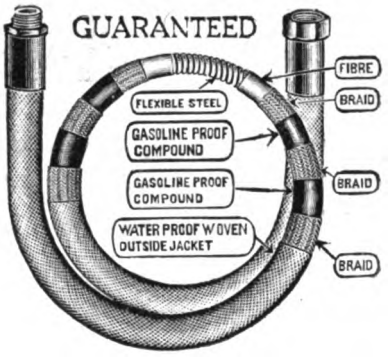


Portable Universal Hoist.

any repair shop or garage. It will enable you to do your big jobs quickly and cheaply, thus making an extra profit and giving quicker and better service to your customers. Write for full information direct to the manufacturers.

Everlasting Gasoline Hose.

This brand of gasoline hose is of guaranteed quality. It has a steel core covered with two plys of gasoline proof compound, and protected by a heavy



woven cotton jacket. The genuine Everlasting has a one-year guaranty tag attached to every length of hose. This hose is made in two sizes—¾ and 1¼ inches in diameter—and is sold in standard lengths by all jobbers. For prices and full particulars, write direct to the manufacturers, the Chicago Tubing & Braiding Co., Chicago, Ill.

Acme Perches.

Acme Perches are designed and constructed to meet the requirements of the present-day service to which the average Ford is subjected. Thousands of Fords to-day are used for commercial purposes, called upon to carry unlimited loads for which they were never intended, and this also applies to pleasure cars. The original clearance at all four points of contact which are called upon to support the load of the body, passengers and merchandise, is only ¼-inch, and this clearance under load with the setting of springs, the wear on the bolts is readily taken up in a very short period, allowing the springs to strike and ride on the axle as well as on the differential housing, and scraping of the fenders entailing considerable damage and expense. This can all be eliminated by the use of Acme Perches. The manufacturers, Twin Spring Company, 1000 Boylton St., Boston, Mass., guarantee to make good their claims or refund the purchase price, which is the best evidence of the confidence they have in their device, which is not a luxury but an absolute necessity.

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JOHNSON'S STOP-SQUEAK OIL

Will Give You Easy Riding Springs

Johnson's Stop-Squeak Oil applied with a brush, rag or oil can to the side of a spring will immediately seep between the spring leaves thoroughly lubricating them from tip to tip and allowing perfect spring action. Also removes squeaks of all kinds.

It Penetrates Between Spring Leaves Thoroughly Lubricating Them

The irksome task of jacking up a car, prying apart the spring leaves and lubricating them is forever done away with. You, yourself, can now keep your springs thoroughly lubricated at all times. All you need is Johnson's Stop-Squeak Oil. You won't require a tool of any kind—you don't even need to jack up the car.

Makes Your Car Ride Easily

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. Instead of bumping over the road, you can fairly float along if your springs are lubricated so you have spring action. Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

Takes Out Every Squeak

Johnson's Stop-Squeak Oil is unexcelled for removing squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil.

Pints.....**$ .50** **Half-pints**....**$ .35**

If your dealer cannot supply you with Johnson's Stop-Squeak Oil use attached coupon.

Write for our folder "Keeping Your Car Young"—it's free.

------ *$1.00 Special Offer $1.00* ----

S. C. JOHNSON & SON, Dept. AD4, Racine, Wis.

Enclosed please find $1.00 for which please send me a quart of Johnson's Stop-Squeak Oil—enough for a season's use.

NAME .....

ADDRESS .....

CITY AND STATE .....

MY DEALER IS .....

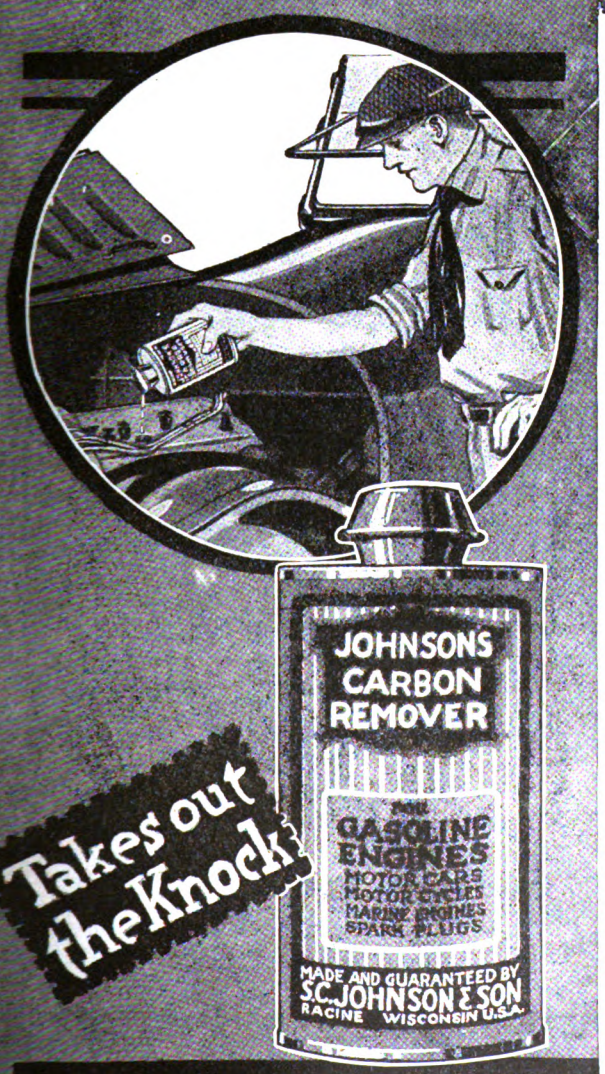


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JOHNSON'S CARBON REMOVER

Cures 80% of Engine Trouble

A dose of Johnson's Carbon Remover—The Engine Laxative—will make your motor run like it did the first 500 miles—quietly and full of "pep"—And your gasoline consumption will drop from 12% to 25%. You will save from $3.00 to $5.00 over any other method.



You Can Take the Hills on High Without a Knock

if you will keep your motor free from carbon with

JOHNSON'S CARBON REMOVER

That knocking in your engine—difficulty you have climbing hills—poor pick-up—pre-ignition and lack of power will all be overcome.

You Can Do It Yourself

For 25c—five minutes' time—and with no labor, you, yourself, can remove all carbon deposits. Pour an ounce of Johnson's Guaranteed Carbon Remover into each cylinder—allow it to remain two to twelve hours, then drive your car 10 or 15 miles. Results will surprise you.

Use It Every 1,000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will eliminate most valve trouble and your engine will always be at its highest efficiency.

If your dealer cannot supply you with Johnson's Carbon Remover, use attached coupon.

Write for our folder "Keeping Your Car Young"—it's free.

$1.00 Special Offer $1.00

S. C. JOHNSON & SON, Dept. AD4, Racine, Wis.

I enclose $1.00 for which please send me by prepaid express enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four-cylinder motor four times.

NAME.....

ADDRESS.....

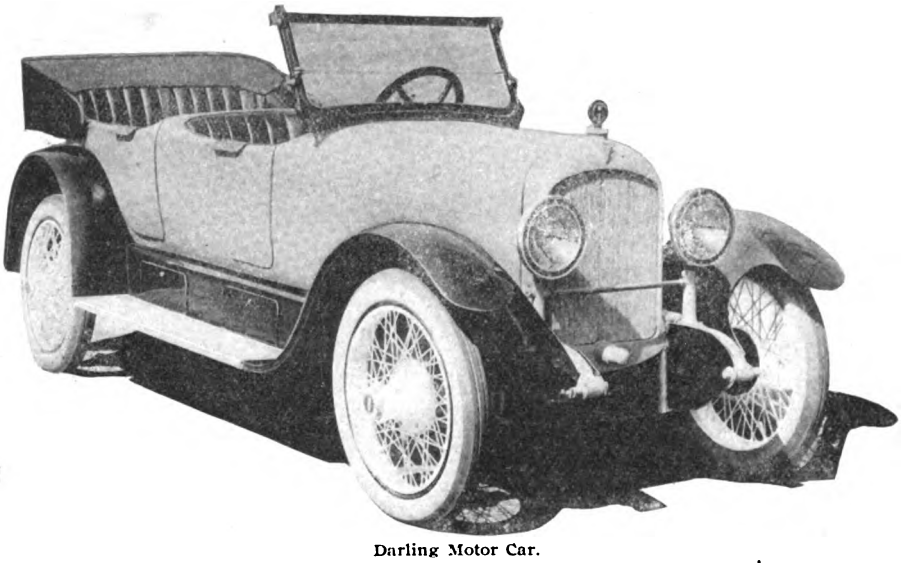
CITY & STATE.....

MY DEALER IS.....

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Darling Motor Company Buys New Plant.

A recent announcement of particular interest in the Automobile Field is the fact that negotiations have been completed, whereby The Darling Motor Company of Dayton, will take over the Wright-Martin Aeroplane factory, and will use this modern fireproof plant for the manufacture of their new motor cars. The Wright Company just recently constructed the plant, using reinforced concrete and brick throughout.



Darling Motor Car.

The Darling car indeed is one of exclusive design and construction. The lines are distinctive, and the car itself speaks well of the efforts put forth by Mr. James Guthrie, the consulting engineer, who is well known in the automobile field.

When the idea of manufacturing the Darling Motor Car was first conceived, the thought from the very start was to build a car that would be a decided departure from the conventional design. The idea was to have a straight body effect and double cowl, patterned after the popular European models, and in fact, to have a car that would be different from the general run of automobiles of today. All Darling cars are built upon the same chassis, but are equipped with several different body styles. The new Darling car contains practically every desirable feature for service as well as convenience that the modern motorist desires. Work on dismantling the machinery of the Wright-Martin Aeroplane Plant is in progress, and it is expected the building will be ready with machinery and equipment for the Darling Motor Car within the next several weeks. Deliveries will begin within the next thirty or sixty days.

Naturalite and Savidge Control.

The Universal Motor Products Company, of Indianapolis, Ind., to meet the demand for suitable automobile lighting to conform with all public ordinances, is putting on the market what they call the Naturalite control for all cars or trucks equipped with batteries. Also the Savidge control for Fords and other magneto equipped cars or trucks. Naturalite is a simple, inexpensive and fundamentally correct system for controlling the lighting of automobiles from batteries and it carries the hearty endorsement of hundreds of motorists based on their experience of a period of over two years. The Savidge light control is a perfectly constructed instrument which makes possible a brilliant uniform light from a magneto at all speeds, from the lowest to the highest, subject to the absolute and instantaneous control of the user. A very large advertising campaign has been arranged by the manufacturers of this product and every dealer will want to handle both Naturalite and Savidge light control when the magnitude of the sales campaign becomes generally known.

Importance of Fireproof Roofing.

The statistics of fire losses in the United States, as collected by the National Board of Fire Underwriters, are startling. In the year 1915, there were losses in the United States from strictly preventable fires amounting to $32,720,239, and from partly preventable fires $58,148,339. The remaining fire losses amounted to $62,263,298, and the last item includes fires from unknown causes, but it is believed that many of these fires might have been prevented by ordinary prudence and precaution. One means of preventing fires is to use metal or other fireproof roofing material. The Merchant & Evans Co., of Philadelphia, is prepared to furnish metal roofing, and their metal roofs have been used in all parts of the world for many years. They have brought out a clever circular to advertise their roofing, which includes the autobiography of a wooden shingle, which makes very interesting reading, but as we do not have space to reproduce it here, we advise all of our readers who may be interested to write direct for it to the Merchant & Evans Co.

A Large New Factory.

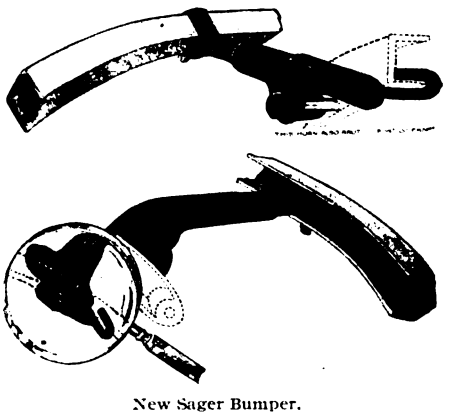
Joseph N. Smith & Company, well known as manufacturers of automobile mountings of every description, have recently moved into a very large new factory located at East Grand Boulevard and Dubois Street, Detroit, Michigan. The plant comprises over 77,000 square feet of floor space, and the buildings are so constructed as to give the best possible facilities for manufacturing the line of automobile body hardware which this company produces. The buildings have been arranged to give every unit and department of the complete factory organization an individual space, so that the work can be systematized to the best possible advantage. We congratulate the officers of this company for the great success which has been attained. This business was founded in 1875 by Joseph N. Smith, and was run as a personal venture until incorporated in 1899 with a capital of only $25,000. In 1905 this capital was increased to $100,000, and this year it has been increased to $500,000. This is a fair sample of the growth attained by many automobile accessory plants in this country.

New Electrical School.

Mr. Charles Leighty, who has contributed some unusually good articles to this magazine on automobile electrical systems is at the head of the Electrical Equipment Engineering Company, 409 Karbach block, Omaha, Neb., proposes to take pupils who wish to become proficient on these and other kindred subjects in relation to electricity. It is a splendid idea, and knowing Mr. Leighty's practical and theoretical knowledge of the subjects, we want to speak a good word for this enterprise. Very few repairmen indeed understand the electrical equipment of automobiles as it exists today. There are more than a score of systems and it requires an up-to-date man to understand them. The literature of Mr. Leighty's school is in itself instructive, and we advise every man, young or old, who wishes to become proficient in electric lighting, starting and ignition systems, to send for it.

The New Sager Bumper.

The accompanying cuts will give the reader an excellent idea of the appearance of the new Sager bumper which has been brought out by the J. H. Sager Co., Rochester, N. Y. The splash pan extending in front of the radiator has become so universal among automobile makers, that the J. H. Sager Company have quickly met this new condition by producing a bumper to be attached without mutilation of or interference with this pin. With these new fittings the Sager bumper can be attached in a few minutes. No machine work of any kind is required to place the bumper on the frame of a car. One of the accompanying illustrations shows the Dodge special—substantial, clean-cut and attractive; while the other displays the splasher Fit-all. Patents are applied for on the two different constructions.



New Sager Bumper.

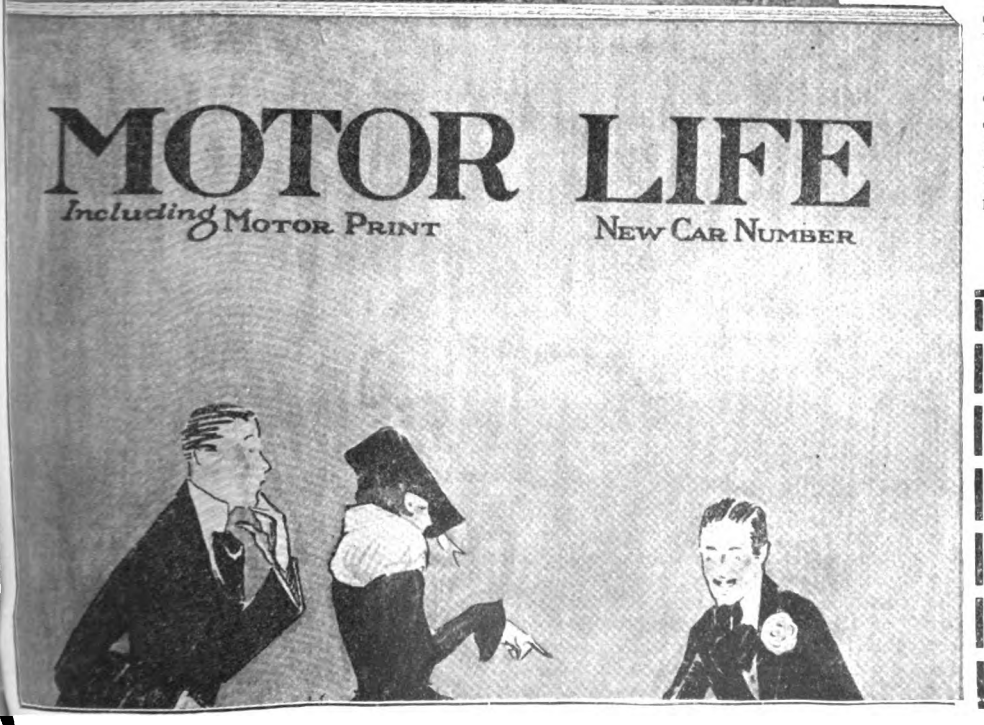
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Every month these five great magazines

—FORD OWNER, MOTOR AGE, AMERICAN MOTORIST, MOTOR, MOTOR LIFE—

carry full page advertisements telling your customers about the merits of the "Perry" Auto Lock. By this means we have created a market for more than 50,000 "Perry" Locks per month.

Are you getting your share of this new business? If not you can blame only yourself. Someone is going to get these orders from your customers. And you are the man—if you carry the

"PERRY"

The Only Lock That Thieves Don't Touch

One turn of the key disconnects the steering wheel. Car cannot be driven or towed away. Insurance companies now allow from 15% to 40% reduction on cars that are "Perry Locked."

Thousands of dealers now!

The "Perry" is so much superior to other locks that thousands of the best dealers now have our agency. You can have it if your territory is open. Write now and find out—or mail the coupon if more convenient. We have no competition—your profits are excellent—and there is a "Perry" to fit every car.

Mail the Coupon!

"Tell Me About It"

Perry Auto Lock Company
Dept. A-6, 1238 Michigan Blvd.,
Chicago, Ill.

Gentlemen: I have read your description of your "Perry" Auto Lock and would like to know about your special proposition to dealers.

I sell..... *cars*

Name.....

Address.....

Town..... *State*.....

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Ideal Hose Clamps.

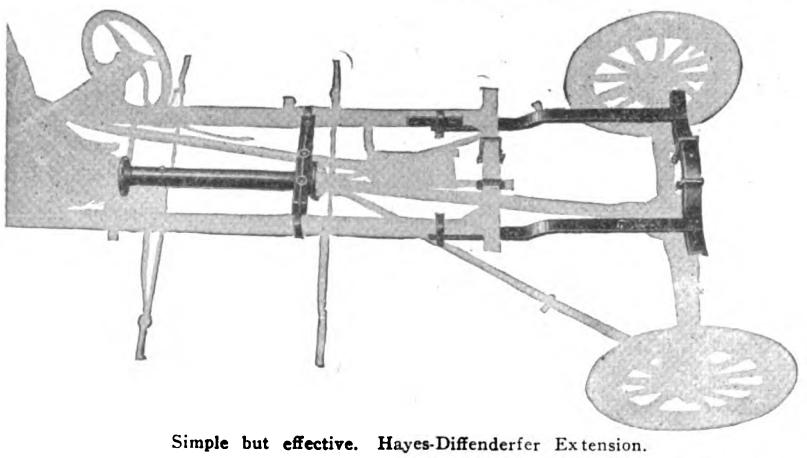
Everyone who owns an automobile or who has done any repair work realizes the value of a good hose clamp. The Ideal Clamp Mfg. Co., 203-205 Bradford Street, Brooklyn, N. Y., manufactures the "Ideal" hose clamp and these clamps are furnished to the trade in a very attractive display case, as shown in the cut. This display case when shown on the counter of a supply store, will appeal strongly to car owner customers.



The "Ideal" hose clamps are extremely practical. They close evenly around a hose and will not buckle or cut the hose, and make leaks absolutely impossible, as they give a perfectly tight joint no matter under what circumstances or conditions the clamp is applied. These clamps are furnished in the attractive display box shown, at a price of only $5 for the box, giving the dealer an excellent profit on retail sales. Send your orders and inquiries direct to the Ideal Clamp Mfg. Co.

Ford Car Extension at Little Cost.

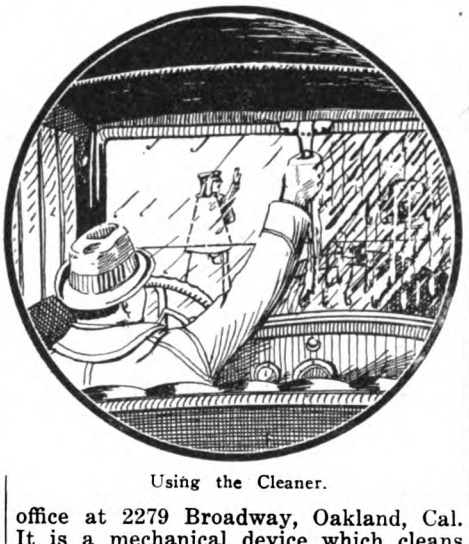
Unless we are much mistaken, there is an unusual chance for garage and repairmen, and others who are in the automobile line to get in on the agency for the extension attachment for Ford cars made by the Hayes-Diffenderfer Co., 237 West 55th Street, New York. There is bound to be a strong demand for this simple and efficient system, and the price of it is remarkably low. It extends the Ford chassis 15 or 30 inches as desired. The overhang is an objection to many commercial Ford cars, but this device so lengthens the wheel base that the load rides just where it carries the load with proper equalization on the wheels and the axles. For 15-inch extension the weight is but 47 pounds and the cost $55, and for 30-inch extension, the weight is 83 pounds and the cost $60. It would be desirable to get the agency for this device at once before it is too late. With a wrench, a hammer, and a few hours of spare time, you can extend a new or used Ford Chassis 30 inches, converting the 100-inch Ford into a 130-inch wheel base—without deviating in the slightest from the Ford construction. For full information, address the firm as stated.



Simple but effective. Hayes-Diffenderfer Extension.

"Clear View" Windshield Cleaner.

A windshield cleaner which has many advantages over others now on the market is manufactured by the Windshield Cleaner Device Co., 1311 S. Figuaroa Street, Los Angeles, Cal., with a branch office at 2279 Broadway, Oakland, Cal. It is a mechanical device which cleans both sides of the windshield clear across and does away with the hazards of driving in rainy, snowy, foggy or misty weather. It is neat appearing, nickel-plated, copperized first so that the rust won't get it, and the wiping bars are made of aluminum and are absolutely weatherproof. It is easily operated with one hand, while driving.



Using the Cleaner.

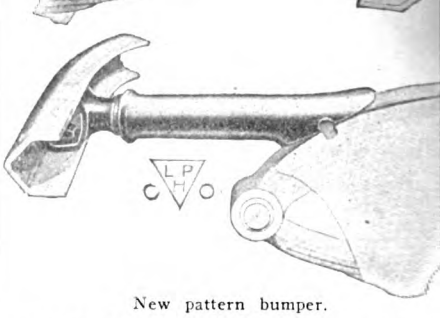
By moving the device across the windshield surface, both sides of the glass are instantaneously cleared of mist, rain, snow or dust and the nervous tension of the driver, peering through obscured glass, vanishes as he looks through the clear unclouded surface left by the "Clearview" device. The field of the "Clearview" extends beyond the pleasur car and is designed to fill the same u gent need for the windshield of truck and delivery cars. It is not a clumsy unsightly accessory, but is a neat and at tractive necessity and an inexpensiv and forehanded insurance against colli sions in rainy and foggy weather. Th price is $1.50.

This Poster Is a Peach!

We have just received from Valentin & Co., manufacturers of varnishes an colors, 456 Fourth Avenue, New York, copy of their new automobile poste This poster is put out as the opening gu in a campaign to educate the public, i possible, to have their cars repainted an revarnished oftener, and the idea is t hang this poster in a prominent positio in garages, repair shops and suppl stores. We understand that a copy c this poster will be sent to any deale repairman, or public garage owner, wh will write for it on his letterhead, s that Valentine & Co., may be assure that the inquiry actually comes from dealer.

New Halladay Bumpers.

The L. P. Halladay Company Streator, Illinois, is now offering an e tirely new pattern of the Hallada Bumper that is specially designed f cars fitted with front aprons extendi to, or nearly to the end of the frame e tension. The main portion of the fittin lies directly over the frame extensi with a clamp extending downwardly the outside and thence under the botto of the frame side. The contour of th part of the fitting which lies on top the frame side is such that the enti fitting may be rocked vertically in re tion to the frame, thereby affording vertical adjustment to conform with curvature of the frame. Such adju ment being made by means of the screws under the frame. Properly tig ening the cross bolt and the set scre insures a positive and non-rattling c nection. This bumper is supplied w either channel, diamond channel or ot bars making up the Halladay Bar Equ ment. The shock absorbing device is regular Halladay internal plunger w heavy steel springs. The finish is eit all black Japanned or black Japan fittings with heavily nickeled bars.



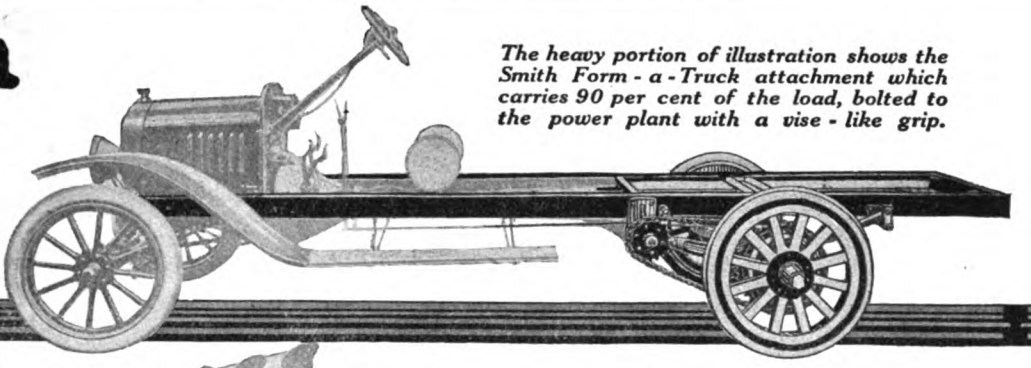
New pattern bumper.

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Smith Form-a-Truck

$350

F.O.B. CHICAGO



The heavy portion of illustration shows the Smith Form-a-Truck attachment which carries 90 per cent of the load, bolted to the power plant with a vise-like grip.



New General Executive Offices
SMITH MOTOR TRUCK CORPORATION
Michigan Avenue at Sixteenth Street, Chicago, Illinois

The Most Valuable Dealer Franchise in the Motor Truck Industry — And We Prove It

The Smith Form-a-Truck dealership is the most valuable sales franchise in the motor truck industry.

It is a guarantee of bigger earnings than are possible with any other make of motor truck or motor truck attachment.

It immediately places the dealer in the position of being the biggest man in his territory in motor delivery or hauling

The facts are all definite: they are based on business actually in hand.

Shipments of Smith Form-a-Trucks in January of this year were 1,277. In February, 2,075.

March 5th factory production reached a total of 200 a day.

And shipping schedules for the month of March are 5,000 for orders on hand.

Orders on hand for April delivery practically guarantee a shipment of 10,000 Smith Form-a-Trucks in that month.

A total of 18,000 Smith Form-a-Trucks sold and shipped in the first four months of this year is practically guaranteed.

This is 80% greater than the entire production for 1916.

And in 1916 more Smith Form-a-Trucks were sold than all other makes of attachments combined, or any other one make of motor truck.

Orders are coming from every part of the country—every line of business. Our entire planned production for 1917 was 20,000—practically reached the first four months.

But shipments will continue to be made promptly, even on this tremendously enlarged production.

We have the material—the money—the manufacturing facilities. We can take care of any demand, regardless of size, that we have scheduled sixty days in advance.

Big sales and positive guarantee of deliveries are what make the Smith Form-a-Truck dealer franchise the biggest asset in the motor truck industry. If the territory you are in is not already closed, apply now—by wire.

SMITH MOTOR TRUCK CORPORATION

Manufacturers of Smith Form-a-Trucks

Executive Offices and Salesroom, Suite 912 Smith Form-a-Truck Building, Chicago

Eastern Branch, 1834 Broadway, New York — Kansas City Branch, 1808 Grand Avenue — Southern Branch, 120 Mariette Street, Atlanta
Pacific Coast Branch, Pico and Hill Streets, Los Angeles, Cal. — Omaha Branch, 2212 Harney Street

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A Large Merger.

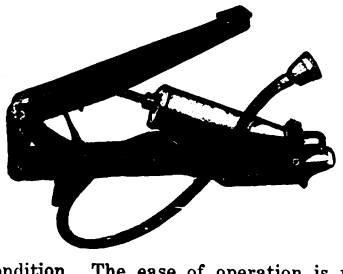
The Detroiter Motor Car Co., of Detroit, Mich., has been taken over by a new four-million-dollar corporation. All the stock in this new company has been fully underwritten, and a new factory will be built which is expected to produce from 2,000 to 5,000 cars each seaso. A. O. Dunk, one of the veterans of the automobile industry in the parts making field, obtained control of the Detroiter on July 15, 1915, and moved it to the present plant at Stanley and Vermont streets, Detroit. D. Minard Shaw will direct the advertising policies of the new corporation. Mr. Shaw is one of the veterans in the agency field in the merchandising of motor cars and previous to entering this field, had a wide newspaper and publishing experience. We wish the greatest success to the new company.

The Little Giant Starter.

This is a special starter for Ford cars. It is operated from the driver's seat by a medium-sized foot pedal just to the left of the other pedals of the car. This pedal remains locked against the dash, out of the way when not in use. All the mechanism is entirely under the head out of sight. This is a great seller for dealers and they as well as car owners should write at once for full particulars to The Little Giant Starter Company, Canton, Ohio.

The Peteler Foot Tire Pump.

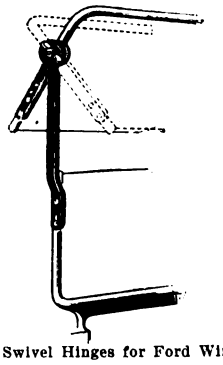
A new tire pump which has been brought out by Moreau & Pratt, Inc., 1834 Broadway, New York City, is certain to commend a large and ready sale, as it is based on a thoroughly practical, though novel, idea. This tire pump is operated with the foot by using your own weight and a simple easy leg motion. You are not obliged to bend up and down; you do not handle the pump and you do not finish the job in an exhausted



condition. The ease of operation is remarkable, and this will undoubtedly appeal to thousands of car owners, especially as the pump retails for only $5. As a selling proposition this tire pump should interest every live dealer in America. All communications should be addressed to the main office of Moreau & Pratt, Inc., 1834 Broadway, New York City.

New Device for Ford Windshields.

We illustrate herewith a new device for Ford windshields, models 1915, 1916 and 1917. To anyone who is familiar with the construction of the Ford car, the cut will tell its own story. The rain-vision feature enables the driver to see the road perfectly and drive safely in rain or snow, while the ventilating feature keeps a steady current of air through the front of the car, overcomes hot feet and keeps the dust and bugs out of your eyes. This device will give the driver of a Ford car the same amount of comfort and protection which can be found



Extension Swivel Hinges for Ford Windshields.

in higher priced cars, and the cost of the device is within the reach of all, as it sells for only $2 per pair, prepaid. This is a quick seller for dealers. All inquiries and orders should be addressed to the General Auto Specialty Co., 151 Berkeley Street, Boston, Mass.

The Niehoff "Cash Register."

The device which bears the above name is really a convenient case or set of drawers to contain contact parts of every description for the use of garage owners, supply dealers and auto repair shop proprietors. With this case the merchandising of contact parts is made easy. You can keep these valuable parts systematically so that you may know just where to find them, instead of having them scattered all over the shop. The Niehoff "cash register" is a money saver and can only be appreciated by those who have actually put it into service. This neat little case will be delivered, prepaid, if desired, with an assortment of contacts such as fit all standard cars or special assortments, as specified by the purchaser. Readers who are interested should write immediately for free illustrated booklet on contact parts and full information as to starter and generator brush equipment to the manufacturers, Paul G. Niehoff Company, Inc., Department A, Metallurgical Laboratories, Chicago, Ill.

A New Company.

The Compradores, Incorporated, is one of the latest Detroit corporations to enter the field of marketing automobile accessories and material. They have opened commodious quarters in the Dime Bank Building, Detroit. The active members of the new selling organizations are: J. N. Lassen and R. T. Brodhead. They are representing The Primolite Company of Indianapolis, The Detroit Gauge and Metal Stamping Company, Detroit Manufacturers of the Retlaw Gasoline Gauge for Ford Cars, Fulton Greuter Carburetor Company of Cincinnati and The Detroit Motor Lock Company, manufacturers of the latest locking device for Fords; The Detroit Cartridge Lock.

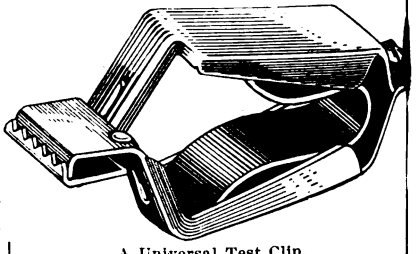
The supervision of distribution for this latter device is controlled for the entire United States by Wallace C. Hood Service Bureau and the Compradores will act as Michigan distributors.

The Super-Vulcanizer.

This is a small portable vulcanizing outfit for the use of car owners. The super-vulcanizer is guaranteed to vulcanize a patch quickly and permanently on any automobile or motorcycle inner tube in five minutes without the use of cement, gasoline, alcohol, acid or blaze. It is claimed that an overcure is impossible. The fuel used is a harmless combustible preparation contained in a small pan. The vulcanizable material is specially prepared raw rubber furnished on the reverse side of the pan. When the patch is applied, just ignite the heating substance with a match, which is sufficient to cure the raw rubber. In five minutes you have a perfect, permanent repair. Discard the pan and ashes and the job is then ready for instant use. No experience is necessary in using the super-vulcanizer. It comes in a package consisting of one machine, twelve patches assembled, ready for use, and a piece of sandpaper. The machine weighs only thirteen ounces complete. Though small in size, it is large enough to vulcanize any puncture or blowout. Additional patches may be purchased when needed, and agents are wanted for the super-vulcanizer throughout the country. Inquiries should be addressed to the Sunshine Light Co., Inc., 70 West Fourth South Street, Salt Lake City, Utah.

Universal Test Clips.

These clips as shown in the illustration are time savers for charging storage batteries, as the batteries can be hooked up with these clips and it is not necessary to stop and clean dirty terminals. The teeth bite through the corrosion and make a good contact. These clips are made of steel, lead plated, and



A Universal Test Clip.

may be used over and over again. The clips are made in all suitable sizes and the No. 21-A size has a 1½-inch spread of jaws. A sample clip will be sent postpaid to any address for fifteen cents, and the prices in lots of 100 are as low as 12½ cents each. Inquiries should be addressed to R. S. Mueller & Co., 435 High Avenue, Cleveland, O.

Removal of Agency.

A. Eugene Michel and Staff, the well known advertising agency, has recently removed from the Woolworth Building to larger quarters in the Morton Building, 116 Nassau Street, N. Y. City. This agency carries several prominent automobile accounts.

Will Represent Osgood Lenses.

George E. LaVietes, who is well known in the automobile trade, has recently severed his connection with the E. J. Willis Co., of New York, where he has been buyer as well as catalog man for a number of years. Mr. LaVietes will now "hit the trail" as manufacturers' agent for the Osgood Lens & Supply Co., of Chicago, manufacturers of the Osgood lens.

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$1150 F. o. b. Racine
Mitchell Junior—a 40-h. p. Six
120-inch Wheelbase

Mitchell SIXES

$1460 F. o. b. Racine
7-Passenger—48 Horsepower
127-inch Wheelbase

Mitchell Junior—$1150
Trebles the Mitchell Field

Here are some of the new attractions in the Mitchell line, to users and to dealers:

Two popular sizes—
8 styles of bodies—
31 extra features—
24 per cent added luxury—
100 per cent over-strength—
Over doubled output—
$1,000,000 in advertising.

The new size—Mitchell Junior—gives a roomy and powerful 5-passenger car—120-inch wheelbase—40 horsepower motor. And it opens an enormous new field to the Mitchells.

The eight body styles—all built in our plant—enable you to meet any idea in bodies.

The 31 extra features are attractions most of which all other cars omit.

The added luxury gives the Mitchell a distinction. And the savings made in our new body plant pay it all.

The over-strength — first announced this year—means a doubled margin of safety.

The larger output—2½ times last year's—places the Mitchell near the top in fine-car production.

The enormous advertising campaign—following a $700,000 campaign last year — will make the Mitchells the most talked-about cars in America.

The Extra Values

The Mitchell prestige is based on extra values. These are paid for by factory efficiency, due to John W. Bate. They show the results of efficiency in a concrete, resistless form.

This entire plant was built and equipped to build this one type economically. Millions of dollars have been invested, under John W. Bate, to this end.

Our new body plant this year completes all these efforts. Now 98 per cent of the Mitchell car is built by us under efficiency methods. The result shows in these extra values.

Every month we send out some 50 million advertisements to tell these facts to users. They have already trebled the Mitchell demand. They are bound to make Mitchells the dominant factor in the field of high-grade cars.

We invite possible dealers of the right calibre to investigate these facts.

MITCHELL MOTORS COMPANY, Inc.
Racine, Wis., U. S. A.

TWO SIZES

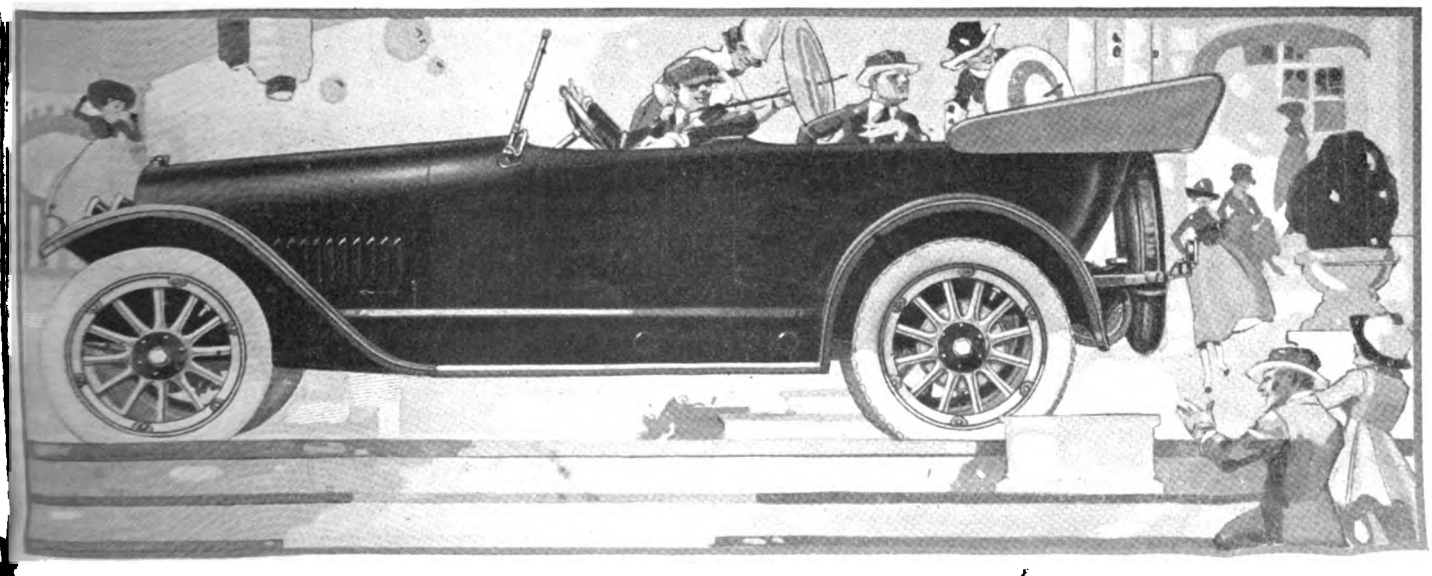
Mitchell —a roomy, 7-passenger Six, with 127-inch wheelbase. A high-speed, economical, 48-horsepower motor. Disappearing extra seats and 31 extra features included.

Price $1460, f. o. b. Racine

Mitchell Junior a 5-passenger Six on similar lines, with 120-inch wheelbase. A 40-horsepower motor—¼-inch smaller bore than larger Mitchell.

Price $1150, f. o. b. Racine

Also all styles of enclosed and convertible bodies. Also demountable tops.



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Frackto Kloth.

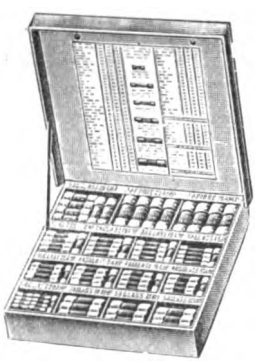
Frackto cloth is a chemically treated fabric, which the manufacturers absolutely guarantee will insure clear vision through the windshield under any and all conditions of weather. This fabric contains no grease or oil, nor anything that will injure the glass. In fact, it



can safely be used on your eyeglasses to prevent steam. This is a live proposition for dealers, and any car owners who cannot buy the Frackto cloth from the nearest dealer, should write direct to the manufacturers, The Davis Chemical Manufacturing Company, Inc., Boston, Mass. The price of a generous piece of Frackto cloth is thirty-five cents.

Fuses for Dealers.

Even in so small an item as the fuses for the lighting or starting circuit a large variety is required to accommodate various designs of cars. The fuse is about the smallest and cheapest part of the car but it stands guard over the nerve center—the battery. Dealers have some trouble in determining what types, amperages and quantities of fuses they should have if they wish to carry as little slow moving stock as possible, and to assist them "Union" auto fuses are now furnished in three assortments, known as No. 1, 2 ad 3, and containing



Assortment No. 2, containing 200 Glass Fuses.

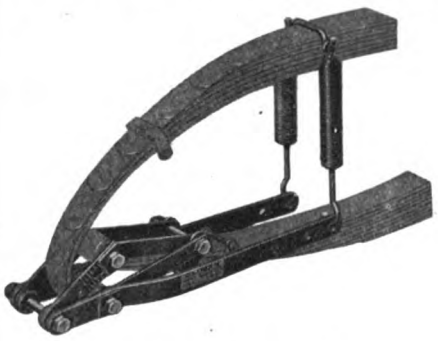
respectively 100, 200 and 150 fuses, selected after careful study of average requirements and neatly packed in a case with compartments for the various sizes. Complete details can be secured from auto jobbers or from the Chicago Fuse Mfg. Co., Chicago or New York.

Northwestern Chemical Expands.

Word has just reached us that The Northwestern Chemical Company, of Marietta, Ohio, manufacturers of the "Chemically Correct" line of Automobile Specialties, has increased its capital stock of $20,000.00, all common, to $150,000.00. The increase in the capital stock was brought about by its rapidly growing business, which necessitates a larger working capital. New buildings will be erected and additional machinery purchased in order that larger stocks of merchandise may be carried to facilitate deliveries. In this manner The Northwestern Chemical Co. will not be dependent upon individual shipments of raw materials, which at present is a very serious problem with most manufacturers. The warehouse stocks carried at New York and Oakland, Calif., will be increased. A new warehouse will very likely be opened in Chicago in the next few months. At present it operates two plants in Marietta, having a combined floor space of over 30,000 square feet. Just as soon as the weather permits two new buildings will be erected. Ground has been broken for one at present.

Climax Cantilever Shock Absorbers.

These shock absorbers are built on the well-tried principle of compound cantilever action. They are designed to act before the regular borings come into action and absorb the small vibrations. Then they assist the regular springs and absorb the regular shocks which otherwise would be communicated to the body



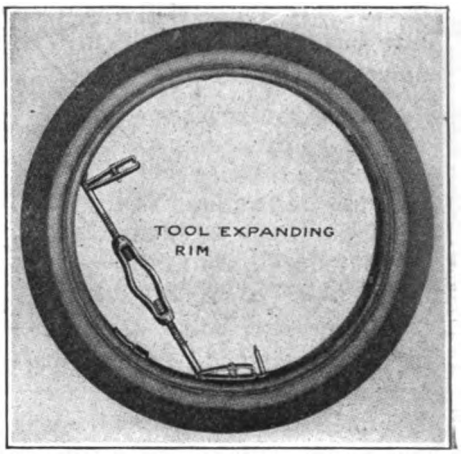
of the car to the discomfort of the passengers. These shock absorbers are sensitive to the slightest vibration. They act under all conditions whether the load be light or heavy. Minor actions of the axle are transmitted to the cantilever bars and absorbed by the tension springs. There is a patented adjustment which gives a wonderful radius of action. By simply turning the coiled tension springs by hand the shock absorbers may be adjusted to suit road or load conditions. The cost of these shock absorbers is small as compared to their work, and all who are interested should write direct to the manufacturers, the Climax Shock Absorber Company, Benton Harbor, Mich.

Advance Automobile Accessories.

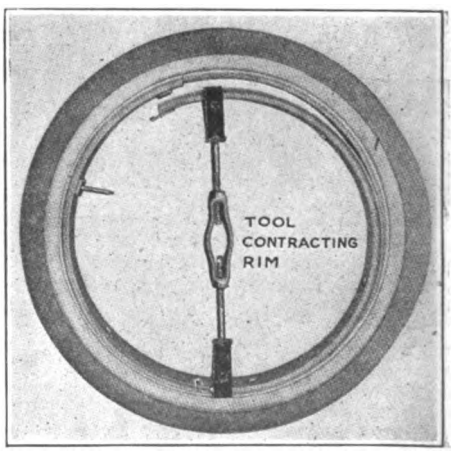
Perhaps the biggest paint campaign ever put out on an automobile accessory is now started for the Advance Automobile Accessories Corp., of Chicago, on their Cork Insert Transmission Linings for Fords. A dominating space on Park Row in Chicago looking north on Michigan Avenue has been rented by this company for a year and at present the display is being used for Cork Insert Linings. Kenneth Cloud, advertising manager of the company, states "This is only a starter. Before the season is well on we expect to be in 'paint' in every prominent position in the United States. Thos. Cusack of this city is figuring with us on the campaign and we will act very shortly. We believe in this advertising and as a method of concentrating our national and motor journal advertising it has no equal." Reports from the company show an amazing increase in business for the last two months and at the present rate of 1000 Myle Maykers a day they have been forced to increase the output to 1500 to meet the demand. The Cork Insert Transmission Linings for Fords are selling after only being in the market a month a thousand sets every day.

Live Specialties for Garages.

We illustrate two live specialties for garage use which are likely to interest a great many of our readers. The Hansen automatic air valve is made on scientific principles. The rubber washers



do not come in contact with the tire stem, and for that reason it is claimed that they will last indefinitely. The detachable stem is a very distinct, exclusive feature. Model C shown in the illustration is used in garages, tire service and gasoline filling stations, and all places where air is used for filling tires. We also illustrate the Hansen hose clamp, which is guaranteed to hold hose in place under extremely high pressure. It will not leak or blow off. It



can be taken off or put on instantly, and its mechanical construction can be readily understood by inspecting the accompanying cut. These specialties also include a general line of air valves, air dusters, hose connections and hose clamps which are manufactured by The Hansen Mfg. Co., Cleveland, O., to whom all inquiries should be addressed.

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AMAZON TIRES

SUPREMACY!

Dominating the tire field by virtue of superior merit, advance improvements and super-quality.

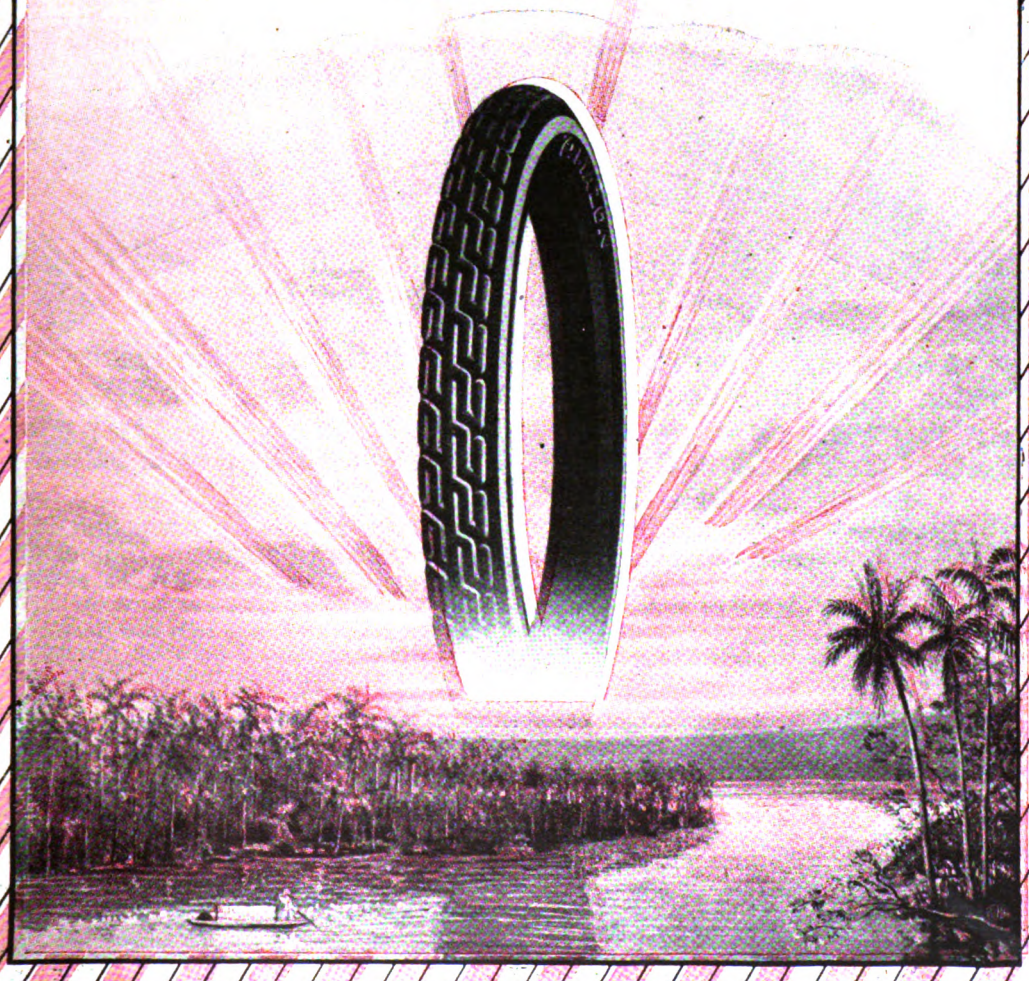
Amazon tires are made in Akron, under the supervision of Akron's most experienced tire men. Comprehensive manufacturing experience, a high ideal, and choice materials, have been combined to produce the AMAZON TIRES.

Any improvement on a standard product makes for a better product—and the Amazon Tire is better—the re-inforced construction, the distinctive appearance, and the honest, inbuilt quality raise the tire into a class by itself, above all!

Amazon dealers are prospering, for the consumer appreciates a BETTER tire as well as the dealer, and the dealer has exclusive sales rights in his territory.

Your territory may still be open, write us for full data.

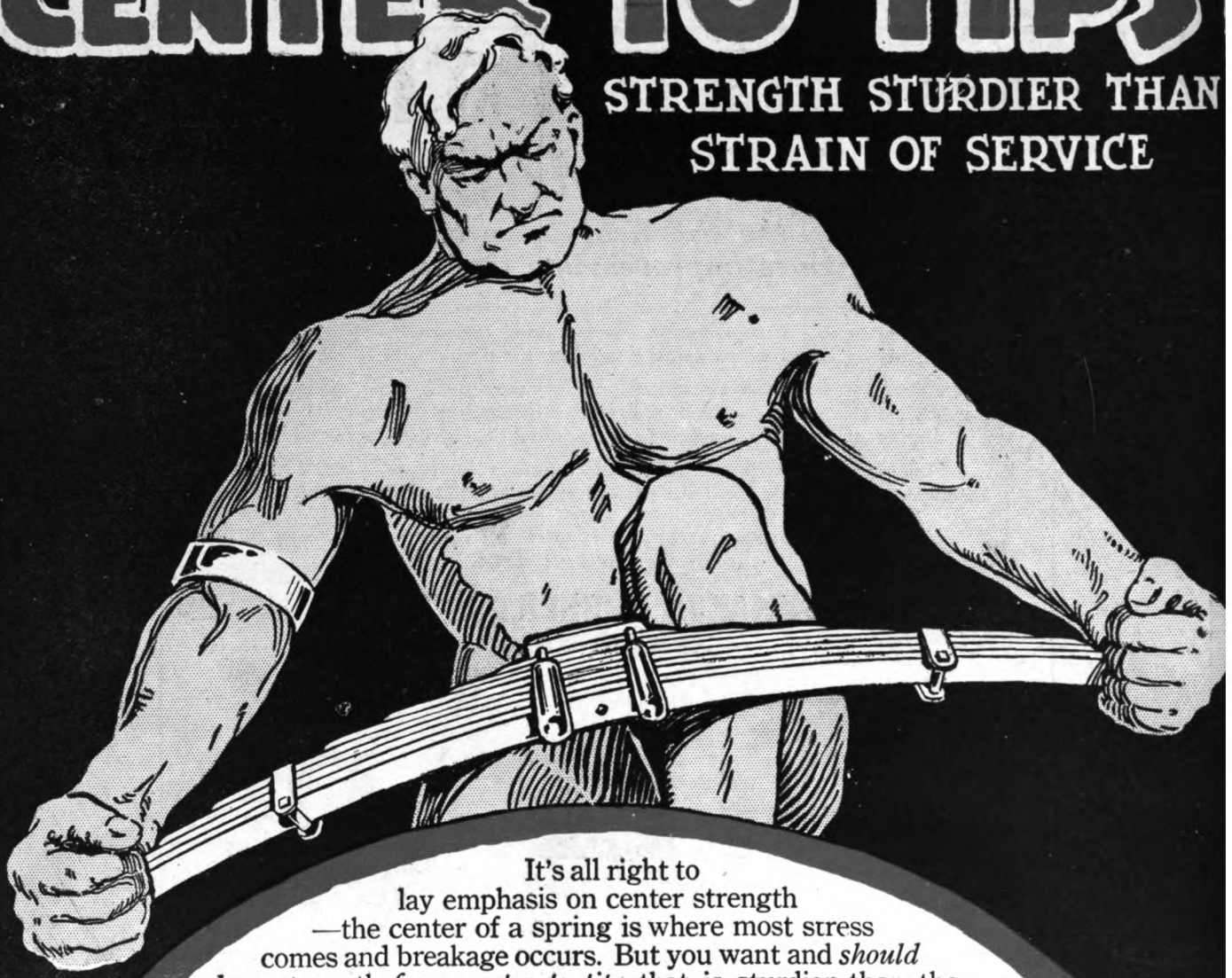
THE AMAZON RUBBER COMPANY
AKRON, OHIO



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CENTER TO TIPS

STRENGTH STURDIER THAN STRAIN OF SERVICE



It's all right to lay emphasis on center strength —the center of a spring is where most stress comes and breakage occurs. But you want and *should have* strength *from center to tips* that is sturdier than the strain of service. You get this in

HIGGINS QUALITY SPRINGS
FOR REPLACEMENT

There's no risk of ordinary breakage at center. The nib construction has surmounted that. It has eliminated holes—bolts—humps—and with them the fear of accident. Higgins Quality Springs have *demonstrated* themselves superior in center construction. And there's no more chance of breakage at *any* point than at the center, where Higgins Quality Springs stand unrivalled in resistance.

Made only from the highest class motor car spring steel of a special analysis—scientifically heat-treated—properly constructed and critically tested, before shipping. Equipped with rebound clips. Leaves are thoroughly lubricated with high grade spring leaf lubricant — preventing rust and squeaks, insuring easy, limber action and freedom from friction wear. Exacting care guided by a 34-year spring making experience is given every little detail—developing an unmatched degree of service strength with easiest riding resiliency.

Our Guarantee Stands Squarely Back of Our Claims

It is the same at all points. It is your protection against imperfection in any form. Demand that your supply house furnish you with Higgins Quality Springs. If they refuse—write us. Be sure to send for catalog listing 500 different styles — discounts and big money-making proposition. Get the best of the business with these better springs.

Higgins Spring & Axle Co.
Dept. 114
Racine, Wis.

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EASY AIR



Buy a Yankee Pump and you'll have "easy air" *always.*

"Easy" because you stand up straight when you pump with the "Yankee."

"Always" because the "Yankee" never goes wrong — never dries out and loses compression — never fails to drive a big, healthy shot of air into your inner tube at each stroke of the lever.

A necessity on every car — a sure-fire auxiliary to the power pump.

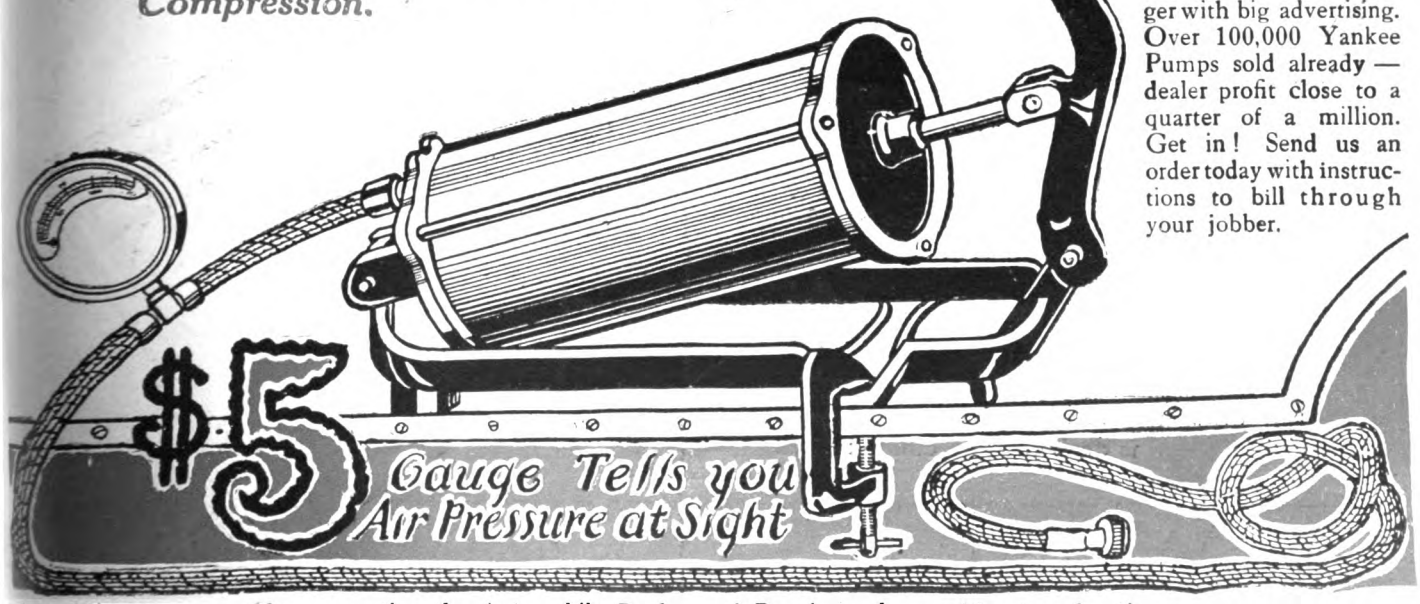
Apex Electric Mfg. Co.
1411 West 59th Street, Chicago, Illinois

YANKEE Pump

A Woman Can Work It With Ease — Clamps on Running Board — Folds to Fit In Any Tool Box When Not In Use — Piston Never Dries Out and Loses Compression.

Dealers:—

The Yankee Pump is one of the best selling accessories you ever were offered. We are going to make it even bigger with big advertising. Over 100,000 Yankee Pumps sold already — dealer profit close to a quarter of a million. Get in! Send us an order today with instructions to bill through your jobber.



$5

Gauge Tells you Air Pressure at Sight

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ere's a Big Demand
GROWING Demand
this Perfect Ring





HI-COMP
PATENTED 1916
PISTON RING
"THE RING THAT MAKES THE MOTOR SING" ©

EXERTS EQUAL PRESSURE UPON
ALL POINTS OF CYLINDER WALL

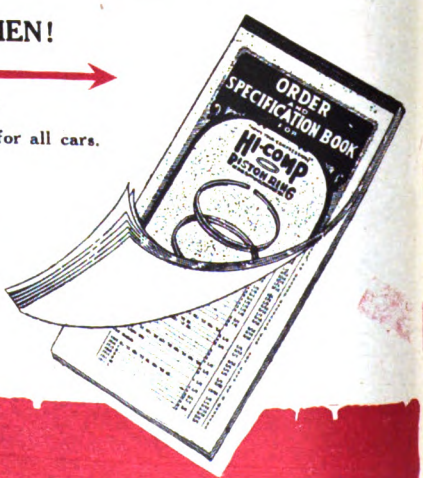
Saves Gasoline. Saves Oil.
Puts Pep in the Motor.
Eliminates Carbon.

ONE PRICE **$1.50** ALL SIZES

DEALERS! REPAIRMEN!

Send for this Book.

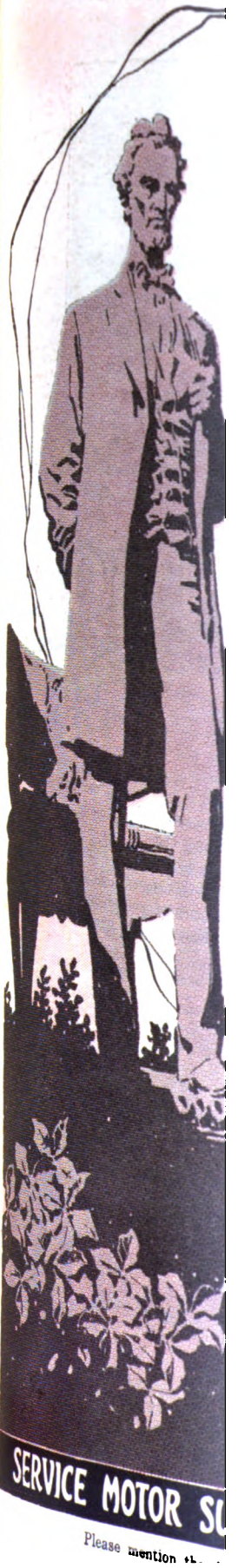
It gives specifications of Piston Rings for all cars.



inental Piston Ring Co.
MEMPHIS, TENN.

ıcturers of Piston Rings for use wherever power is derived from compression.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Please mention t

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CHARACTER

THE individual experiences of over 34,000 auto supply dealers, garagemen and repairmen, are the most convincing testimony of the character of the Service Motor Supply Co. of Chicago.

¶ These 34,000 dealers have come to know that our pledge of SERVICE is kept to the letter. They know that we buy and sell for cash and are thus enabled to give them the benefit of a decided saving on every item of merchandise they buy from us. They know our six hour service in the filling of orders is PERFORMANCE and not merely a PROMISE. They know that our traffic department insures promptness in shipping your order and economy in freight and express charges.

¶ They know that we sell only to dealers—that we do not sell to consumers at any price, either in our own display rooms in Chicago or by mail. To protect our dealers, we maintain a T. D. (Turn Down) Department, employing many people and maintained at a tremendous expense. No consumer orders can get by our T. D. (Turn Down) Department. It serves as a positive protection to our dealers, for it prevents consumers from getting wholesale prices.

¶ We can afford to sell goods at lower prices, because our selling expense is less. We have no expensive traveling salesmen—we sell our goods entirely through the medium of our monthly catalogue—"SNAPS"—which is now known among auto supply dealers and garagemen, as "The National Bargain Directory of Auto Supplies." All goods listed in "SNAPS" are guaranteed to be absolutely as represented. There is no quibbling—no attempt at evasive phrases—every article bought from us is exactly as represented. We back all our transactions with a *guarantee* that you, the customer, must be satisfied or your money will be promptly refunded.

¶ On these foundation stones, rests our character.

Dealer's Note: If you have not been receiving a copy of "SNAPS"—our monthly catalogue, send for it! It will be mailed *free* to any legitimate dealer, repairman or garageman who writes for it on his letterhead.

SERVICE MOTOR SUPPLY COMPANY

1523-25-27-29-31 Michigan Avenue

SERVICE MOTOR SUPPLY Co. 1523-25-27-29-31 Michigan Blvd. CHICAGO, U.S.A.

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THIS CAR GREW



from a FORD CHASSIS AND A

HAY DEE EXTENSION

THOUSANDS of such cars; big, roomy, powerful, economical, have been made by lengthening and strengthening the wonderful Ford Chassis with the HayDee Extension. No cutting, machining or drilling. It gives 130 inches wheelbase, permitting the mounting of bodies with 90 to 96 inches loading space behind the driver's seat. Over 900 merchants in New York City alone are using them. You profit big on Extension sales, by supplying bodies, by doing the work.

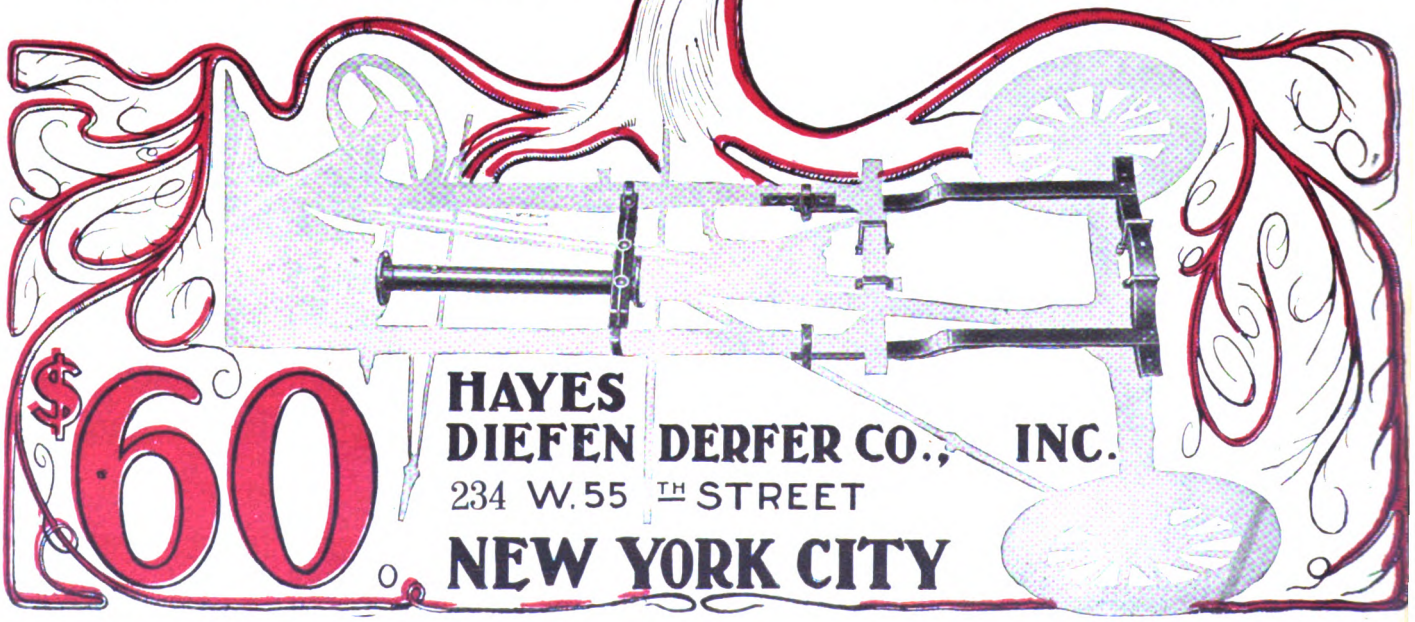
HayDee Extensions are made in two sizes, 15 and 30 inches. Can be put on by anybody with wrench and hammer.

Merchants everywhere—almost every line—all want delivery cars—not trucks. A Hay-Dee Extended Ford Chassis, with any kind of body, is unequaled for loading capacity, power and low running costs.

Furniture and Department Stores, Grocers, Florists, Undertakers, Laundries, Hospitals, Markets, Etc., are adopting these cars and discarding big, heavy, costly trucks.

Write for full information which will be sent you by return mail.

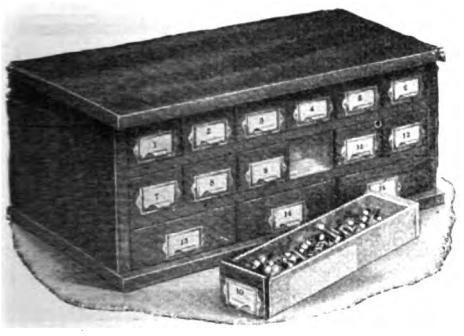
We are sole manufacturers and owners of the HayDee Extension, Patented



$60

HAYES DIEFENDERFER CO., INC.
234 W. 55TH STREET
NEW YORK CITY

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$5.00
To
Dealers
—
HANDY
SERVICE
CABINET

For Private Garage, Dealer, Repair Shop. The very best Cabinet made for taking care of Repair Parts. Boxes galvanized, iron-oak fronts—no stick—no warp. Rest of Cabinet Solid Oak. Better order one at once from your jobber—also a catalogue of larger unit sections.

375 Broadway STEVENS & COMPANY New York

The Upholstery.

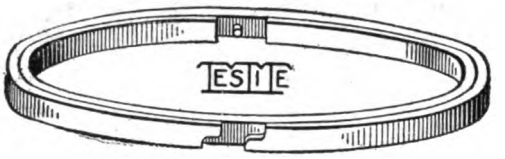
Any purchaser of a low priced car can add considerably to its value as well as to its appearance by the expenditure of a very little money and perhaps several hours of time. Look over the upholstery cushions, etc., and see that no rips have started. You sometimes find these in a new car and they are quite sure to develop in a few months in any case. Too much upholstering is done with tacks, especially at the corners, and these work out very easily. It is often possible to save trouble later by getting after a single dropped stitch early. Sometimes a rivet can be put in a corner that will effectually prevent further ripping. Reinforcing the curtains around the fasteners will also save some ugly tears later. Simply remove the fastener, cement a round patch of soft leather, such as an old glove, over the spot and put the fastener back again. Use a waterproof cement or the patches may come loose in the first rainstorm. This should not cost more than $10 or $15 for a good job and it will pay. Your car will look new for months after your neighbor's has become dull and shabby, unless he is one who always keeps his car polished. The coat of real coach varnish will not only keep the car looking well for months, but it will make it much easier to keep clean.

Starter Troubles.

Cold and gelatinous oil around the pistons and on the bearing surfaces make cranking with the electric starter decidedly more difficult than under normal circumstances. The owner is apt to accuse the starting motor or some part of the system, but the real cause lies in the thickened oil. There are two common remedies. One is to get heat to the cylinders so as to thin the oil, and this can be done by pouring hot water into the cooling system. Another is to crank the engine by hand a few times so as to free the pistons. When the oil thickens as above mentioned the starting system may act very much as though the battery were almost exhausted.

Dry cells must be packed with care to prevent trouble. If in round cartons, paper or cloth should be stuffed in between so that they will not shift and cause two negatives to touch, thus short-circuiting one or more cells. Set up the terminals firmly with a pair of pliers and see that no water gets into the battery box.

ALL YOUR GAIN



It Is a Hobby with Some Men to See How Good They Can Make a Thing

IN THIS CASE IT HAPPENS TO BE THE

Testite Piston Ring

And a very—VERY Good Ring It Is

Made with an eye single to absolute technical precision. You would hardly imagine it possible that such a supposedly common thing as a piston ring could be made so uncommonly good.

Testite Piston Rings are made in all sizes to fit all motors.

Testite Piston Rings save gas by utilizing the entire fuel charge in the production of power. There is no waste. No loss of power, no waste of exploded gases past piston ring openings.

Testite Piston Rings are a boon to marine, and also to aeroplane motors, where the highest compression is so vitally important.

Testite Piston Rings make your motor measure more power, make it more responsive, and though the highest in efficiency, are the lowest in price for piston rings of their character.

Every ring is inclosed in a separate envelope with directions for installation and are packed twelve in a box for the trade.

Our literature, we believe, treats the Piston Ring question in an intelligent manner—learn more—write us—today—that's better than forgetting it.

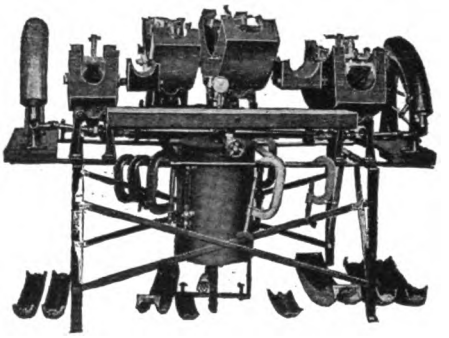
STEVENS PISTON RING CO., Inc.

FREEPORT, N. Y. - - BRIDGEPORT, CONN.

—AGENTS—

Fairfield Auto Co., Bridgeport, Conn. E. J. Willis Co., N. Y. City
Standard Tire & Rubber Co., 104-6 Portland Street, Boston, Mass.

Vulcanizing With A Vanderpool Vulcanizer Brings Big Profits.



3 CAVITY COMBINATION
VANDERPOOL VULCANIZER

HERE is an exceptional opportunity for Garages as well as Vulcanizing Companies to secure a vulcanizer that will turn out high-grade work at a small cost. The fuel saved alone, will pay for the machine in a short time—then you will "cash in" on your investment. This plant, the *Vanderpool Vulcanizer*, is meeting with the enthusiastic approval of hundreds of satisfied users all over the country. Unsolicited testimonials from the various companies now using the *"Vanderpool"* testify to the dependability, efficiency and economy of this "Vulcanizing Wonder". One man writes that the first month's profits paid for the plant. No experience needed—we teach you how. It occupies very little floor space, and "once bought, you will never have to buy again".

Send in this ad with your name and we will mail catalogue and prices.

VANDERPOOL COMPANY,
Springfield, Ohio BOX 53

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FORD OWNERS

Blame the brake and the transmission, yet all the rattle and jar are unnecessary

When Mr. Ford Owner steps on the brake and the car jumps and jerks, he thinks it's something he must put up with in his car. He thinks the jerky, noisy "get away," the lurch when he goes into reverse—are part of the way the Ford naturally acts.

But it isn't so! The trouble isn't with the Ford. Its brake is all right. Its transmission is simple and positive. The whole trouble is in the transmission linings. Ordinary transmission fabric gets hard and glassy smooth from the constant pressure, friction and soaking in oil. When the brake is applied it grips but slips—then grips and slips again. That's what causes the vibration, that ruins the car and makes it rattle.

$3 per set of 3

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

TRANSMISSION LININGS FOR FORDS

$3 per set of 3

Allow the Ford to start and stop with velvety smoothness

The brake responds to the slightest pressure. The car makes a smooth, easy, quiet stop. It goes into low and picks up speed with the steadiness and quietness of a high cost car. It eliminates the mechanism-killing vibration.

The difference is entirely due to cork. Cork has the quality of "taking hold." The cork discs in Advance Transmission Linings *grip* at the slightest pressure. They wear very slowly. Never get hard or smooth surfaced. They end the *rattle*. Make a great car greater.

40,000 and 50,000 Miles—18 Months in Service

—These are some of the records made by Advance Cork Insert Transmission Linings. The sworn affidavits covering these records are on file in our office. No other transmission lining has ever made any such mileage records. It can't without cork, and we control the patents on the cork idea. No substitute for cork has the gripping or wearing qualities. Get the genuine.

JOBBERS! DEALERS! "Cork Inserts" are taking hold in great shape. Over 125,000 sets already have been sold. It is being advertised by full pages in Saturday Evening Post—full pages in the motor journals. We supply snappy display signs and dealer helps of different kinds. There's a mighty nice profit on every sale—plus an installation profit. Sold *only* through dealers. Every sale means a profit to some dealer.

Send the coupon—Dealers —don't lose good profits

Don't wait! The big season is right here! Send the coupon! Get acquainted with these inserts. Then get in your order. Order of your jobber or us. We'll give him credit.

Jobbers! The leaders are all lining up with "Cork Inserts." They're ordering by the thousands of sets. Don't lose out on this live profit maker.

COUPON

Advance Automobile Accessories Corp.
Dept. D5-1, 56 E. Randolph St., Chicago.

Send me a set of Advance Cork Inserts.

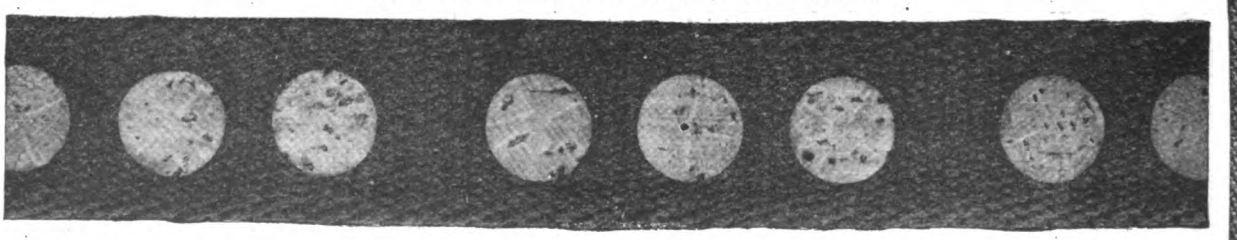
Name .....

City .....

State .....

Advance Automobile Accessories Corp.

Dept. D5-1, 56 East Randolph Street, Chicago, Ill.



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The Demand for Myle-Maykers during the past 60 days has been greater than ever before

Demand always follows an accessory that has merit

DEALERS—

Think what this means to YOU

It can only mean one great big thing. Myle-Maykers are *moving!* Wide awake dealers are making lots of money on their sale of the

MyleMayker

It Makes a Great Car Greater

They have found it is the livest and biggest Ford seller they've ever had and are *going to it!* They are putting their best efforts behind the best sellers. And—cleaning up!

Why don't *you* do this, too? The Myle-Mayker has proved itself to be a winner. Over 125,000 have been sold during the winter season. Three times that many will be sold—this summer. So get in the game now. You can't lose.

Saturday Evening Post Advertising

starts in April. That means Myle-Maykers are going to sell more quickly than ever and when once they are sold *they stay sold.*

So—right now—before this advertising starts—get them in stock. Get our literature and display cards.

Put our "Silent Salesman" on your counter. Let him sell for you. Get behind this proved winner.

Put your honest self—your honest efforts behind this proved winner. You can't lose. Clean up this summer on this *live* one.

MyleMayker Co. Dept. D 5, 56 E. Randolph St. **Chicago, Illinois**

What it is and how it works

The Myle-Mayker is a gravity operated auxiliary air control for the Ford carburetor—a control such as every high priced carburetor has. Nothing to regulate—nothing to get out of order—put on in a minute's time. Replaces the standard hot air pipe—no service—no adjustments.



What It Does for a Ford

1. Easier starting.
2. Quieter and cooler running.
3. Less carbon.
4. More flexible.
5. 3 to 10 miles more per gallon of gasoline.

Sole Makers of

ADVANCE CORK INSERT FORD TRANSMISSION LININGS

Outlasts three sets of ordinary lining. Stop the jerking and clatter — the mechanism-killing vibration. Write for full particulars.

Mail This NOW!

Myle-Mayker Company,
Dept. D 5, 56 E. Randolph St., Chicago

Gentlemen:—Please send me one Myle-Mayker, which I want to test out with the idea of ordering a dozen or more if satisfactory. Enclosed is $3.50 (regular dealer's price). I agree not to sell at less than $5.00 retail.

Name .....

R. F. D. or St. No. .....

P. O. .....

State .....

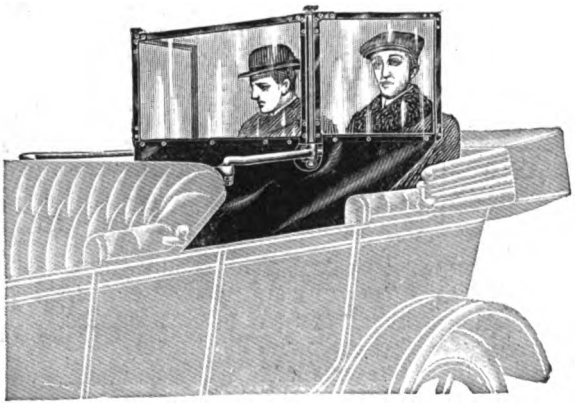
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Send for "Snaps."

"Snaps" is the title of an interesting monthly catalogue which is published by the Service Motor Supply Company, 1523-31 Michigan Avenue, Chicago. This catalogue should be in the hands of every dealer, repair man or garage man, and it will be sent free if you will write for it on your letter head, to indicate that you are really entitled to it. The Service Motor Supply Company sells to dealers only, not to consumers at any price. They have a mail order service to dealers only, and by doing away with traveling salesmen and selling their goods entirely through the medium of their monthly catalogue, they are able to quote remarkably low prices to supply dealers and garage men. All goods are backed by a very strong guarantee of complete satisfaction or money promptly refunded. If you are a dealer and have not already sent for a copy of "Snaps," get one by all means. It is likely to save you money and materially assist you in your business.

The "J. H." Tonneau Shield.

Nearly all motorists have come to realize that the occupants of the tonneau or rear seat of a motor car, are just as much entitled to protection from wind and weather as the man who sits on the driver's seat. The "J. H." tonneau or rear seat shield which is illustrated herewith is an admirable device for protecting the rear seat passengers. It can be easily and readily attached to any car, and is so adjusted that you can dispense with it and have an absolute open car if that is preferred, or the protection of a closed car when you need it, the change from one to the other being made in a minute. This windshield is neat in appearance and reasonable in price. Many dealers will be interested because this device is a ready seller. For prices and full particulars write direct to the "J. H." Tonneau Shield Co., 1777 Broadway, New York, N. Y.



The J H Tonneau Shield.

G. A. C. Vulcanizing Outfit.

There are many car owners who, if they only realize it, would save much trouble and expense by vulcanizing their own inner tubes. The G. A. C. inner tube vulcanizing outfit, which has recently been placed upon the market, is so simple and compact that it requires scarcely any room, and yet becomes almost indispensable to those who have used it. This device is so simple that any one can operate it. All that is necessary is to press the clamp, which automatically brings to bear an even pressure on the container, and then light the chemically treated substance inside the container, and after the surface is burned over, leave for seven minutes. The action of this vulcanizer is automatic, and it is impossible to overcure the patch or overheat the tube. The price of this handy little machine, with twelve patches in containers, is $2.25. As this is likely to prove a great seller during the coming season, correspondence is invited not only from car owners, but from supply dealers, repair shops and garage owners. Address all correspondence to The General Appliance Company, Inc., 127 Federal Street, Boston, Mass.

Gas Apparatus and Welding Appliances.

The Bradford-Ackermann Corporation recently formed by A. H. Ackermann and C. C. Bradford, with offices in the 42nd Street Building, New York City, announce that they have concluded arrangements with Ashton, Laird and Company, for the sole selling rights of their "Astra" High Temperature Gas Apparatus and Oxygen Welding Appliances, manufactured from the designs and patents of E. Raven Rosen-Baum, the well-known consulting engineer on high temperature gases.

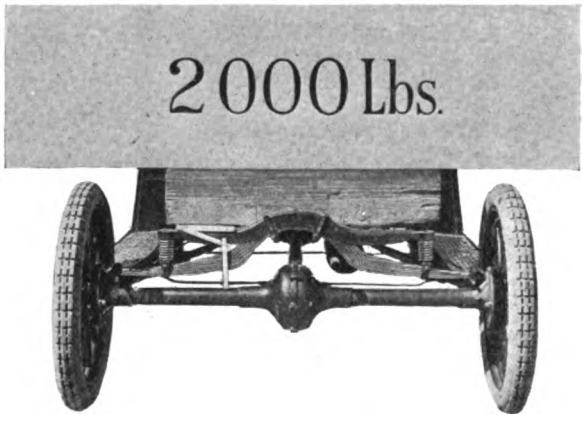
In addition to the extensive line of the various Oxy-Acetylene Welding Appliances, of proven merit and superiority, there will be marketed a new and standardized line of Oxy-Illuminating Gas Apparatus exclusively manufactured by this company. In this process either natural or artificial illuminating gas, direct from the town supply, is substituted as a supporting gas in connection with oxygen, and recommended for economy and efficiency, on a number of classes of work where its specific temperatures are especially adapted. These new appliances produce a proper neutral flame and permit an extraordinary simplicity of operation. The process has proven to be of considerable technical value on a variety of work and is already domineering various fields, such as lead burning, etc.

Crow-Elkhart Enters Export Field.

Extensive merchandising plans which involve the marketing of cars on every continent of the world, have crystallized in the establishment of an Export Department by the Crow-Elkhart Motor Company of Elkhart, Indiana. Mr. Pierre Maas, who has an exceptionally successful record in export business, has been made export manager. The Crow-Elkhart Motor Company has been brought into the export field purely by reason of the fitness of its cars and the attraction they had for the foreign market. The Elkhart firm showed good judgment by adding to its highly efficient organization such an experienced man as Mr. Maas, who during his many journeys to all parts of the world, has made numerous friends in the automobile trade. In the past year many hundreds of inquiries have been received from the countries now at war and also from a few of the belligerents, with the result that it was decided upon to enter the field, and there is every likelihood that the Crow-Elkhart will soon take its place among the leading American motor cars abroad.

New Accessory for Ford Cars.

Every user of Ford cars should be interested in a new accessory which is illustrated herewith, and especially those who own or drive Ford delivery wagons. We refer to a relief spring and frame supporter especially made for Ford cars. This device, it is claimed, will prolong the life of rear tires fifteen hundred miles. The plan has been in cases where the Ford chassis must carry a greater weight, to add leaves to the camel back spring, but this is apt to stiffen the car to a point where it is useless when running light, and the vibration is likely to injure the differential and running gears. With the simple, inexpensive device shown, the body is properly supported to carry heavy weights up to two thousand pounds without undue wear and tear on the Ford chassis. This device keeps the top from sagging on one side or the other, to the consequent damage of the tires; also prevents the breaking of the axle and its housing. Any boy can jack up the car to a point where these springs can be readily inserted, the socket being attached to parts now on the car. There are no holes to drill and no experience required to apply the device. We understand that a pair of these relief springs will be sent prepaid for $8 to any point in the United States with the understanding that satisfaction will be guaranteed or money refunded. Write for full particulars and interesting free literature direct to the manufacturers, the Ford Relief Spring and Frame Supporter Co., 7 East 42nd St., New York, N. Y.



A Relief Spring and Frame Supporter for Fords.

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Mr. No-Worry Springs

Let Me Help You Build a Bigger, Better Spring Business

Listen! When a man drives in with a broken spring, what do you do? Do you just repair the break? Or do you put in a new spring?

You know that three out of four breaks occur in the center. It's the hole or nib in the center that weakens the spring and causes the break.

Don't just repair that spring. It is likely to break again. And who gets the blame? You do—the owner feels it's *your* fault. Sell him a new spring—a

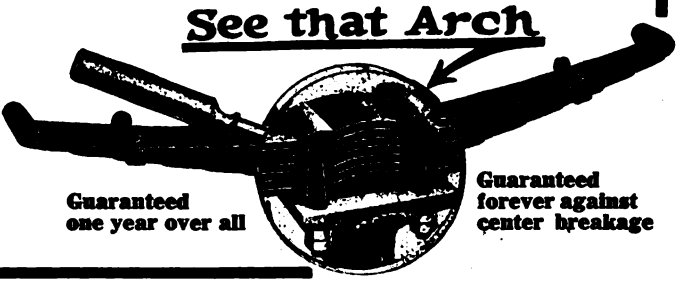
TUTHILL LUBRICATED TITANIC SPRING

the spring with *the patented arch—no weakening center bolt—no center nib*—the spring that ends center breakage — the spring whose trouble-free reputation is so great that it's sold for more replacements than all other makes put together.

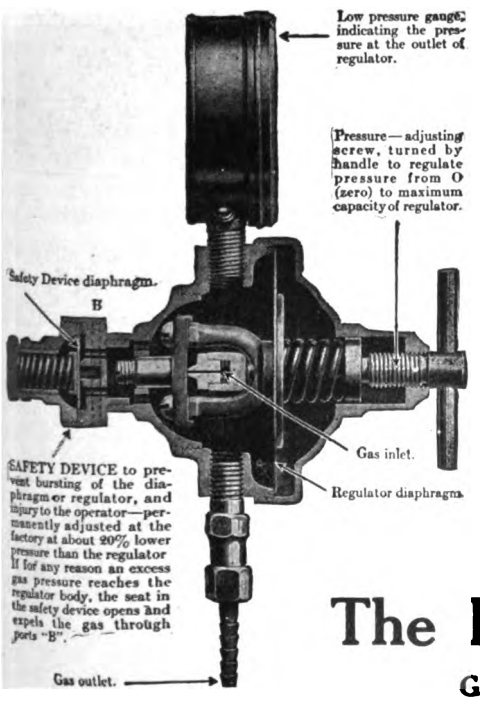
Sell him a Tuthill Titanic — you make a good profit on the sale and installation — and you make a satisfied customer — a customer that will *boost* for *you*.

There's a Tuthill distributor near you. Let us send his name — also our 1917 price list — the most complete list of springs ever published.

TUTHILL SPRING COMPANY
760 Polk Street, Chicago, Ill.



SAFETY FIRST FOR WELDERS



B-B-B Diaphragm Safety Device

How often have you heard of a serious accident because of the poor design or weakness of a regulator? Because of the nature of oxy-acetylene welding and cutting it is of the utmost importance that the apparatus used be properly designed and made to insure the operator.

Accidents are Impossible

The B-B-B Diaphragm safety device takes care of any excess gas pressure—the safety device works like the blow-off on a steam boiler. The pressure never reaches the danger point. B-B-B regulators are strong, durable and reliable.

Welding and Cutting Torches

B-B-B welding and cutting torches are made with the same care and thought as are B-B-B regulators. They are built to give maximum results with perfect safety.

Send for Complete Catalogue—It's Free

The Bishop-Babcock-Becker Co.

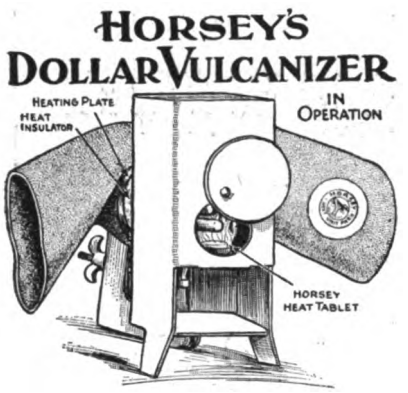
General Offices and Factories: Cleveland, Ohio

Branches in the larger cities

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Horsey's Dollar Vulcanizer.

This vulcanizer, which sells at the very low price of one dollar, is especially designed to quickly and perfectly vulcanize the Horsey heat unit patches, using a Horsey heat unit tablet. The vulcanizer is made of steel in one unit. It is small and compact, of pocket size, and weighing only one pound. This vulcanizer has an insulated heating plate, which keeps body of vulcanizer always cool, so that it can be handled without burning the



hands or the tube. The illustration will give a good idea of the appearance of this device. It will perfectly vulcanize the patch to conform to and stretch with the tube. As this vulcanizer does not use gasoline or alcohol for vulcanizing or cleaning the tube, it is absolutely clean and safe to operate. For full particulars write to the Horsey Mfg. Company, Cleveland, O. Correspondence with dealers is especially invited.

Change in Bosch Advertising Department.

Alfred H. Bartsch, who has been advertising manager of the Bosch Magneto Company for seven years, has resigned his position to become a member of the firm of McLain-Hadden-Simpers Co., advertising and merchandising council of Philadelphia and New York City. Mr. Robert S. Westcott, who has been assistant advertising manager of the Bosch Magneto Company, will immediately assume the duties of advertising manager and will serve in that capacity at the present advertising offices of the Bosch Company, 1764 Broadway, New York City.

Perfection Cylinder Grinder.

This is a very handy machine for the automobile repair shop. It can be attached to any ordinary engine lathe which has a hollow spindle and a swing of 14 inches or more. This machine is guaranteed to do the work quickly and accurately. Descriptive literature will be gladly sent on request by the manufacturers, Wood & Safford Machine Works, Great Falls, Mont.

The "Nu Way" Button for Fords.

In driving a Ford or any other car, prompt warning is of vital importance to every motorist. Sometimes where accident is threatened, the fraction of a second necessary in reaching for the horn is very important, but if the electric button for operating the horn is placed at the center of the driving wheel, it can be reached instantly and is handy for all emergencies. The Nu Way Button, which can be attached to any Ford car in five minutes, provides for a button at the point named, and as this button with attachment sells for only 50 cents, it is certain to command a large and ready sale. Readers who are interested in this device should write for descriptive circular and full particulars to The Aerofram Co., Inc., 107 Massachusetts Avenue, Boston, Mass.

Repair Work and Special Parts.

The Automobile Mechanics Corporation, 221 West 53rd Street, New York City, is prepared to furnish extra parts for the following cars: Marion, Pullman, Elcar and Abbott-Detroit. They also do all kinds of repair work, such as motor work, painting, trimming, top fitting, slip covering, etc. They fill all orders promptly and guarantee the best workmanship.

Testbestos Automobile Brake Lining.

The Testbestos brake lining is a well known and widely advertised product. Every dealer needs to carry some good brake lining in stock, and the Testbestos is very highly recommended by all who have used it. This brake lining is manufactured by the American Asbestos Company, 1217 Stambridge Street, Norristown, Pa., to whom all inquiries should be addressed.

Safety in Cranking a Ford.

Many a man or woman has had a broken arm caused by cranking a motor car. The engine in a Ford car is very powerful and this accident is quite as apt to happen with a Ford as with any other make, although not any more so. The Bill automatic spark retarder renders it absolutely impossible for an accident to occur. It not only retards the spark to a point of absolute safety, but instantly and automatically advances it on the first power stroke of the motor. This is a valuable improvement which should appeal to every owner of a Ford car, especially if the car is to be driven by inexperienced persons. Write for descriptive booklet and full particulars to Bill Manufacturing Co., La Porte, Ind. Correspondence with dealers is also invited, as this is likely to prove a quick selling article for any garage or supply house.

Repair Parts for Fords.

The Acme Mfg. Co., 258 Broadway, New York City, with factory at Boonton, N. J., makes a specialty of furnishing all repair parts for Ford cars, and readers who are interested should write to the New York City office for complete price list.

New Electric Boat Motor.

The electric motor boat has always met with favor on account of its noiseless working and cleanliness. In view of the success the outboard motor has met with, it is not surprising that an electric outboard has recently been placed on the market. Also the high cost of gasoline in foreign countries has created a very large demand for the electric outboard motor in place of the gasoline motor. The outfit illustrated is manufactured by the Jewel Electric Co., 112 North 5th Avenue, Chicago, Illinois. The machine is of particular use in cases where simplicity of operation is desired, while for duck or trolling a boat fitted with one of these little motors would be almost ideal. As regards general layout, the machine closely resembles the conventional type of gasoline-driven outboard motor, being clamped to the boat in the usual manner. The motor is placed directly above the main driving snaft, which is contained in a telescopic tube, allowing the propeller to be adjusted to the correct distance beneath the surface of the water. The propeller is driven through a modified type of worm gearing, which gives a great reduction between the motor and propeller, this being necessary owing to the fact that the normal speed of the motor is about 3000 r.p.m. Above the motor is a small steering wheel, which enables the propeller to be turned to the right or left hand, or completely around if it is desired to reverse the direction of the boat. To this wheel may be fitted either a tiller or steering yoke, according to requirements. The outfit is made



Jewel Electric Outboard Motor.

of aluminum and manganese alloy wherever possible, the idea being to reduce the weight. It is worthy of note that the motor complete, but without the battery, weighs only 50 lbs. Regarding details of the motor, the armature runs on ball bearings, and the commutator and bushes are of special design, suitable for low voltages, as the motor used with a current of from 6 to 12 volts. By means of a simple device the motor may be detached from the driving shaft and used for other purposes where power is required, and the current can be derived from the same batteries as used in the boat. The standard storage batteries supplied with the regular equipment are two of 6-volt 120-ampere each, but the Jewel Electric Co. supply a range of accumulators of 6 to 12 volts, having varying capacity of 60 to 120 ampere hours. The Jewel Electric Co. are making arrangements for agents and territory rights in this country and foreign countries.

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Classified Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange, at the uniform price of five cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 75 cents, however small. Remittances may be made in postage stamps or in any convenient way. Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

General Speedometer Repair Company

Repairs and Repair Parts
For ALL Makes
SPEEDOMETERS
HORNS
CLOCKS

Official Service Station
American Electric Company
VAN SICKLEN SPEEDOMETERS
CORBIN BROWN SPEEDOMETERS
KLAXON HORNS

51 W. 63d St., New York City

Free

Our new 1917 Catalog is just off the press. It has the finest line of up-to-date accessories for all cars that has ever been offered at money-saving prices. Every article is guaranteed to give satisfaction, or money returned.

Ask For Catalog D. R.

General Automobile Supply Company
1671-1673 Broadway New York City

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Ford Wheels, 30x3½, new $2.00
Ford Fan Belts, all } 1916 ..... 15c
leather, to dealers } 1917 ..... 20c
Inter-State Rubber Co., 259 N. 15th St., Philadelphia

Carburetors

SHIP THAT TROUBLESOME CARBURETOR

By Parcel Post. We rebuild and install new parts. Largest and most fully equipped carburetor testing plant in the East. Factory appointed service station for all the leading companies. Also a stock of used rebuilt carburetors, $5.00 up. All work guaranteed.

JOHN WILLS, Carburetor Specialist,
284 Halsey St., Newark, N. J.

Auto Accessories

AFFA SPECIALTIES

For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

W. S. GRAFFAM,
49BW Carleton St., Newton, Mass.

We Still Have a Few 100-lb. Box Assortments
Bolts, Nuts, Set Screws, Rivets, Filister Head Screws, Key Stock, Etc., Etc.
$5.00 per 100 lbs.
Westchester Accessories Co., Inc., 1777 B'way, New York

Magnetos and Batteries

Hecht's Magneto Exchange
INCORPORATED
Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.
Expert Repairing of All Makes.
Express your Magneto, Starter and Generator to us. Same will be repaired and returned same day as received.
Distributors and Service Station for
MICHIGAN AND NATIONAL MAGNETOS
— Also —
Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos
230 WEST 49th STREET NEW YORK CITY

MAGNETOS

Expert repairing on all makes of Magnetos, Coils, Self-Starters and Generators. Armature winding a specialty. Parts for all makes carried in stock.

MAGNETO SALES COMPANY
1779 Broadway, Suite 229, New York City

Cylinders Repaired

Thousands of Satisfied Customers

SCORED CYLINDERS
REPAIRED
With a Silver-Nickel Alloy
"Fused Electrically by Patented Process"
NO WARPING OR ENLARGING OF BORE
Same Piston and Rings Used
Also Do a Large Grinding and Welding Business
ALL WORK GUARANTEED

L. LAWRENCE & CO.
(Established 1862)
—PLANTS AT—
Chicago, Ill. ..... 1518 Michigan Ave.
Detroit, Mich. ..... 1240 E. Jefferson
Newark, N. J. ..... 240 Halsey St.

Auto Bodies

Auto Bodies
SPECIAL SALE
Sacrifice All Styles—Immediately
PRICES, $5.00 UP
Write for Full Particulars
JANDORF AUTO CO.
1763 Broadway Dept. A. D. New York

Welding

DON'T SCRAP ALUMINUM PARTS
Save Them With
SO-LUMINUM
This new welding compound for aluminum is stronger than aluminum—perfect substitute for acetylene. One-half time and cost.
Use Gasoline torch.
Trial Bar, 50 Cents $3.00 per pound
SEND FOR BOOKLET 7.
SO-LUMINUM MFG. CO., 1790 Broadway, NEW YORK

WELDING PLANTS--$25 to $250
LIBERAL TERMS TO RESPONSIBLE PERSONS OR FIRMS.
Write at once to Manager Dept. B.
BERMO WELDING APPARATUS CO. OMAHA, NEBR.

ACETYLENE WELDING
New Process—Brazing of Aluminum Crank and Gear Cases
GIVE US A TRIAL
DAVIS & SCHEGG CO., 2124 Broadway, New York

Patents

IMPROVEMENTS WANTED—Send for free bulletins and advice. Book, "Inventions—Patenting and Promoting," free. Lancaster & Allwine, 212 Ouray Bldg., Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

Books

PRICE WRECKER No. 18, listing 3,000 automobile supplies and accessories. Just off the press. Thousands of motorists save 25% annually with this as a guide. It's free. Send for one.

TIMES SQUARE AUTO SUPPLY CO.
World's Largest Dealers
56th Street and Broadway, New York — 1210 Michigan Ave., Chicago

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Tires

HERCULES TIRES
GUARANTEED 4,000 MILES

If a tire fails to run 4,000 miles, we will replace with another tire for one-half of below price.

Size	Plain	Non-Skid	Tube	Size	Plain	Non-Skid	Tube
28x3	$5.95	$6.95		35x4	$13.45	$14.95	$3.30
30x3	6.50	7.50	$1.90	36x4	13.95	15.50	3.35
30x3½	7.95	8.95	2.15	34x4½	16.95	18.95	4.00
32x3½	8.95	9.90	2.25	35x4½	17.45	19.45	4.10
34x3½	9.50	10.45	2.35	36x4½	17.95	19.95	4.15
31x4	11.45	12.60	2.95	37x4½	18.45	20.45	4.25
32x4	11.95	12.95	3.05	35x5	19.45	21.95	4.90
33x4	12.45	13.50	3.10	36x5	20.45	22.95	4.95
34x4	12.95	13.95	3.20	37x5	21.25	23.25	5.05

WE SHIP C. O. D.
WE PAY ALL EXPRESS CHARGES
MAIL ORDERS PROMPTLY FILLED
WE CARRY A LARGE STOCK

Special Propositions to Good, Live Dealers

HERCULES TIRE CO.
612-14 N. BROAD STREET PHILADELPHIA, PA.
Phones: Poplar 5169—Race 6019-D

Tires

FRESH STOCK

Ball Bearing Tread Tires
GUARANTEED 4,000 MILES
NON-SKID

We have a tremendous stock of the Endurance Ball Bearing Tread and Hamilton Cable Cord Tires in factory blemished on hand, at the following prices:

Size	Price	Size	Price
30x3	$7.63	34x4	$17.25
30x3½	9 88	34x4½	21.50
32x3½	11.38	35x4½	22.50
32x4	15.50	36x4½	23.00
33x4	16.50	37x5	27.00

Mail orders promptly attended to and sent subject to examination. No deposit required. Send your order to-day.

The TIRE SALVAGE CO., Inc.
251 W. 55th Street New York City

Fair Proposition to Dealers

DOUBLE TREAD TIRES
AT 75% SAVING

Size	Plain	Non-Skid
30x3½	$6.00	$6.50
33x4	8.00	8.75
35x4	8.00	8.75

All Other Sizes in Proportion
These Tires Are Absolutely Puncture-Proof
Terms: C. O. D. 10% Deposit
BERGEN & ZAAGER
243a West 56th Street NEW YORK

CHEAP DOUBLE TREAD
NEW AND SECOND HAND
Tires and Tubes
Write for Prices
JAFFE BROTHERS
260 West 54th Street NEW YORK CITY

30x3½ STODDARD
New, first quality. No mileage guarantee. $8.75.
Ribbed Tread, Non-Skid.
STAR RUBBER CO., 1781 Broadway, New York

Tires

GET WISE MR. AUTOMAN!
WHY OVERPAY?

Write us for price list on tires and tubes. Don't fail to do this before purchasing your next set. Will cut your tire expense in half.

M. LIBEN & CO.
205-A West 48th St. New York City

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2 00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4 50	8.50	10.00
37x5	5 00	9.00	12.00

Ship Your Old Tires by Prepaid Express
McDANIEL RUBBER CO.
613 Ohio Street Cairo, Ill.

Don't Be Misled By Fictitious Mileage Guarantees

Our Tires Guaranteed
ALL FRESH FACTORY BLEMISHED
NOT MADE OVER OR RECOVERED

Size	Plain	Skid	Size	Plain	Skid
28x3	$5.55	$6.32	34x4	$12 00	$12.85
30x3	5.88	6.71	35x4	12.50	13.20
30x3½	7.70	8.63	36x4	12.50	13.75
32x3½	9.50	10.67	35x4½	16.00	17.00
34x3½	9.60	10.85	36x4½	17.25	18.00
33x4	11.50	12.50	37x5	18.75	20.00

All Other Size Tires Carried in Stock.
THESE PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.
Any Order Sent C. O. D. on Approval
TIRE SALES CO.
1338 Arch Street Philadelphia, Pa.

DOUBLE TREAD TIRES
GUARANTEED

for big, low cost mileage. They save you 65%. We build splendid double thickness tires by special process, giving you the unusual strength and resistance qualities so essential for heavy work in the country.

Sizes	Tires Plain	Red 9 Ply Tubes
30x3	$4.50	$3.00
30x3½	6.00	3.60
32x3½	6.25	3.65
34x4	7.75	5.00

All sizes from 23x3 to 38x5½ in stock.
Tires, Fisk, Red and Gray Tops, 2nd's. Special Prices.

Three years ago we introduced DOUBLE TREAD TIRES to the farmer. Square dealing, honest values and prompt delivery have built the largest retreaded tire business in America around our "*Doutrè*" trade mark. Compare these prices on tires and tubes. Send for booklet and detailed lists.

Sizes	Tires Plain	Red 9 Ply Tubes
34x4½	$9.50	$6.60
34x5½	10.00	6.75
36x4½	10.00	6.90
37x5	12.00	8,20

75 cents additional added on all non-skid tires.
20% Deposit Required on C. O. D.

DOUBLE TREAD TIRE CO., Inc.
104 WEST 52nd STREET NEW YORK CITY

NEW FIRST GRADE TIRES
Hand Made Wrapped Tread

30 x 3½	Clin. Plain	$6.50
30 x 3½	Clin. N. S.	7.00
32 x 3½	S. S. Plain	8.50
32 x 3½	S. S. N. S.	9.00
33 x 4	S. S. Plain	11.50
33 x 4	S. S. N. S.	12.00
34 x 4	S. S. Plain	12 00
34 x 4	S. S. N. S.	12.50

Other sizes in proportion.

JANDORF AUTOMOBILE COMPANY
1761 Broadway New York
Mail orders filled same day.

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Tires

SPECIAL SPRING OFFER
—ON—
DOUBLE TREAD TIRES
AT A SAVING OF 75%

A Special Discount of 5% When Cash Accompanies Order. We Also Give Special Discount to Dealers.

The following are our net prices on Double Tread Tires and New Tubes of Standard Makes kept on stock:

Size	Plain	Non-Skid	Tubes
28x3	$4.00	$4.50	$1.95
30x3	5.00	5.50	2.05
30x3½	6.00	7.00	2.40
32x3½	7.00	7.50	2.55
34x3½	7.00	8.00	2.70
30x4	7.00	8.00	3.15
32x4	7.00	8.00	3.35
33x4	8.00	9.00	3.45
34x4	9.00	10.00	3.60

Size	Plain	Non-Skid	Tubes
35x4	$9.00	$10.00	$3.70
36x4	9.00	10.00	3.80
34x4½	10.00	11.00	4.40
35x4½	10.00	11.00	4.50
36x4½	10.00	11.00	4.60
37x4½	10.00	11.00	4.75
35x5	11.00	12.00	5.35
36x5	11.00	12.00	5.45
37x5	11.00	12.00	5.55

For retreading your old tires, prices on request.

Make sure when ordering tires to state whether Q. D., Straight bead or Clincher type.

We carry a full line of New First and New Second Tires at a big saving. Write for prices mentioning sizes. Prices upon request.

TERMS: 10% DEPOSIT, BALANCE C. O. D.

I. JAFFESS

Two Stores, 1319A Fifth Avenue, 241 West 54th Street, NEW YORK CITY

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$4.00	35x4	$8.00
30x3½	4.50	36x4	8.50
32x3½	5.50	36x4½	9.00
32x4	6.00	36x5	9.00
33x4	6.50	37x4½	9.00
34x4	7.00	37x5	9.50
34x4½	7.50		

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.

236 WEST 48th STREET, NEW YORK

GRIPWELL TIRES

CARRY 4,000 MILE GUARANTEE

MR. DEALER WRITE FOR OUR PRICES, WHICH ARE RIGHT.

UNIVERSAL RUBBER CO.

BROAD AND WOOD STREETS, PHILA., PA.

PRICE WRECKERS

All goods bought before the January increase in price sold at 1916 prices.

Blemished New Tires		Double Tread	
30x3	$6.50	39x3	$5.00
30x3½	8.00	30x3½	6.00
34x4	13.00	34x4	8.00
Guaranteed		$1.00 Less for Re-covering	

Give Us a Trial, We'll Both Benefit By It

ROYAL TIRE EXCHANGE

282 Halsey Street Newark, N. J.

DOUBLE SERVICE TIRES

At the Lowest Possible Prices. Send for Price-List.

Hartford Tire Co., Inc, 149 W. 51st St., New York

AUTO TIRE PRICES HIGHER. Sell Insyde (Armour) Tyres. They double tire mileage, prevent punctures, blow-outs, etc. Great profitable seller. Free details. American Accessories Co., Dept. AD-2. Cincinnati, O.

SPRING REDUCTION ON
DOUBLE TREAD TIRES AND TUBES
GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75
30x3	4.50	1.75
30x3½	6.00	2.10
32x3½	6.50	2.15
34x3½	7.50	2.25

Sizes	Tires Plain	Tires Tubes
36x4	$9.00	$2.90
32x4½	9.00	2.75
34x4½	9.00	3.00
35x4½	9.00	3.00
36x4½	9.00	3.10

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
30x4	7.00	2.50	37x4½	9.00	3.10
32x4	8.00	2.75	34x5	9.50	3.25
33x4	8.00	2.75	35x5	10.00	3.25
34x4	8.00	2.75	36x5	11.00	4.00
35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street NEW YORK CITY 112-A East 100 Street

THE HOME OF DOUBLE TREAD TIRES

Tires

AT LAST!
Double Tread Puncture-Proof Tires at a Saving of 75 Per Cent.

Size	Plain	Size	Plain
28x3	$3.95	35x4	$ 9.00
30x3	4.40	36x4	9.00
30x3½	5.75	34x4½	9.00
32x3½	6.40	35x4½	9.00
34x3½	7.00	36x4½	9.75
30x4	7.00	37x4½	9.75
32x4	7.75	35x5	10.50
33x4	8.00	36x5	10.50
34x4	8.00	37x5	11.00

*Non-Skid $1.00 extra on all sizes. Good used tubes, all sizes from $1.00 up. A deposit of 10 per cent required on all C. O. D. orders. Any other size you need ask for.

Five per cent discount on all cash orders. Be sure to state the bead, whether QD., straight or clincher.

SIMONS AUTO SUPPLY CO.

133 West 145th St., NEW YORK CITY

Gears and Parts

STODDARD DAYTON PARTS
THE DAYTON AUTO PARTS CO.

Successors to the
DAYTON AUTO REPAIR CO.

New York City, 351 West 52nd Street — Kansas City, Mo., 1623A McGee Street

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Automobile Parts
For All Cars—50% to 75% off

Cadillac, 1909 to 1913
Chalmers—F. K. M., 36-40
Studebaker—Garford
E. M. F.—Flanders
Dorris, 1906 to '09
Peerless, 1906 to '13
Stoddard Dayton
Regal—Stevens Duryea
Midland-Wayne-Welch
Henderson—Speedwell
Stearns, 30 to 60
Kissel 6—Matheson
Amplex, all models
Pope Toledo
Pope Hartford
Oakland—Seldan
Interstate—Jackson
Reo, 1908 to '13
Glide-Warren-Holladay
Locomobile—Knox
Buick, 10-17-27-31
Moon 30-40-45
Maxwell, all models to 13
Packard, 1905 to '11
Pierce-Arrow, '07 to '09
Ohio—Hudson, 20 to 33
Bergdoll-Staver
Krit 20—Atlas
Mitchell, 1908 to '13
Thomas, all models
Great Western—R. C. H.
Oldsmobile Special Ltd.
Autocrat Defender
American Underslung 30 to 50—Welch
Marmon—Carter Car
Overland 38-40-41-42-45-46-51-52-54-55-56-59-60-69-71
Oakland 30 H. P.

Parts for all cars above and many others. Write us your wants or send old parts.

Complete Motors—Best makes, tested and in good running condition, $35 to $175. **Bearings**, including Timken, Hess-Bright, Hyatt-Roller, etc., 50c to $7.00. **Carburetors**—All makes, $3 to $9. **Magnetos**—Bosch, Eisemann, Splitdorf, Remy, etc., $10 to $32.50. **Good Auto Wheels**—All kinds from standard cars, $2 to $7. **Auto Springs**—$2. to $5.

GUARANTEE—Every part we ship is carefully examined or tested, and nothing but the very best is shipped out.

MAXWELL BROS. AUTO SALVAGE CO.

3920 OLIVE STREET ST. LOUIS, MO.

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Gears and Parts

GEARS & SHAFTS

Transmission gears and shafts, differential gears and axle shafts in stock for over 125 makes (500 models) of pleasure cars and trucks. Obsolete, Orphan and Current models.

Dealers and repairmen, send for our 125-page price list and make a good profit on your repair work.

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844 Eighth Avenue, New York, N. Y. — 1461 S. Michigan Ave., Chicago

275 Marietta St., Atlanta, Ga.

NO SECOND-HAND PARTS OR JUNK

REPAIR PARTS

—FOR—

Magnetos, Coils, Starting, Ignition Systems

PLATINUM RIVETS Screws and Springs — TUNGSTEN RIVETS Screws and Springs

Carbon, Gauze, Metal Brushes

H. & L. MFG. COMPANY

33-35 Liberty Street, New York City

Parts for All Make of Cars

Bosch Magnetos, Any Type
Stromberg Carburetors
Slightly Used Tires
Hess Bright Bearings

Wm. J. Dougherty

1843-45 North 19th St. Philadelphia, Pa

AUTO PARTS

Magnetos, Carburetors, Prest-O-Lite Tanks, Tires and Tubes

For All Makes of Cars Always on Hand

We can fill your orders promptly. Requirements for any make of car supplied.

EDWARD'S GARAGE

(EDWARD CAVANAGH)

285-287 MORRIS AVENUE

Near 138th and 3d Avenue — NEW YORK CITY

REPAIR PARTS FOR FORD CARS

Write For Our Lists

ACME MFG. CO., 258 B'way, NEW YORK

WORKS: BOONTON, N. J.

SAVE 50% TO 75% ON PARTS—Parts for Pope-Hartford, Columbia, Reo, Buick, Overland, Chalmers, Mitchell, Thomas, Oldsmobile, Maxwell, Stoddard-Dayton, Stevens-Duryea, Corbin, Cadillac and all others. Eiseman, Splitdorf and Remy magnetos, $5.00 to $10.00. Bosch-tension magnetos, $15.00 to $25.00. Also the Mea, Connecticut National, U. & H. and K. & W. magnetos in stock. Springs, wheels, axles, etc., for all cars. Connecticut Auto Parts Co., Inc., 1070 Main St., Hartford, Conn.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Piston Rings

CYLINDER GRINDING PISTONS —AND— RINGS

Largest Because Best.

Send for Price List.

Houpert Machine Co.

355 West 52nd Street

New York, N. Y.

For Sale

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

FOR SALE—1 Williams 36-inch new pattern Retreading Kettle, good as new; 1 Williams 36x8-inch tube plate, good as new, for 6 spring clamps. Rockford Tire & Vulcanizing Co., Rockford, Ill.

AUTOMOBILES at Rock Bottom Prices, overhauled and repainted. Good assortment of Pleasure Cars and Motor Trucks. Good agents wanted. Inclose stamp for Special Bulletin. Eureka Auto Co., Rebuilders, Beavertown, Pa.

FOR SALE—Second-hand Haywood Vulcanizer, used very little. Will include $25 or $30 worth of material. R. S. Morey, Plainville, Conn.

FOR SALE CHEAP—1 Stromberg Carburetor, Type B No. 4 for Six-Cylinder Motor; perfect condition. 1 pair Velvet Shock Absorbers, nearly new. 1 Michelin Gas Saver. Write Box 464, Fayette, Iowa.

WORN OUT dry batteries can be recharged for less than one cent. Send 20 cents for formula to R. Bohner, 1009 S. Wabash Avenue, Chicago.

Radiators and Lamps

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.

HUDSON AUTO LAMP WORKS

1650 Broadway, New York City

BRANCH: 1054 Bedford Avenue, Brooklyn, N. Y

RADIATORS REPAIRED

We also make and repair FENDERS, HOODS and TANKS of all kinds.

DAVIS & SCHEGG CO., 2124 Broadway, New York

Rectifiers

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

Bearings

BEARINGS

(ANNULAR)

No.	Net	No.	Net
201	$1.20	211	$4.75
202	1.44	212	5.20
203	1.70	305	2.76
204	1.90	306	3.20
205	2.10	307	3.40
206	2.50	308	4.75
207	2.90	309	5.70
208	3.00	310	6.25
209	3.50	311	7.20
210	4.15	314	11.78

TIMKEN

(CONES)

No.	Net
250	$2.00
257	2.00
258	2.00
259	2.00
288	2.30
315	2.30
316	2.30
317	2.30
318	2.30
319	2.30
336	2.60
337	2.60
341	2.60
358	2.80
375	3.00
385	3.15
395	3.50
435	3.65
456	4.00
444	3.60
457	4.00
458	4.00

(CONES)

No.	Net
3350	$3.2
3352	3.2
3354	3.2
3150	2.7
2750	2.4
3653	2.5
3750	3.5
4350	4.2
4363	4.2
4360	4.2
5350	5.2

(CUPS)

No.	Net
312	$1.0
363	1.2
2320	.9
2520	.9
2620	.9
2720	1.0
3320	1.2
3520	1.2
3720	1.3
3730	1.4

Bearings listed are in stock for immediate delivery.

Absolutely Brand New. We do not handle junk.

We also carry in stock
- Bower Roller Bearings
- S.R.B. Taper Roller Bearings
- All styles Thrust Bearings
- N.D. Double Row Bearings
- N.D. Radax Bearings

Bulletin No. 3

J. C. Gorey & Co

354 West 50th St., New York

BALL BEARINGS REPAIRED

Complete stock repaired Annular Bearings. Special Bearings made to order, all sizes; exchange. BILODEAU BALL BEARING W'K Inc., 66B Stanhope St., Boston, Mass.

Automobile Initials

DECALCOMANIA TRANSFER INITIALS in gold and colors. You apply them. automobiles while they wait, making $1 profit on $1.50 job; free particulars. Ad Monogram Supply Co., Initial Dept., Niagara Bldg., Newark, N. J.

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Cylinders Reground

CYLINDER GRINDING
GREATER EFFICIENCY
QUICKER WORK
LOWER PRICES

are the result of specializing in a single line. By taking advantage of our service, you can have cylinders reground or rebored and fitted with new cast iron aluminum alloy pistons and individually cast rings, at the finest equipped plant. *specializing exclusively* in this line. We guarantee absolutely every piece against poor workmanship. 20 years' practical experience is back of us. Write for prices.

BRIDGEPORT PISTON RING CO.
Connecticut Ave. and 3rd Street
BRIDGEPORT, CONN.

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

CYLINDER GRINDING
NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order.
Prompt and reasonable.
NILSON-MILLER COMPANY
1302 Hudson Street, HOBOKEN, N. J.

Scored Cylinders
We fill your scores with a nickel and silver composition, with our electric process, no heating to warp cylinders, same piston and rings used. Reboring not necessary. 24 hours service. We sell outfits New Chemical Process Co., 6 West Ross St., Wilkes-Barre, Pa.

CYLINDERS REBORED AND REGROUND. Fitted with light grey iron pistons and leakless rings. High grade quality. McCadden Machine Works, Inc., St. Cloud, Minn.

CYLINDERS REBORED
We rebore Cylinders and equip with our Eclipse rings and extra high quality pistons, insuring a correct fit and giving extra efficiency to your motor. Give us a trial. Prices interesting.
HOPE MACHINE COMPANY
Mfrs. Eclipse Piston Rings
2nd and Dauphin Sts. Philadelphia, Pa.

Miscellaneous

COUPON Books for gasoline and supplies. Samples free. J. P. Forbes, Coshocton, Ohio.

FORD AUTO HEEL RESTS, SIZE 5x7, made of cast frosted aluminum. A big seller, fits all models of Ford Cars; price, post paid, $1.00. Ask your dealer for it. Lucas & Son, Bridgeport, Conn.

FACTORY REPRESENTATIVES WANTED —Automobile polish that's "Different." Removes all dirt, scum and grease from enameled and metal surfaces, restoring original factory finish and luster, making old cars look new. Great seller; car owners want it. Garage making big money cleaning cars. Money-making proposition anywhere. Samples and particulars free. Common Sense Specialties Co., 15A West Third Street, Tulsa, Oklahoma.

INCORPORATE YOUR BUSINESS; AVOID partnerships; protect private property from business ventures; information free. Philip Lawrence, former assistant secretary state, Huron, South Dakota, Department 12.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Wanted

WANTED—Competent man to take charge of Cutting Room in Tannery, cutting auto and carriage trimmings, chair seats, etc. One capable of figuring out wastes and who has had experience in trimming work preferred. Address "M.," c/o Automobile Dealer and Repairer. P. O. Box 654, New York City.

——WANTED——
A Superintendent who can invest a few thousand dollars in our plant and take charge of same.
CONTINENTAL TRUCK MFG. CO.
Superior, Wisconsin

WANTED—Sandbo Starter for 1914 Saxon Roadster. Answer with price. N. T. Fisk, Brasher Falls, N. Y.

WANTED — CUT-RATE TIRES — We are open for a good Standard Non-Skid Tire and Tubes Agency for California, with a guarantee of 3,500 miles. Maker must submit a sample cross-section, with lowest price for spot cash. Address Martel Bros., Burlingame, Cal.

A Unique Flag Holder.

Those motorists who desire to display a flag on their cars to show their patriotism, or a pennant of any kind, will find the Shattuck Auto Flag Holder very useful, as it is not only adjustable to any pleasure or commercial car, but can be attached in a few seconds and with the hands. It is secured to the filler tube of the radiator, and the flag holder proper is so arranged that it does not interfere with the removal or replacement of the radiator cap when renewing the supply of water. The holder will take flags having staffs up to and including ¼-inch diameter, and the holder is of sufficient length to afford a firm support for the staff. One of the features of the device is that the part carrying the flag staff may be adjusted to any position, either in front or in back of the radiator cap and as desired. Extra staff holders are supplied for those who desire to mount two flags. The holder is light and strong, will not scratch the radiator and comes finished in black enamel. It is marketed by the Shattuck Mfg. Co., 98 Park Place, New York City. The retail price of the holder is 25 cents. A liberal discount is offered the trade.

Parry Enters the Export Field.

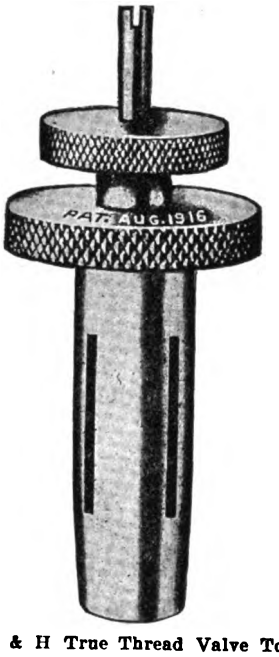
The Parry Mfg. Company, specialists on Ford commercial bodies, have made rapid strides in the foreign field. Last month a large order of commercial bodies for Maxwell chasses was shipped to William E. Peck & Company of Buenos Ayres, and several dozen one-man tops were shipped to Valparaiso, Chili. Every week sees a large number shipped to the Island of Cuba. All over the world people are transforming Ford and other chassis into delivery wagons for commercial use, and it is in this field that the Parry Mfg. Company is especially successful.

Change in Name.

The Dayton Auto Parts Co. announce that they are successors to the Dayton Automobile Repairing Co. The New York address of this concern is 351-355 West 52nd St., New York City. They carry in stock transmission and differential gears, piston pins, standard and over sizes for all cars, also valves and a full line of parts for Stoddard Dayton cars.

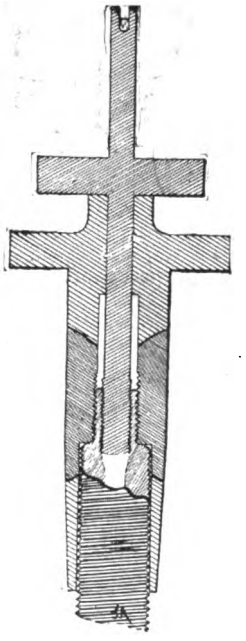
A & H True Threader Valve Tool.

The A & H True Threader Valve Tool is a new device for trueing up the cap stems of pneumatic inner tubes. The two illustrations will give an excellent idea of the appearance and construction



The A & H True Thread Valve Tool

of this tool. One of these illustrations gives a section view of the device, which will be self-explanatory to any mechanic who is familiar with tire work. The patented guide enables the operator to recut the internal and external cap stems at the same time or separately without any danger of crossing or stripping the


Sectional View of Valve Tool.

threads. No doubt a great many of our readers will be interested to know that there is such a tool as this on the market, as it is something absolutely new. All inquiries in regard to this device should be addressed to the A & H Mfg. Co., Inc., 505-507 West 45th Street, New York, N. Y.

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AUTO TOPS

Regular and *"One Man"* style, for Ford and all other cars.

"E. Z. On" Top Recoverings

For Ford Cars always in stock. For all other cars made in two days. Special measurement chart guarantees a perfect fit. You save expense of returning old top.

SEAT COVERS

To fit all cars. Special high quality, actually tailored to fit.

Exclusive makers of **"Stik-Tite" Windows and Roof Patches.** Attached by anyone in ten minutes. No metal fasteners—no stitches.

Big profits for dealers and jobbers. Catalog free.

ADDRESS DEPT. RC 47

THE CINCINNATI AUTO SPECIALTY CO., Cincinnati, O.

TIRE-DOH

Makes Difficult Repairs Easy

Outsells other tire repair outfits because it outworks them. Retails at 50c and $1.00.

750,000 Users—10,000 Dealers

Made only by **ATLAS AUTO SUPPLY CO.,** 656 W. Austin Ave. CHICAGO

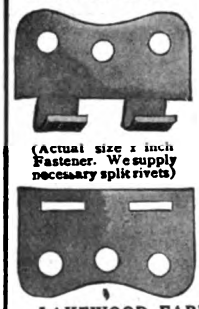
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Save $25 to $50

Our big free book "The Car Beautiful" is the recognized authority on the home painting of cars. After reading it, you, yourself, without previous experience, can successfully repaint your car, or revarnish it, or enamel hood and fenders, or lamps, redress top and cushions, paint the wheels a different color—in fact do anything you otherwise would have to pay a painter big money to do.

Send for "The Car Beautiful" today. Don't buy painting materials until you have read it.

ARSENAL VARNISH CO.
2501 Fourth Ave. ROCK ISLAND, ILL.

"LAKEWOOD" **QUICK ATTACHABLE FAN BELT FASTENERS**



(Actual size 1 inch Fastener. We supply necessary split rivets)

Take the "jinx" off Fan Belt Repair troubles.

On or off in a jiffy — makes Fan Belt Repair profitable to you and enables you to quickly handle "special" fan belts to order. Outlast belts.

Car Drivers will buy them separate also.

Write us direct or ask your Jobber to get them for you.

LAKEWOOD FABRIC BELTING & MFG. CO.
1516 Highland Ave. Lakewood, Ohio, U. S. A.

A Lightweight Piston for Fords.

We illustrate herewith the Dyer lightweight piston for Ford cars manufactured by The G. H. Dyer Company, 155 Brookline Street, Cambridge, Mass. The weight of this piston is one pound less than that of the Standard Ford piston, and is as finely made as any piston used in the highest price cars, being manufactured to the limit of two ounces variation in weight. A reduction of four pounds weight on reciprocating parts is made in the Ford cylinders by the use of this piston, thus saving a tremendous percentage of crankshaft and wrist pin bearing wear. For full particulars as to mechanical construction those who are interested should write direct to the manufacturers.



Dyer Piston.

Bill Automatic Spark Retarder.

One of the latest and most valuable accessories for the Ford car is the Bill Automatic Spark Retarder, a device operating in connection with the starting crank by means of which the spark is automatically retarded to a point of absolute safety by the engagement of the crank and instantly advanced to the running point by the starting of the motor. The majority of the accidents resulting from premature ignition while starting the motor are due to the fact that the spark is advanced to high before cranking. Sometimes this is a matter of carelessness but often by the operator intentionally taking the chance rather than being compelled to hustle to the spark lever to advance the spark before the engine stops on account of delayed ignition. With the Bill Automatic Spark Retarder ignition may be timed by means of the spark lever to whatever point affords best results as the action of engaging the crank retards the spark to a point of safety without any attention on the part of the operator. At the first explosion of the motor the crank is disengaged and at the same time the spark is automatically advanced to the point prearranged by the setting of the spark lever. The device is simple, compact and easily applied, requiring no cutting or alteration of any part of the motor or its equipment. The only effect upon the ignition is previous to the actual starting of the motor, after which ignition is controlled in the ordinary manner. Distribution will be through regular trade channels, the territory surrounding Chicago having been allotted to the Gray-Heath Co., 1440 Michigan Avenue. Other distributors will be announced in the near future. The sale price of this device, packed, ready for shipment is $3.50.

The Hi-Comp Piston Ring.

The manufacturers of this ring make the very graphic statement that it is a regular miser when it comes to stopping up tire leaks. Also that it is "the ring that makes the motor sing." This is just the kind of a piston ring which appeals to the car manufacturer, the garage owner, the repair man and the car owner. Hi-Comp rings are distributed by jobbers and accessory dealers everywhere, but readers who are interested should write without fail for their unique order and specification book direct to the manufacturers, the Continental Piston Ring Co., Memphis, Tenn.

The New Departure News.

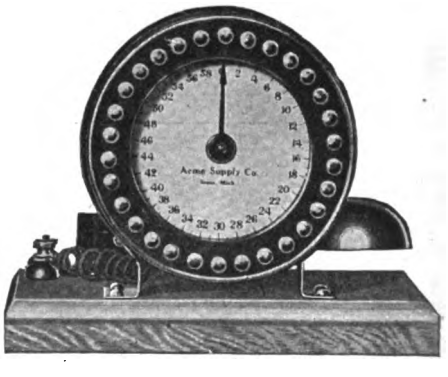
The above is the title of a very bright and newsy weekly house organ, the first number of which has just been brought out by the New Departure Mfg. Co., of Bristol, Conn. The employees of this company are organized for various sports, including baseball, pool, tennis, boxing, etc., and of course the weekly paper deals with these matters; also with many other things connected with the welfare of the very large staff of employees. It is an excellent idea for any large manufacturing corporation to maintain a good house organ and we trust that this venture of the New Departure Mfg. Co. will be a very successful one.

Gordon Enters the National Field.

Having established a wide recognition of the merit and practical value of Gordon seat covers, tire covers and other fabric specialties for automobiles, and having secured their distribution through nearly 800 jobbers and thousands of dealers, the J. P. Gordon Co. will now advertise their products nationally. Beginning with a full-page ad. in the Saturday Evening Post of March 24th, and with a liberal use of space in such other national media as Life, The Literary Digest, Collier's and Leslie's Weeklies, Cosmopolitan, Metropolitan, McClure's, and Hearst's Magazines, car owners will be made more fully acquainted with their needs for these specialties with a resulting benefit to the jobbers and dealers.

A Timer for Vulcanizing.

We illustrate herewith an extremely clever and handy device which has recently been put on the market by The Acme Supply Company, of Ionia, Mich. It is an interval timer for use when vulcanizing tires and tubes. With this device the repair man can go about other work while vulcanizing and forget that a tire is in the molds or on the tube plate. The device is absolutely automatic and the bell will ring when the job is done. This prevents overcuring and undercuring of tires. Note the position of the hands as shown on the cut. If you have a job to be removed in twenty minutes, the pin should be set at 20; if you have a job to be removed in twenty-five minutes, push in firmly pin 25 and so on. As many as thirty jobs can be taken care of at any one time and as each job is completed, the bell will ring. The tire or tube can then be taken out, with the work of vulcanizing done just as it should be. Acme timers are shipped ready wired for a connection to a battery of two dry cells. Anyone who has done tire repairing will appreciate the advantage of this new invention, and all correspondence should be addressed direct to the manufacturers, Acme Supply Co., Ionia, Mich.



Acme Interval Timer for Tire Vulcanizing.

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SUNDERMAN
Vacuum Carburetor

$5

F. O. B. Newburgh
$6.50 for other than Ford or Metz

Car Owners:

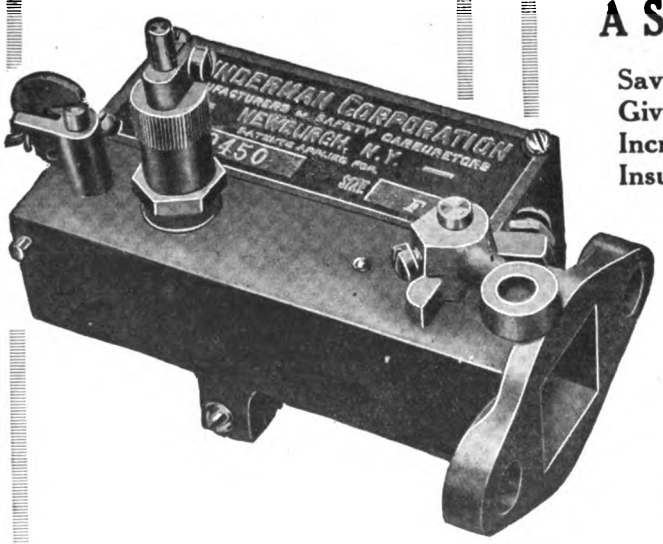
Get your order in at once —put the Sunderman Vacuum Carburetor on your car for your Spring driving.

Gives More Power with a LEAN Mixture

Ponder over that statement—"more power with a LEAN mixture." It expresses briefly the superiority of the Sunderman Carburetor, and furnishes to car owners, dealers, engineers and manufacturers the basis of all our claims.

Because the Sunderman wrests from every tiny particle of gasoline the last atom of energy and makes it work for you in driving the car. It does it by breaking up these particles more minutely than has ever been done before, and changing them into lusty, driving *power*—without wasting any of it through *burning* it instead of exploding it.

Therefore a given amount of gasoline will give more power—we confidently assert *30 to 50% more.* It will save on any grade of fuel, and on high-grade gasoline will make records that will surprise you.



A Simple Statement of Our Claims

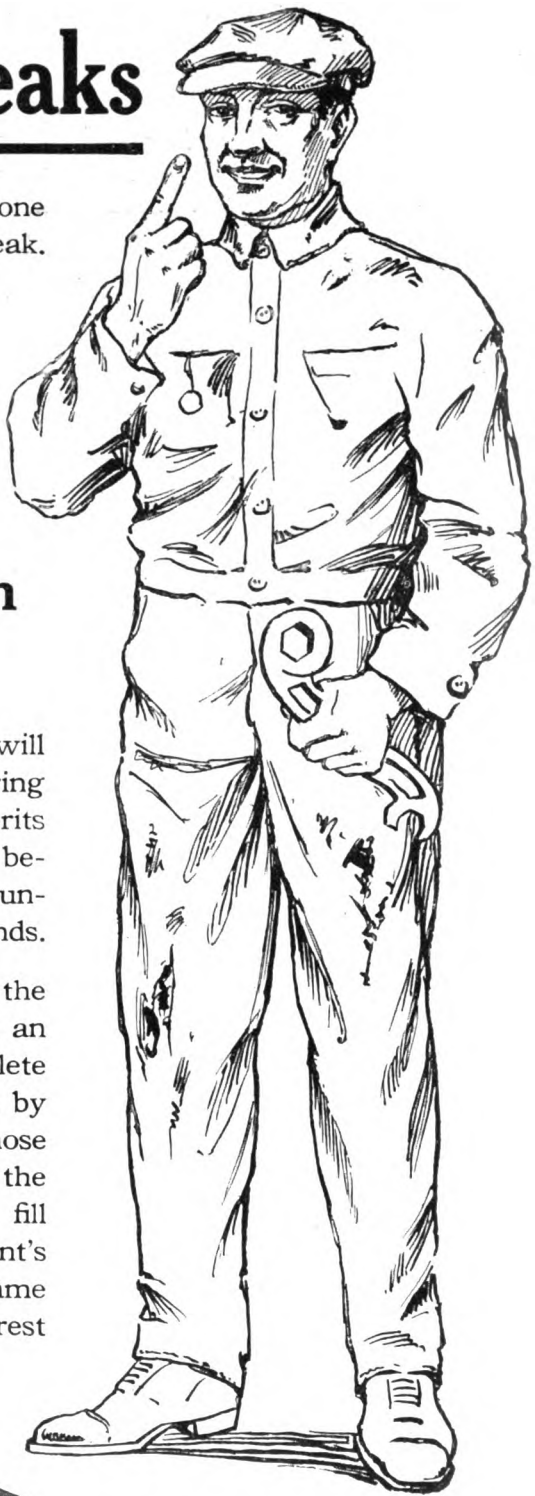
Saves Gasoline — Adds Flexibility
Gives More Power — Decreases Gearshifting
Increases Mileage — Assures Safety
Insures Easy Starting — Picks Up Quicker
Climbs Hills Like a Scared Rabbit

Dealers:
Our Advertising makes the demand
Our Carburetor Makes Good
Get our Proposition at once

Sunderman Corporation
9-11 Chambers St. Newburgh, N. Y.
Western Sales Office, 403 Kresge Bldg., Detroit

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When a Spring Breaks

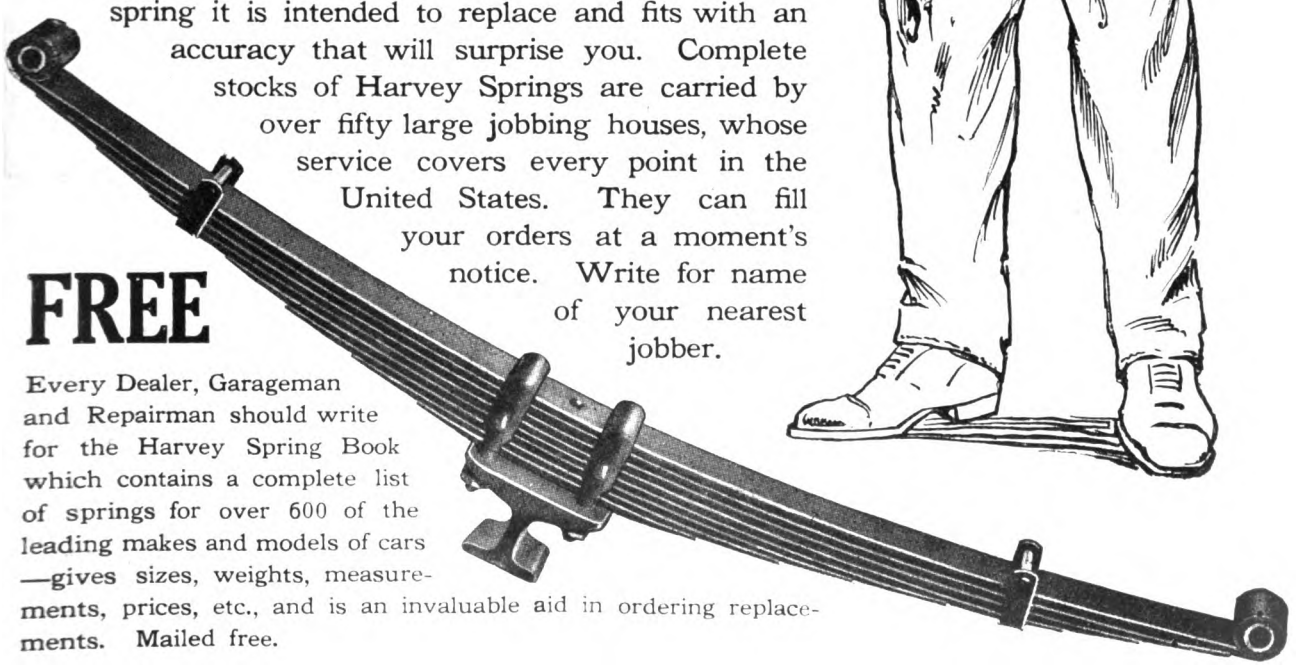


the car owner naturally doesn't want another one "just like it"—he wants one that **will not** break. You can recommend Harvey Springs without fear or hesitation to your closest friends and most particular customers. They are strong, durable, resilient, easy-riding and have more real quality than any other springs you can buy.

Harvey RACINE SPRINGS ARE Guaranteed From End to End

If a spring proves defective **at any point,** we will replace it. You can build up a good, profitable spring replacement business on the solid worth and merits of Harvey Springs. Our extensive advertising is being read by car owners in every section of the country, and the demand is growing by leaps and bounds.

Every Harvey Spring is an exact duplicate of the spring it is intended to replace and fits with an accuracy that will surprise you. Complete stocks of Harvey Springs are carried by over fifty large jobbing houses, whose service covers every point in the United States. They can fill your orders at a moment's notice. Write for name of your nearest jobber.



FREE

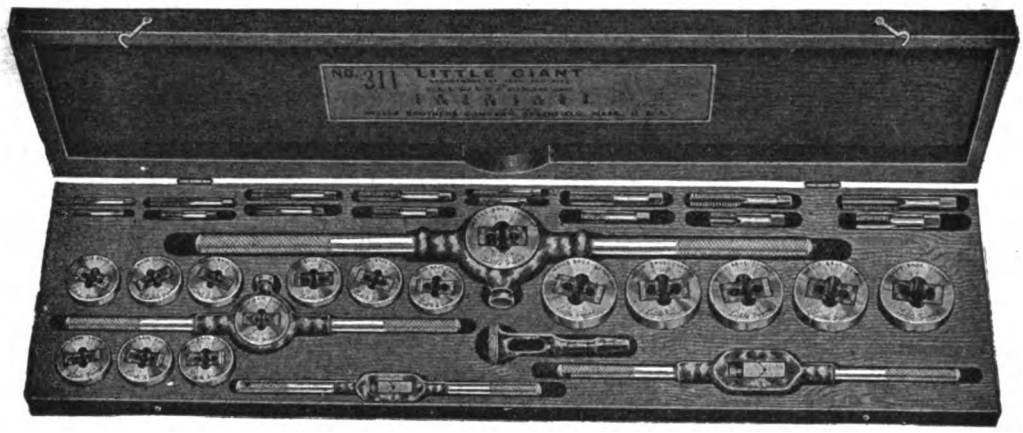
Every Dealer, Garageman and Repairman should write for the Harvey Spring Book which contains a complete list of springs for over 600 of the leading makes and models of cars—gives sizes, weights, measurements, prices, etc., and is an invaluable aid in ordering replacements. Mailed free.

The Harvey Spring Co.

849 Seventeenth Street **Racine, Wis.**

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How Complete is Your Screw Threading Equipment?



No. 311 *Little Giant* Combination Screw Plate

Every need of the garage and repair man, or the car owner who makes his own repairs, for tap and die assortments can be supplied from the diversified line of the Greenfield Tap and Die Corporation. For instance, the

Little Giant Combination Screw Plates

(Shown above)

contain both United States and S. A. E. standard taps and dies; each die is contained in its own collet and is adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in hard-to-get-at places.

A few more assortments are shown below.

Send for No. 37 Catalog—showing the complete line.



No. 2501
G. T. D. Garage Repair Set
For Ford Cars

Seven sizes taps and dies. Two reamers for important bushings. Die stock and tap wrench.

A new set that is meeting a real demand.



No. 308
G. T. D. Screw Plate
In Leather Roll

Seven sizes taps and dies. Stock and tap wrench. Very convenient and compact for emergency cases.

Look for one of these trade marks on any screw plate you buy:

Little Giant

GREENRIVER

SMART LIGHTNING

GTD

Greenfield Tap & Die Corporation

GREENFIELD, MASS.

Wells Brothers Co. Division
Wiley & Russell Mfg. Co. Division
A. J. Smart Mfg. Co. Division

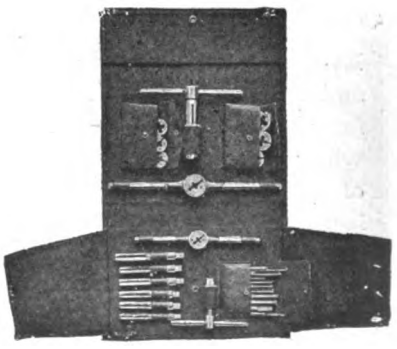
New York, 28 Warren St.
Chicago, 13 So. Clinton St.
London, 149 Queen Victoria St.

Canadian Factory
Wells Brothers Co. of Canada, Ltd.,
Galt, Ontario



No. 305
***Little Giant* Screw Plate**
One of the most popular assortments.

Five sizes taps and dies. Die stock, tap wrench and bit brace die holder.

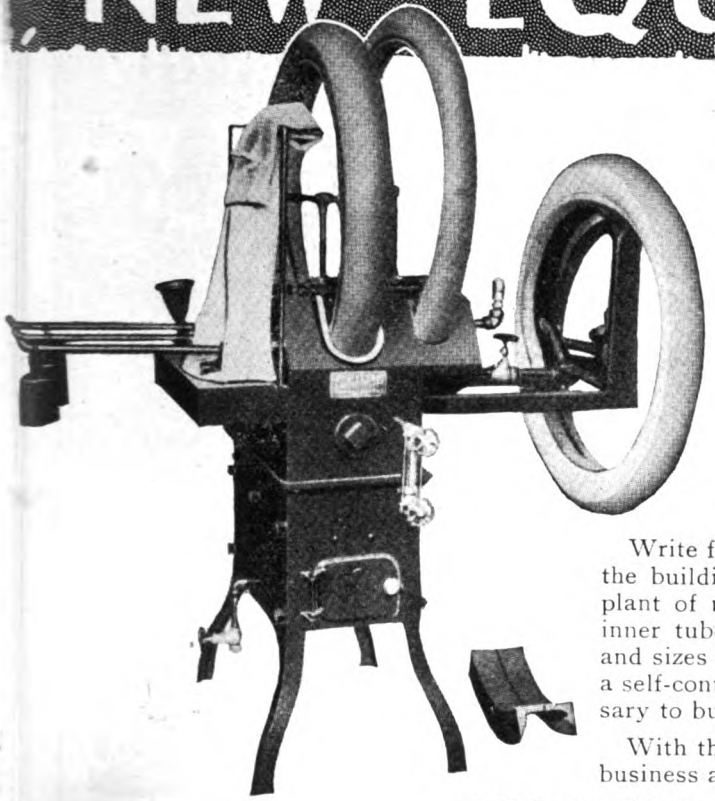


No. 2500
G. T. D. Emergency Kit
For Ford Cars

Sixteen sizes taps and dies—being practically every screw thread on Model T Ford that ever needs replacing. Thousands of these are in use.

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THIS IS OUR GREAT NEW EQUIPMENT



TYPE F

Big Capacity Vulcanizer Self-Contained Outfit

With the Range of Output and High Quality Shown by the Specifications below

FOR ONLY $125

Write for particulars about this remarkable achievement in the building of tire repair equipment—a complete tire repair plant of rigid and heavy construction which will make both inner tube and outer casing repairs on practically all makes and sizes of automobile tires on the market. Equipment has a self-contained source of steam supply so that it is not necessary to buy a separate steam boiler.

With this Type F equipment you can start in the tire repair business and do practically any kind of tire repairing.

SPECIFICATIONS

Equipment consists of: 4½-5, with reducing shell to take 3½-4, on which practically all sizes of inside work can be done. 2½-3, 3½-4, 4½-5 bead molds in either Quick Detachable Clincher or Straight Side furnished with outfit.

Made in one-fifth circle only.

By the most careful experimenting we have been able, now while everything else is high, to design this great equipment which we can sell for the remarkably low price of $125. We can make prompt shipments at this time, and it will pay you to write quickly for any further information desired and place your order early as we cannot guarantee prompt deliveries for any length of time.

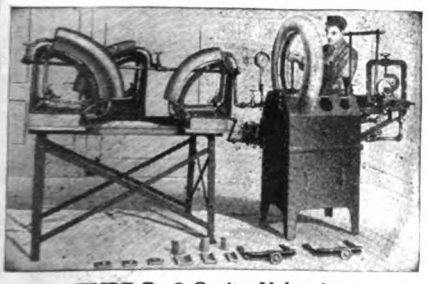
Make Big Money in the Tire Repair Business

There is no other business today which offers such a good opportunity to make money with little capital as the Auto Tire Repairing Business—Either as a separate business or as part of a garage or auto supply business. Everybody connected with the automobile business is making lots of money these days, and you can too.

Start NOW—This is the Very Heart of the Season.

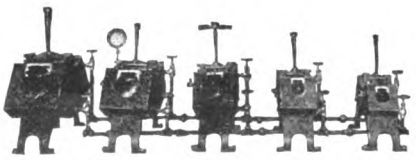
Don't delay. Now is the time of the year when you can "clean up" big in the tire repair business. We are prepared to make prompt shipment of our equipment so that you can get started in the business about as quickly as you can make arrangements at your end.

WE MAKE A COMPLETE LINE OF TIRE REPAIR EQUIPMENT.



TYPE B—3 Cavity Vulcanizer.
With self-contained boiler, inside patch vulcanizing attachment and 8 in. x 20 in. Tube Plate.

If interested ask us for complete catalog.



TYPE C—5 Cavity Vulcanizer.
Piped for Separate Boiler.

SEND COUPON FOR FREE BOOKLET

Before starting the tire repair business be sure to read our booklet "How I would conduct a Tire Repair Business—by an Old Tire Repair Man"—a little book but one that contains a lot of information on the business end of the tire repair business.

TIP-TOP
OF ALL IN
TIRE REPAIR OUTFITS

AD&R

Please send me further particulars regarding your Tire Repair Outfits and copy of your Free Book.

Name .....

Address .....

.....

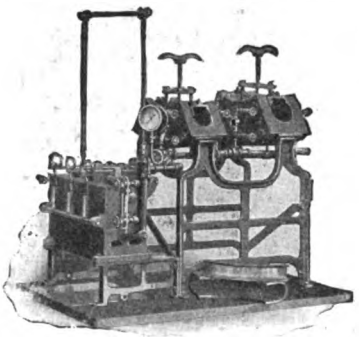
THE AKRON RUBBER MOLD & MACHINE COMPANY
Dealers Wanted Everywhere 917 SWEITZER AVENUE, AKRON, OHIO

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Akron-Williams

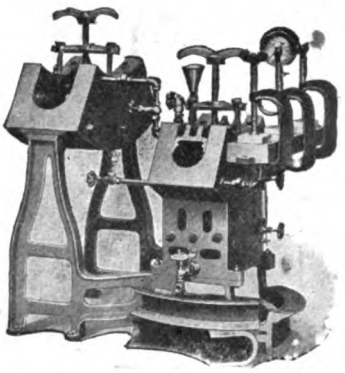
TIRE REPAIR EQUIPMENT

The Most Complete Line In The World



THE Akron-Williams line includes every approved time- and labor-saving device for modern tire and tube repairing, and there is a complete outfit for every kind of work and size of shop. No equipment is too large, no tools too small.

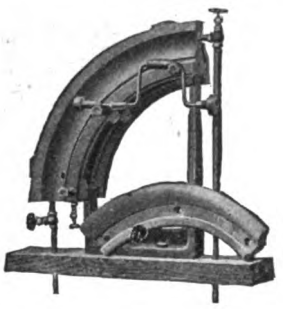
Akron-Williams equipment enjoys the unique distinction of being designed and perfected with the active co-operation of experts employed by the various tire factories of Akron—the largest in the world.



Used and Endorsed by more than 60 Leading Tire Manufacturers. Names furnished on request.

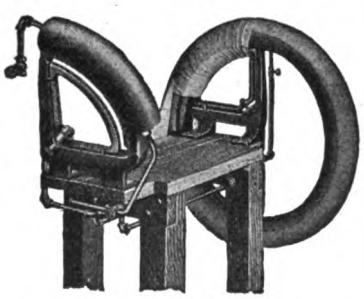


The equipment we offer you is the same in every way as used by 90% of the leading tire companies in their factories and recommended and sold by them to their dealers throughout the country. With this equipment anyone can follow the latest and most approved methods.

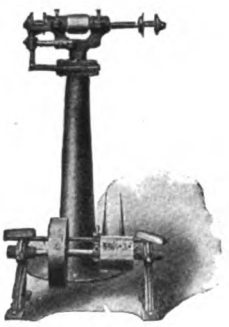


DO TIRE REPAIRING

It offers wonderful opportunities for building up an established and profitable business with a small investment—either as an individual business or a department of a garage.



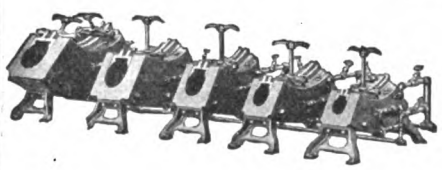
YOUR success or failure depends largely upon the outfit you use. You will want Akron-Williams equipment later on—get it AT FIRST and make money RIGHT FROM THE START.



Send for new catalog illustrating the latest devices and equipment.

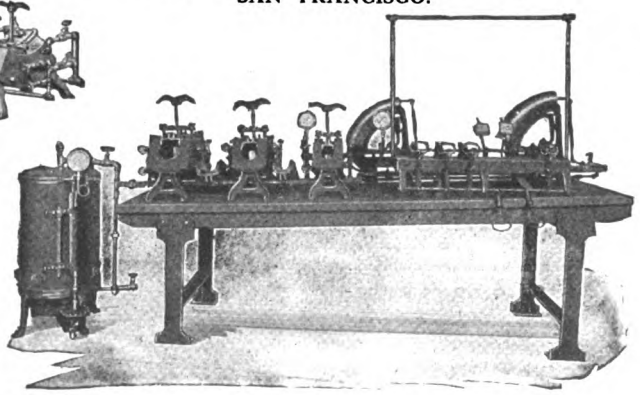
The Williams Foundry & Machine Co.
GLENDALE STREET AKRON, OHIO

Exclusive distributors for California:
THE WATERHOUSE & LESTER CO.
SAN FRANCISCO.











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DO YOU HEAR

the UTILITY KID signaling you to go ahead and get

UTILITY VARNISH RENOVATOR



"They shall not pass," says he, "unless they have been made clean, bright and lustrous with UTILITY VARNISH RENOVATOR."

Old cars are made to look spick and span, brand new—as if just from the factory—and Utility keeps 'em that way for good.

It is just as necessary to use Utility on your newly bought car or the car that is just out of the paint shop as it is for you to dust off your hat and clothes every morning—only, mud spots on cars must not be rubbed as on clothing—they must first be dissolved with Utility Renovator. Shrubs and bushes and over-hanging tree branches scratch cars in Spring and Summer—as well as sand and water. Autoists now carry Utility with them and go over the car at the end of the run.

Catch the Scratches Quick! Cover Them With Utility and Forget It!

Utility Varnish Renovator

is the only known specialized preparation that will actually fill and heal up scratches, flying pebble marks and abrasions. It is your absolute protection against water-breaks, blistering and checking.

Road Tar and Grease Spots Make Their Get Away At the First Sight of Utility

It is a varnish protector—it sheds water and you can defy atmospheric changes. Use it on the leather upholstery, body of car, hood, fenders, etc. We have been told by many autoists that it is far—far superior to anything heretofore used for renewing and brightening lack-lustre furniture at home.

Spring Is Here—Summer Is Coming—Look Out for the Scratches!!

Get Your Order in Early—Get It In—Get It In—For You'll Need Utility Just As Sure As That You Are Born

Take Utility With You! Catch the Scratches Quick! Cover Them With Utility and Forget It!!!



WRITE US TODAY

PRICES

Quarts - - $1.00 Sprayer, 25 Cents Extra

Gallons - - $3.00 Sprayer, 25 Cents Extra

DEALERS, Get Our Special Offer. Every Sale Leaves You a Net Profit.

MANUFACTURED BY

POUGHKEEPSIE UTILITIES CORP.

POUGHKEEPSIE, NEW YORK, U. S. A.

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Prest-O-Lite SERVICE in CHICAGO

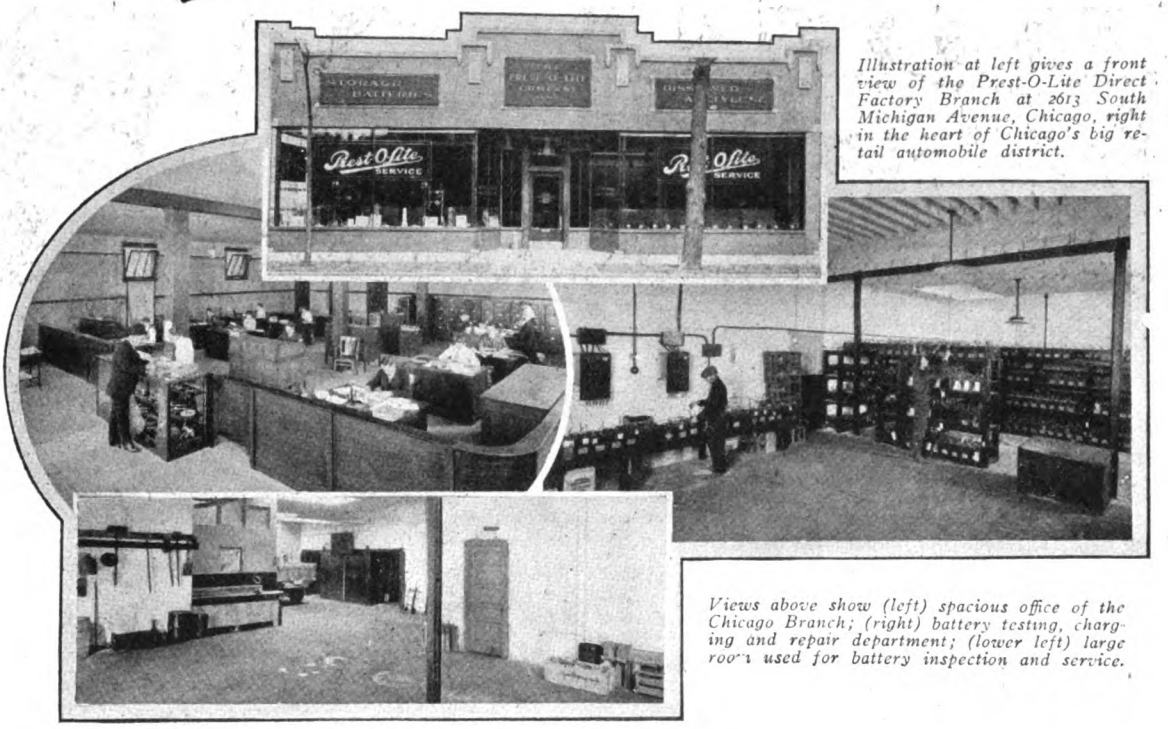


Illustration at left gives a front view of the Prest-O-Lite Direct Factory Branch at 2613 South Michigan Avenue, Chicago, right in the heart of Chicago's big retail automobile district.

Views above show (left) spacious office of the Chicago Branch; (right) battery testing, charging and repair department; (lower left) large room used for battery inspection and service.

CHICAGO, the second largest city in America, together with its adjoining territory, which is so closely dotted with towns and cities throbbing with industrial activity, demands SERVICE of the highest order.

Helping in a big way to supply this need in Chicago, is a large Prest-O-Lite Factory Branch with ample facilities and an expert organization which is ready and willing at all times to handle the storage battery problem of the automobile owners, dealers, distributors and manufacturers in its territory.

This direct factory branch serves the double purpose of a sale depot and service headquarters for the Prest-O-Lite Storage Battery; insuring prompt, expert *factory service* to all.

Throughout the United States and Canada we maintain a strong chain of Direct Factory Branches—each in a center of commercial importance. Closely linked to this chain of branches are the thousands of special Prest-O-Lite Service Stations in other cities and towns, fully providing for every battery need of the motorist, no matter where he may be.

The Prest-O-Lite dealer proposition is bringing more profit to dealers today than ever before. Write us for interesting details.

The Prest-O-Lite Co., Inc., U. S. Main Office and Factory, 906 Speedway, Indianapolis, Indiana
Canadian Main Office and Factory, Merritton, Ontario, Canada

The Prest-O-Lite battery is a better battery--backed by a better service

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HALLADAY BUMPERS



For Front and Rear

¶ A good Bumper is like a friendly haven in time of storm; a poor Bumper is like a friend who betrays your confidence in time of need.

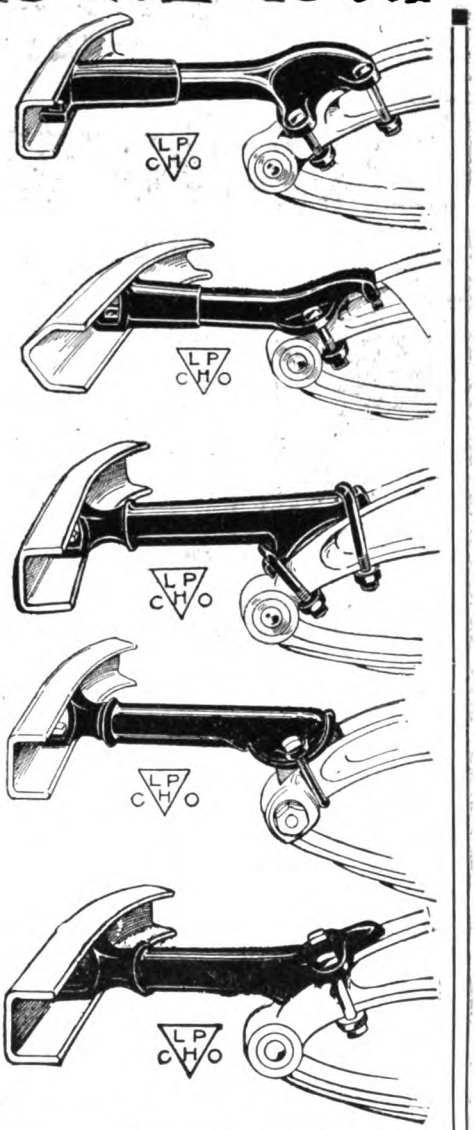
¶ Discriminating buyers who know the best buy Halladays.

¶ Wise dealers who build for future business sell them.

¶ There is a Halladay Bumper for every automobile on the road and the dealer who handles the Halladay line is ready to fill all orders.

¶ Write to-day for catalog of Bumpers and Auto Accessories made by the House of Halladay.

¶ Wise dealers stock quick sellers.



L. P. HALLADAY COMPANY

STREATOR, ILLINOIS

DISTRIBUTORS:

ASCH & CO., 16-24 W. 61st St., New York City

S. L. THOMPSON CO., 817 Boylston St., Boston, Mass.

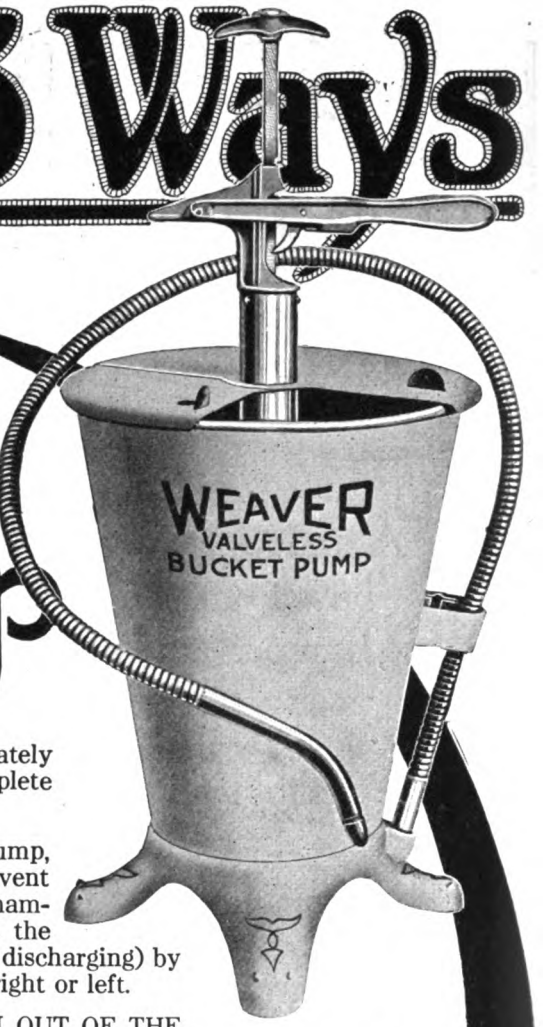
GRAY-HEATH CO., 1440 Michigan Ave., Chicago, Ill.

Southern Distributors: SANFORD BROS., Chattanooga, Tenn.

Pacific Coast Distributors: HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland and Seattle.

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There are 3 Ways of using The WEAVER VALVELESS Bucket Pump





THE LUBRICANT CAN BE PUMPED FROM THE BUCKET DIRECTLY INTO THE CAR—and accurately measured as it is delerived. One complete discharge measures one pound.

There is no valve employed in this pump, as is true of other suction pumps. An open vent at the bottom of the brass barrel or inner chamber is thrown into communication with the bucket (for filling) then with the hose (for discharging) by simply turning the handle ¼ turn to the right or left.



THE LUBRICANT CAN BE DRAWN OUT OF THE DIFFERENTIAL or transmission of the car and discharged into a separate receptacle WITHOUT disturbing the contents of the Bucket.

This is accomplished by letting the vent (referred to above) remain in communication with the hose while the used grease is drawn into the barrel of the pump and again discharged through the hose into the separate receptacle.

The used grease gets no further than the inner barrel so does not contaminate the contents of the main bucket.



A LUBRICANT OF A DIFFERENT QUALITY THAN THAT CONTAINED IN THE BUCKET-PUMP CAN BE PUMPED INTO THE CAR.

This is accomplished in the same manner as described above. The nozzle of the hose is inserted into the can of foreign lubricant, the barrel of the Pump drawn full and discharged into the car without disturbing the contents of the Bucket-Pump.

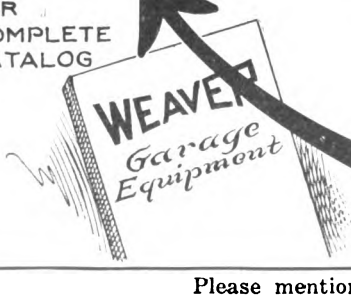
Another Great Advantage

of this "valveless" construction is that the unobstructed opening in the Pump barrel enables the Weaver Bucket-Pump to handle heavier lubricant than other suction pumps employing a trap valve.

Indestructible Metal Hose

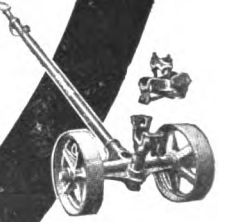
This Pump is equipped with a flexible steel hose instead of the usual rubber hose. Grease and oils do not affect it.

WRITE FOR COMPLETE CATALOG



WEAVER MFG. CO.

2175-79 SOUTH 9th STREET
SPRINGFIELD, ILLINOIS



Weaver Auto Ambulance

Will tow your crippled cars safely, quickly and economically. Fits either axle.

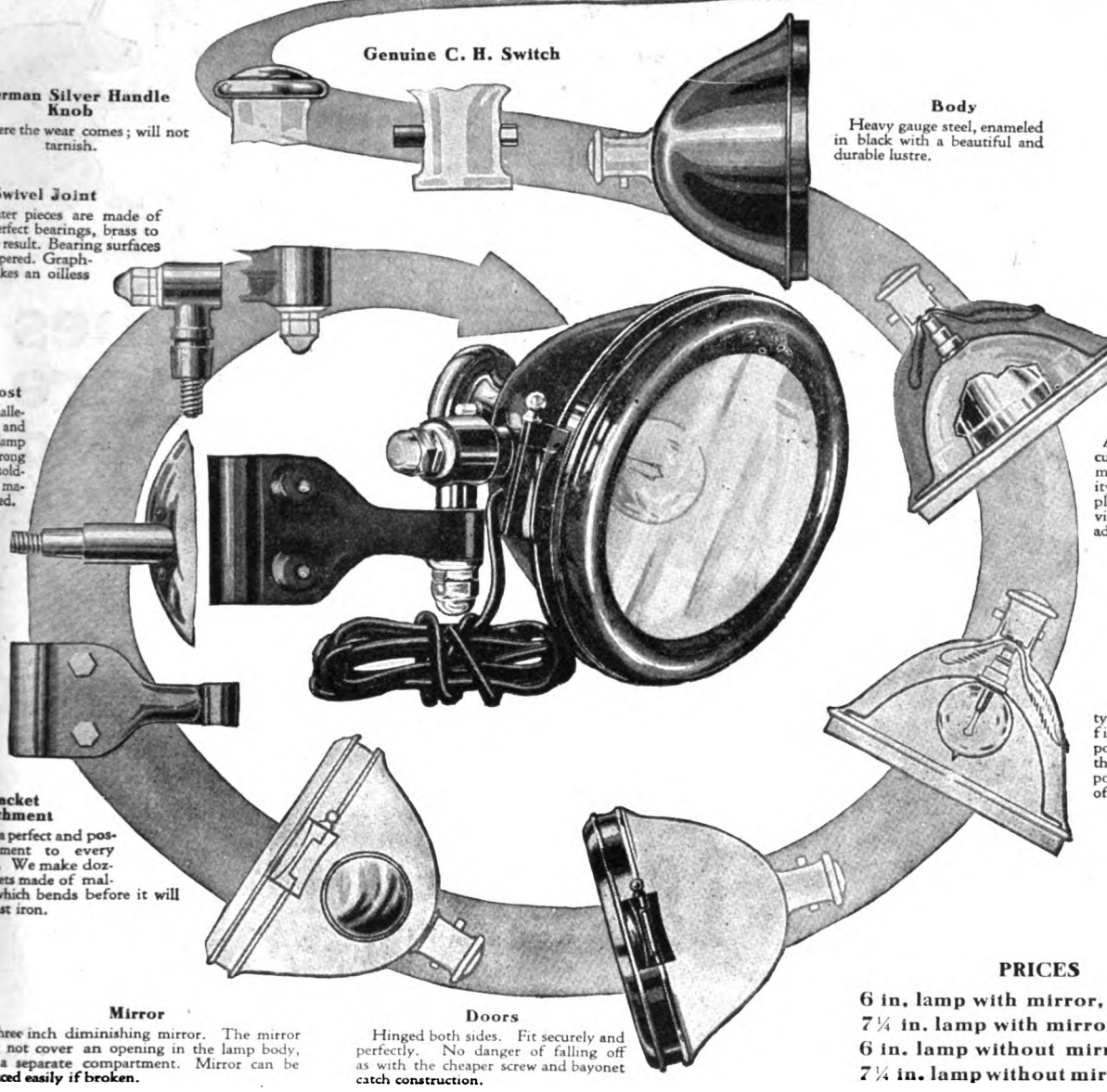


Weaver Towing Pole

Gives a rigid connection between the two cars and eliminates the dangers of the tow line. The spring absorbs all shocks. Cars can be backed when necessary.

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Vesta Searchlights
Quality Throughout



PRICES

6 in. lamp with mirror,	$7.00
7¼ in. lamp with mirror,	$8.00
6 in. lamp without mirror,	$6.00
7¼ in. lamp without mirror,	$7.00

Here is the ***trouble-proof*** searchlight. The highly perfected design and the thorough quality that is in every part of the Vesta relieves the owner of the annoyances that are always present with inferior searchlights. Hence Vesta's popularity.

Vesta Searchlight is powerful, efficient and completely dependable. Throws a clear beam 800 feet in any direction. Impossible for it to rattle or jolt loose. ***Stays put*** in any position it is turned. Easily manipulated.

The illustrations above show the thorough quality of the Vesta.

A line of Vesta Searchlights will prove profitable for you. Write for our dealer's proposition and complete information about Vesta Searchlights.

VESTA ACCUMULATOR COMPANY
2101 INDIANA AVENUE. CHICAGO

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Make Money Selling This Popular Accessory

Over 100,000 of these wonderful vulcanizers sold last year with scarcely any advertising. The demand is tremendous! Every motorist wants the

SHALER 5-MINUTE VULCANIZER

Manufactured under Low & Miles Patent

It gives you a liberal profit on the first sale and brings customers back into your store for supplies for use on the road.

We are just starting a large advertising campaign that will send customers to your store. Motor car owners know the Shaler and call for it by name. Get your share of the profits from this advertising.

Every Shaler user praises this handy outfit because it works so easily and safely and because it saves tire money.

No car is equipped with a vulcanizer, and your customers are going to buy the Shaler from some dealer.

That dealer can be you!

Write today for our new Catalog, dealer's discounts and terms, or

Ask Your Jobber's Salesman About It

C. A. SHALER CO., 803 Fourth Street, WAUPUN, WIS., U. S. A.

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PATRIOTIC RADIATOR EMBLEMS

NOW IN TREMENDOUS DEMAND

Every autoist wants a Patriotic Emblem or an American Flag on his car at this soul stirring time. The call for our special emblems is far beyond previous record. Orders and REPEAT ORDERS are coming hourly by mail and wire.

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Finishes: Nickel or Gold, with colored enamel design.

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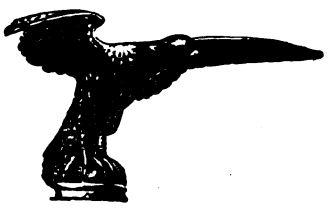


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EAGLE

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EAGLE

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Eagle, with Flag, 11 in. between wing tips.

UNCLE SAM

(Design Copyright)

Height: 6 in.
Width: 4 in.

Finishes: Nickel, Gold, with colored enamel design.

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The Scientific Radiator Cooler

(Patented)



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List Price, $3.50

UNCLE SAM

(Design Copyright)

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Width: 12 in.

Finishes: Nickel, Gold, with colored enamel design.

No. 8032
List Price, $2.00





AMERICAN FLAG

(Design Copyright)

Height: 4½ in.—Width: 8½ in.
Finishes: Nickel, Gold, with colored enamel design.

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EAGLE

(Design Copyright)

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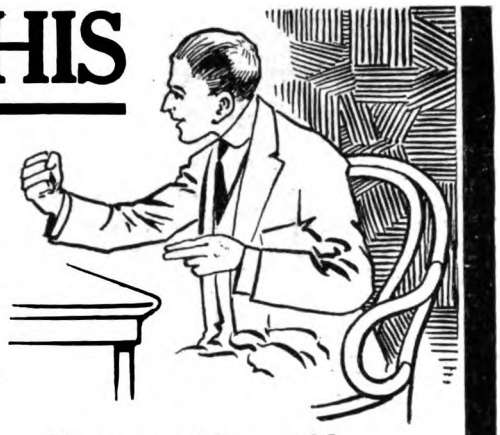
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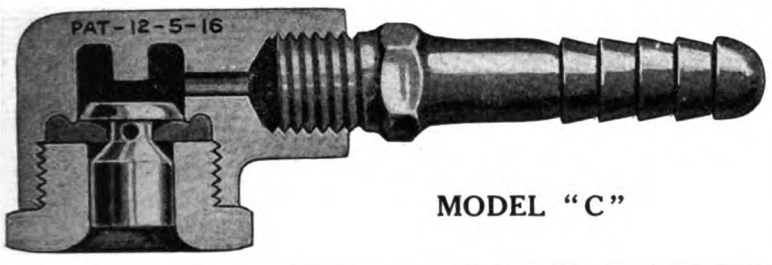
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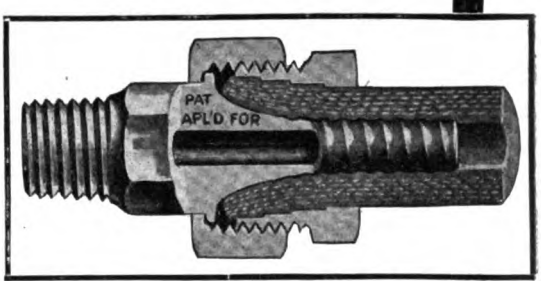
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Hansen Hose Clamp

It holds hose in place under extremely high pressure

NEVER FAILS

Will Not Leak or Blow Off



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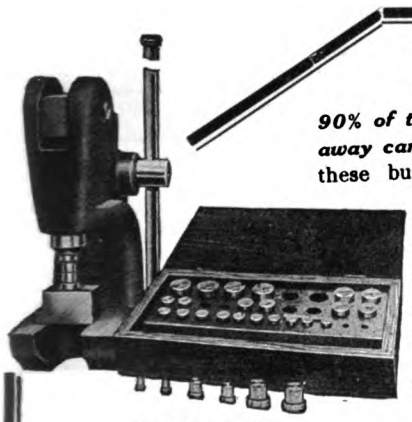
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Manufactured by

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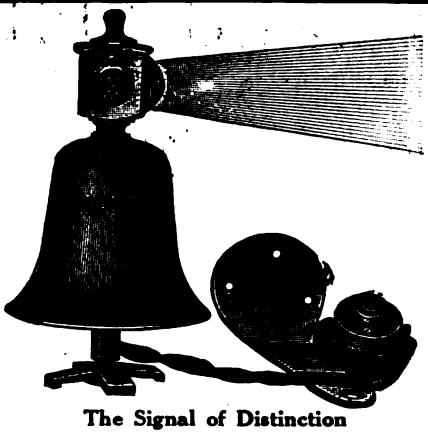
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This improved signal says "car coming," but not as a harsh command to "Get out of my way." It calls attention rather than gives an order. It does not startle.

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Definite and Distinctive

The clear bell tone carries through all the sounds of traffic. Its warning is positive and in addition a red light is flashed from a semaphore lens located just above ths bell.

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An ornament and a double signal. Made in styles and sizes to suit all makes of cars.

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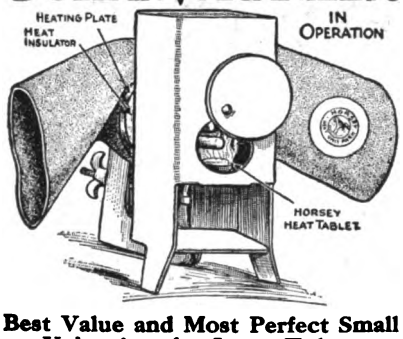
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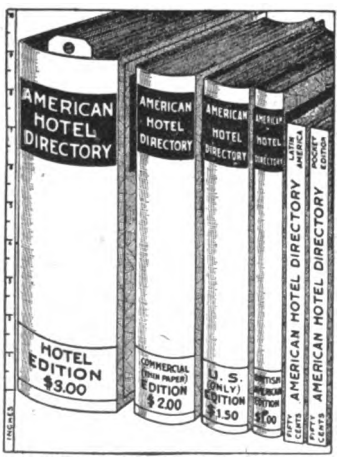
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7 in. Handle—Steel Forging. 2 Screw Driver Bits—Tool Steel. 7 in. Extension Bar.
7 Sockets—Steel Case hardened for Bolts and Nuts 5/16 in.-5/8 in. Inclusive.

Put up in neat, strong cloth case. Weight 1¾ pounds.

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are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight. Expands and contracts with the metal to which it is applied and not affected by heat, cold, water, gasoline or oil.

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E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15½
K	3½	2½	12	17
L	4	3	12	21
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The Bunting Brass & Bronze Co., 740 Spencer Street Toledo, Ohio

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Conserve America's Dwindling Supply for its Most Valuable Uses.

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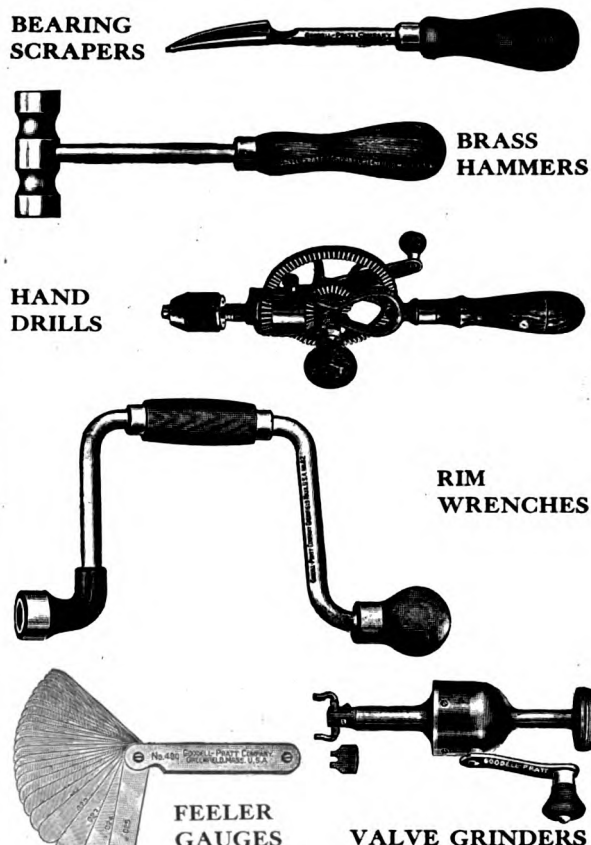
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Combination Pliers
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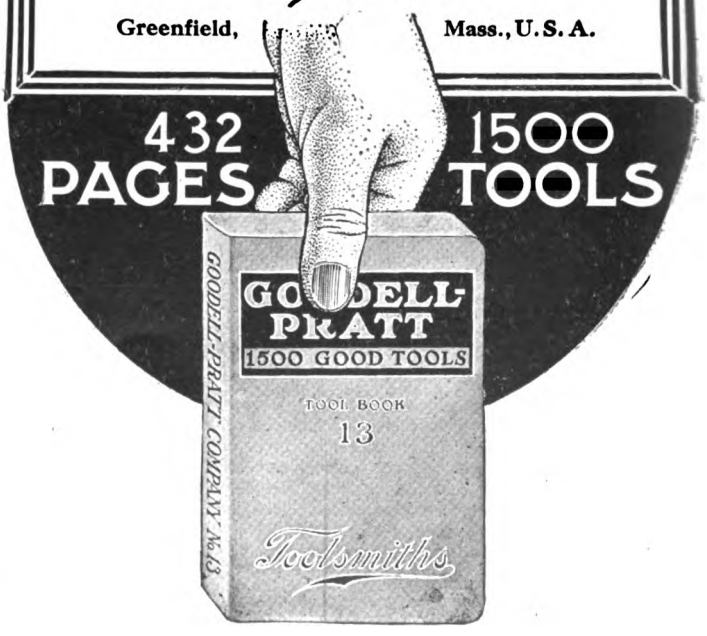
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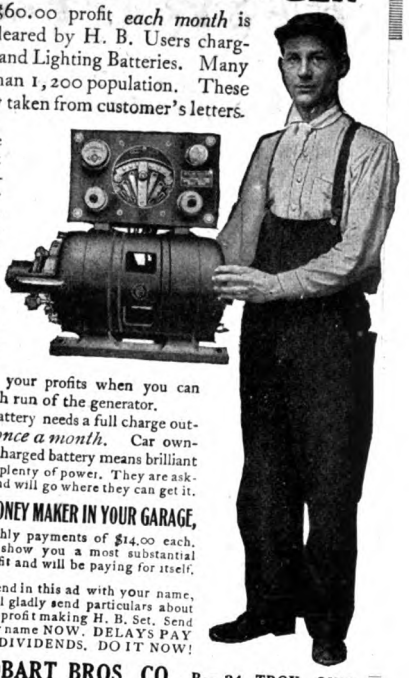
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Less Gasoline
More horsepower

Every bit of the mixture is instantly ignited by the intense spark from the

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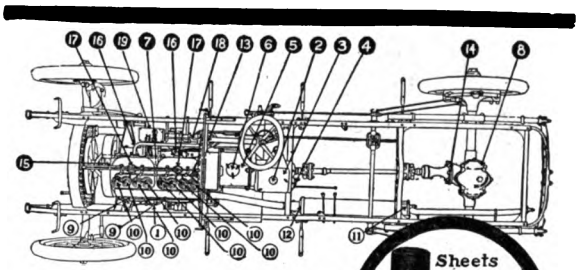
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Couldn't you use the extra flexibility and power you would obtain?

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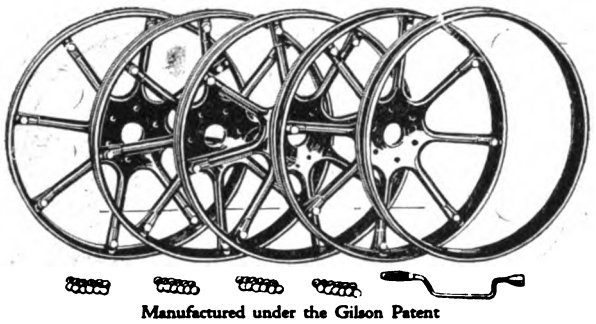
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PRESSED — STEEL — WHEELS
FOR FORD CARS



Manufactured under the Gilson Patent

Price Per Set - - $32.00

F. O. B. Cleveland, Ohio

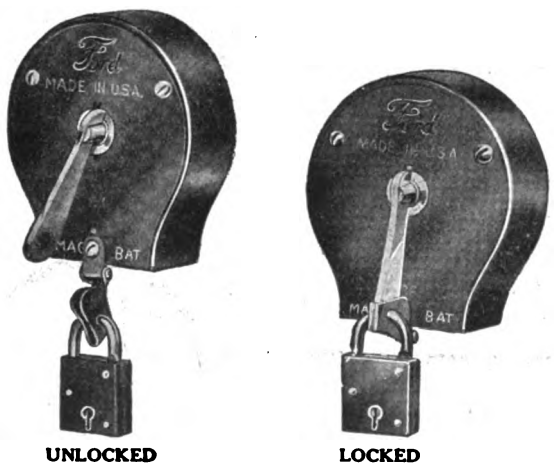
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Each set consists of four wheels, one spare rim, new hub bolts and socket wrench. Instruction Tag with each set.

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A NEW LOCK FOR FORD CARS
The Sandell Switch Lock

(Patent Applied For)

SIMPLE AND SURE

Permanently applied in less than a minute by taking out a screw and putting it back through the device. It cannot be tampered with, as the screw cannot be reached when the car is locked.

PRICE, 75 CENTS

Sent Postpaid on Receipt of Price

Liberal Discounts to the Trade

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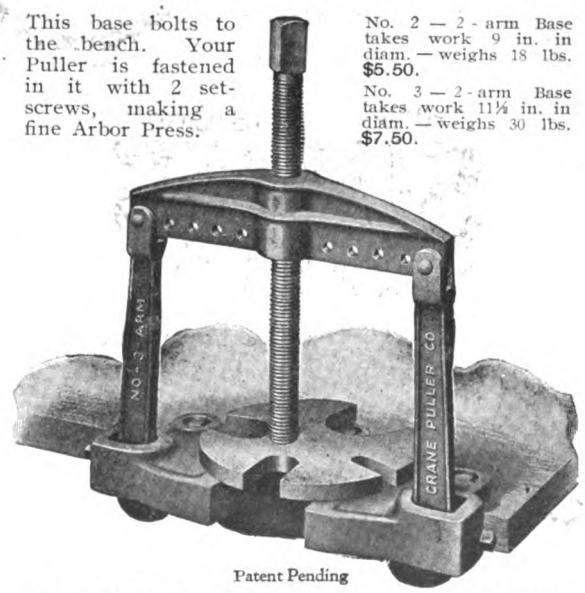
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CRANE PULLERS
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This base bolts to the bench. Your Puller is fastened in it with 2 set-screws, making a fine Arbor Press.

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DEALERS

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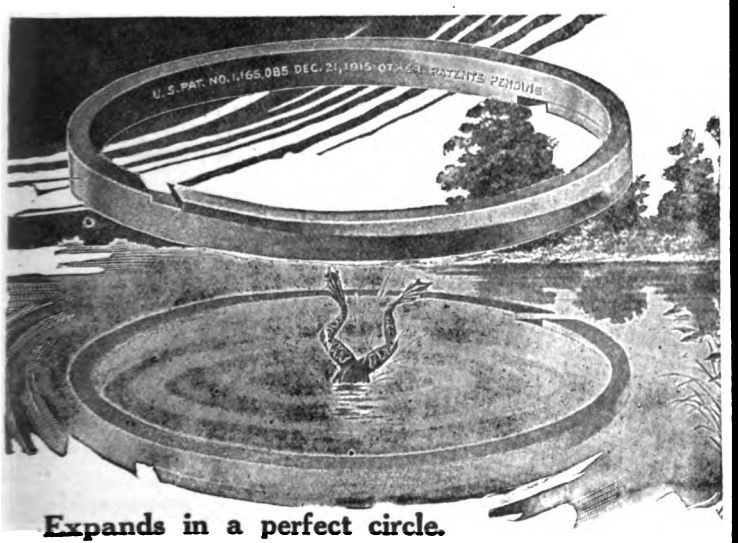
Right now is the time Reflex Dealers are making big sales and big profits. Now is the time car owners are getting ready for spring and summer driving. They need new spark plugs. They insist on better ones than furnished. More than 90% of all Reflex plugs are sold by our dealers direct to car owners.

Highest quality—big profits—real sales assistance—spell success for Reflex Dealers. We want to tell you more about it. Write us today for full information.

THE REFLEX IGNITION CO.

1711 Payne Avenue, Cleveland, Ohio

KEEP THE CAR ON THE GO



Expands in a perfect circle.

The Inland is absolutely gas-tight because it has no gap and its patented Spiral Cut causes it to expand in a perfect circle, making positive contact with the entire inner circumference of the cylinder.

One width and thickness all around; therefore strongest and most durable. One-piece; therefore low-priced. Standard equipment for Stutz, Franklin, Hal 12, Apperson, Weidely motors, etc., and chosen for Army Aeroplanes.

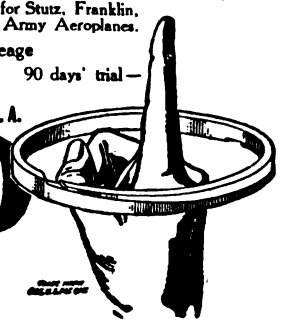
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Get 25% MORE power and mileage by installing GAS-TIGHT, LOW-PRICED Inlands. 90 days' trial—money back guarantee. Ask your garage to-day.

Inland Machine Works, 882 Hoyal St., St. Louis, Mo., U. S. A.

INLAND

1 PIECE PISTON RING





LEADERSHIP

Based On Performance

Why pay $1.25 or $1.50 for a piston ring that lacks the essentials and performance of the Jointless at $1.00?

While other piston ring manufacturers have been talking "leak-proof" the Jointless has achieved it.

Wherever performance is the supreme judge of piston packing you will find the Jointless leading with its undeniable superiority.

You, as a practical man, know that the Jointless possessing these essentials insures a long life of service:

—Being of equal thickness and strength throughout, it insures uniform tension.

—Expands to fit a worn cylinder or takes up its own wear, yet still remains leakproof.

—The absence of dowel pins, plugs or other devices tending to weaken and impair its usefulness.

—The impossibility of scoring cylinders by the Jointless with its smooth area of construction.

—Lack of carbon pockets and grooves in its surface.

Its every feature of construction has a sound and practical reason—the Jointless was designed for performance by specialists.

Any standard automobile, size 2½ to 6 in. in diameter.

List Price, each, $1.00

Set of 12 for 4-cylinder cars, $10.80 Set of 18 for 6-cylinder cars, $16.20

Should your dealer not have in stock the size you wish, write us, giving name of car and model, also dealer's name. We will see that you are supplied.

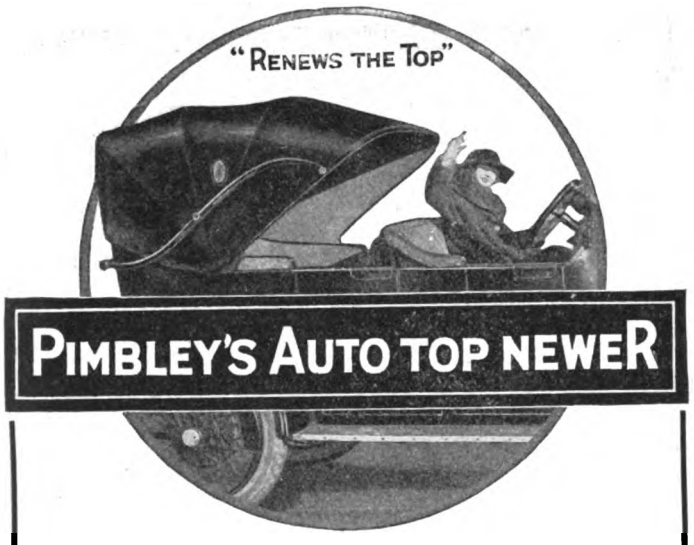
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Factory: DETROIT, MICH.



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New, fresh and clean—the kind of a top you admire on your neighbor's *new* car; a splendid, lustrous finish. All you need is

PIMBLEY'S
AUTO-TOP-NEWER
For Pantasote, Mohair and Leather

—a black liquid compound that you put on with a brush. It dries instantly—doesn't rub off—weatherproof—waterproof. Wears marvelously well and long. For Leather, Mohair, Pantasote. For seats, cushions and trim. Also fine for axles, running-board and under parts of car. At garages, drug and supply stores: 50c—85c—$1.50.

PIMBLEY'S
AUTO-NEWER
"Cleans and News any Exterior Finish"

It is unequalled for youthifying your car. Not an oil, polish or wax—just *a* **RENEWER.** Brings to life and newness the manufacturer's first finish. At garages, drug and auto supply stores: 50c and $1.00.

*A Fine Dealers Proposition—**Get busy! Write!***

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ST. JOSEPH, MO.

"NORMA"
BALL BEARINGS
(Patented)

Dependability—isn't that the really essential quality in any car? Isn't dependability—so far as car performance is concerned—synonymous with pleasure-capacity and service-capacity? And doesn't dependability in the car as a whole demand dependability in every detail of construction and equipment? The ignition apparatus and lighting generator, for instance?

"NORMA" Bearings are the standard bearings in the high-grade magnetos and lighting generators used on cars of the better class, and adopted because of their proved dependability. It is, then, a mere statement of fact to say that "NORMA" Bearings identify dependable magnetos and lighting generators.

Be Sure—See That Your Electrical Accessories Are "NORMA" Equipped



THE NORMA COMPANY OF AMERICA
1790 BROADWAY NEW YORK
Ball, Roller, Thrust, Combination Bearings

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YOU
Make More Sales!

because customers can pick out

IDEAL HOSE CLAMPS
FROM THE DISPLAY BOX

which is open on your counter. They don't have to wait until you get through talking to someone else—customers often pick out the sizes they want—plank down the money and there you are!

180 Clamps—Retail Value $11.40
18 sizes, from ⅜" to 2¾"

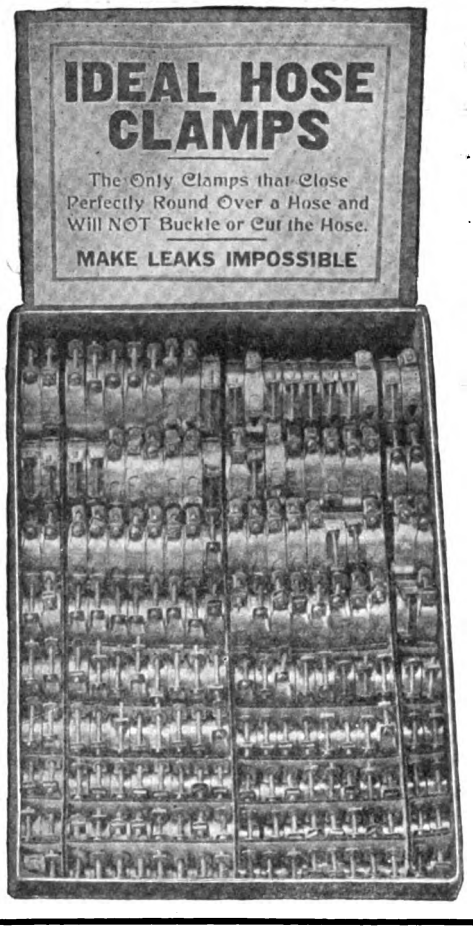
There isn't anything on the market that can touch *The Ideal Clamp* for making a perfectly tight joint—no matter under what circumstances or conditions the clamp is applied. It acts concentrically and closes evenly around the hose. This Display box reminds folks of clamp needs.



Send for a box today and see how quickly you will sell them—price **$6.00**

Perhaps you would like to make further inquiry first—by all means write us—we will answer letter same day as received.

Ideal Clamp Mfg. Co.
203-205 Bradford St.
BROOKLYN, N.Y.



Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

1500 SIZES. YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING

WRITE NEAREST OFFICE

GEORGE NASH CO.
217 Pearl Street
New York City

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THERE IS NO OTHER
CYLINDER RE-BORING MACHINE LIKE THE
MARVEL

Without question the simplest, easiest to operate, least expensive, speediest and most efficient device ever offered for the purpose of trueing automobile cylinders.

Should be in every repair shop. Pays for itself in a remarkably short time.

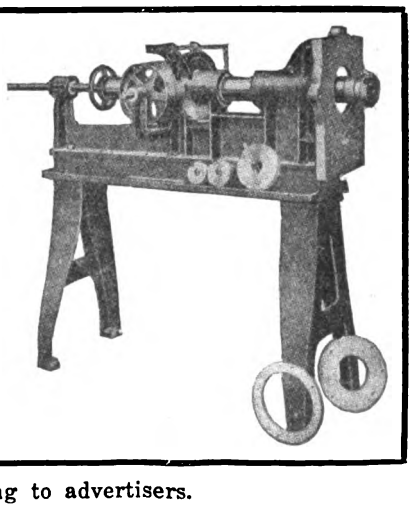
Often increases the repair business as much as 100% in two or three months after installation.

Will handle any type of cylinder block from one to twelve cylinders, of from three to eight inches in diameter.

For full particulars, price and terms, write the

MARVEL MACHINERY COMPANY

610 Boston Building **Minneapolis, Minn.** **Department No. 9**



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STOP THE SPRING BREAKAGE.



It's a poor policy to risk repeating the annoyance of a broken or weak spring—and the delay—by saving only a very little in buying or selling a *cheaper* spring instead of a "NEW ERA *BETTER* SPRING."

Don't replace a broken spring with one no better.

Wise dealers—sell only the best—

New Era "BETTER" Springs are the oldest and largest used line for replacement—at same price as from car factories. Made for all cars, GUARANTEED one year against breakage or sagging, graphited between leaves for two years' lubrication.

Write for complete line, discounts—or state requirements and class of business.

NEW ERA SPRING & SPECIALTY CO.,
871 Woodward Ave., Detroit, Michigan.

Quickly Saves Its Cost

For Cutting Headlights

"RED DEVIL" Circular Glass Cutter No. 033

"It's all in the wheel."



Enameled wood handle and base, "slip proof" bottom; steel rod and head. Pays for itself on the first headlight you cut. Hand honed, tested steel wheel. Mailed for 50c. Discount on quantities.

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Money-Making Proposition for Dealers.

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-- GREASE CABINET --
A GARAGE NECESSITY
RUNYEN MANUFACTURING CO.
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BEAU BRUMMEL BODY OUTFITS

are sold wherever Ford Cars are found; each sale makes additional sales automatically. Orders are easily closed.

We want to hear from progressive dealers—Write
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IGNITION LOCKS

Two types—keyless and fitted with standard Yale lock. *Ask your jobber or write.*

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Highest Compression PISTON RINGS
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Our stock of supplies and accessories is the largest in the world. Everything at reduced prices. Far below what you are paying.

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TOOLS For shop, factory, garage and home, many high class tools attractively priced in our **"ODDS and ENDS" pamphlet**—

which is mailed free on request by **MONTGOMERY & CO.,** 105 Fulton Street, NEW YORK CITY

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THE NEW HEADLIGHT LENS

gives 26% more light and all of it on the ground, where needed. You too, should use Legalite Headlight Lens, but first send for "Daylight Conditions for Night Driving."

LEGALITE CORPORATION
Dept. 22, 120 Boylston St., BOSTON, MASS.

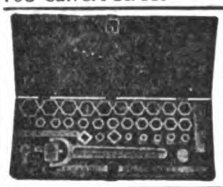
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STANDARD FOR QUALITY LOW IN PRICE

25 years' experience back of each one.

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BAY STATE SOCKET WRENCH SETS

are high grade tools made for real mechanics whether professional or amateur.

Four sizes, $3.00 to $10.00.

Send for circulars.

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MICRO PISTON RINGS



Two part, pressure tight.

Write for offer to dealers.

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SAFERLITE LENSES
No Glare No Danger

A shadowless light from gutter to gutter on a line with your bumper and an ample distance ahead for absolute safety.

Your garage man will be glad to get them for you.

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$380. F. O. B. Harvey, Ills.

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The two-horse-power Benninghofen Engine offers even economical power for every purpose. Many new, exclusive features, including "auto throttle governor," not hit and miss governed. Surprisingly low cost. Burns kerosene or gasoline. Runs machinery, pumps water, saws wood, runs separator, churns, etc. Catalogue and details free.

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SANBORN'S
Spindle Arm Silencer
FOR FORD CARS
Patented Aug. 31, 1915

One of the best things ever invented for the Ford. Absolutely stops all rattle in the arm, prevents wear and helps in the steering. Easy to put in by using a pair of nippers. No bolts to take out and not over five minutes time required. Insert from front side. Take hold of spring about half way from end, press ends together and push into place. Once there they will stay and you will have no more rattle from arm. Thousands now in use. Ask your Garage man for them. If he does not have them, send 35 cents and we will send a pair post paid. *Send for Price List.*

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THE MANLEY "HILITE" PORTABLE CRANE

Is easier handled and stronger, and less liable to upset than other cranes.

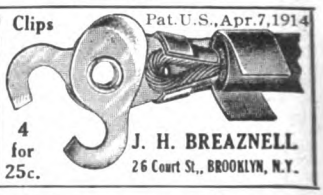
Built in one, one and one-half and two ton capacity.

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PILOT "THE CAR AHEAD"
Six Forty-five $1150
Five-Passenger "Double Cowl" Touring Car
Four-Passenger "Get-Chummy" Roadster
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VIBRATION CANNOT LOOSEN



4 for 25c.

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KENNEDY AUTO STORAGE COVERS

Furnish efficient and economical protection for cars in dead storage. They are made of heavy, durable paper, in standard sizes to fit any cars.

MADE ONLY BY
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BALL AND ROLLER BEARINGS.

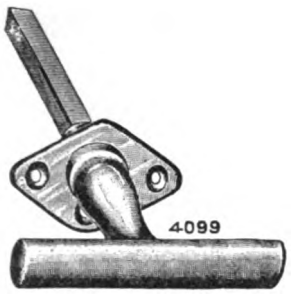


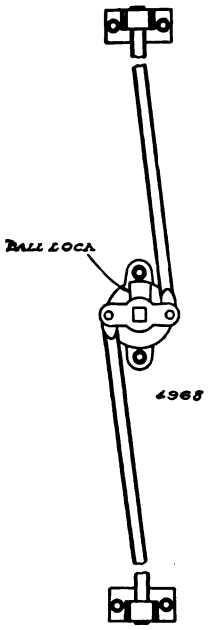
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Delivery Wagon Door Bolt.





This item is being quite largely used with satisfactory results.

Fastened on inner edge of one of the back doors of delivery wagon, having handle No. 4099 as illustrated on the outside. The rods are made of a suitable length to reach to the top and bottom of door respectively, while the mechanism at center is so arranged that a quarter turn of the handle effectually bolts the door.

Special attention is called to the "ball lock" which keeps bolts in place, and which automatically releases by a pressure on handle.

Handle enameled, polished brass or nickel; balance made to paint.

NET PRICE ON REQUEST.

JOSEPH N. SMITH & CO.
DETROIT, MICH.

Guaranteed for 10,000 Miles



BRICTSON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Brictson Tires punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding too.

Try Them At Our Risk

Give Brictson Tires a free trial on your own car. Put them to test at our expense. Find out why Brictson Tire sales are increasing daily.

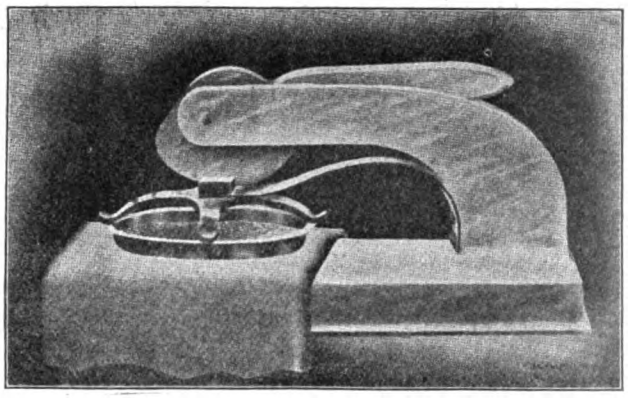
Your Tires Rebuilt The Brictson Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blow-outs, sidewall breaks, skidding, ruts and oil, and give you thousands of miles of additional service.

Write to-day for full information about Brictson Tires, Tire Rebuilding, and details of our liberal Free Trial Offer.

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147 Brictson Bldg.
Brookings, South Dakota

Brictson Pneumatic Tires



VULCANIZE YOUR OWN INNER TUBES

save the repair-man's profit

and eliminate the annoyance and time wasted in taking your tubes to and from the repair shop.

You can be sure of having inner tubes in perfect condition when you need them, if you use

THE G.A.C. INNER TUBE VULCANIZING OUTFIT.

(illustrated above)

So small and compact, it requires scarcely any room, and yet has become indispensable to those who have used it. All that is necessary is to press the clamp (this automatically brings to bear an even pressure on the container), light the chemically treated substance inside the container, and after the surface is burned over, leave for seven minutes.

It's so simple anyone can operate it.

It's impossible to overcure the patch or overheat the tube. A permanent and lasting job results.

This nickeled vulcanizer and 12 patches in containers **$2.25**

THIS SMALL AMOUNT INVESTED IN A **G. A. C.** OUTFIT WILL BRING YOU BIG DIVIDENDS IN TIME AND MONEY SAVED.

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GUARANTEED to make good *all* and *more* than is claimed for SHOCK ABSORBERS regardless of *make* or *cost*, or we will refund the purchase price upon return of the same in 10 days.

INCREASING demand, with production capacity of one set to every two cars built, enables us, after *ten years*, to sell TWIN SPRING at *less* than *one-half* their *original cost*.

FOR ALL CARS

Quickly and easily applied by anyone in a few minutes. *In ordering, state make, model and year of car.*

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NO CARBON
(NO WASTE OIL)
MORE POWER
(PERFECT SEAL)
LESS FUEL
(OIL CONTROL)

A DOLLAR SAVED IS A DOLLAR MADE

Makes your engine run like new all the time.





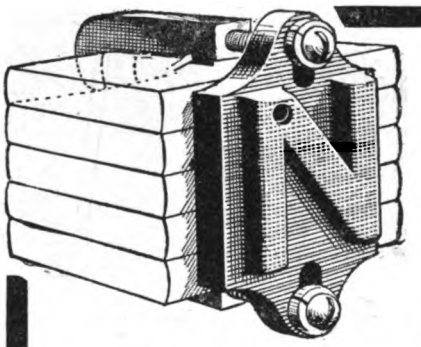
STOP! LOOK!! LISTEN!!!

With a groove full of oil all around the ring, gas cannot escape, oil cannot get up. That's why you have more power and no carbon. Write for Booklet. Ford size or under, 50c. Discount to the trade.

AUTOMOBILE ACCESSORIES CO.
(Sole Mfrs.) 816 W. North Ave., Baltimore, Md.

Representatives:
Auto Appliance Co., 1960 Broadway, New York. H. G. Paro, 30 N. Michigan Blvd., Chicago. J. W. Van De Grift, 627 Charles Bldg., Denver. L. A. Nott, 37 Stevenson St., San Francisco.

Carried by all leading jobbers.



Give Your Springs a Fair Chance

A SPRING LEAF is a **moving** part—it **needs** lubrication—for rust, in time makes any spring a stiff spring. You can take out the stiffness, prevent rust, and get real spring service by putting on the

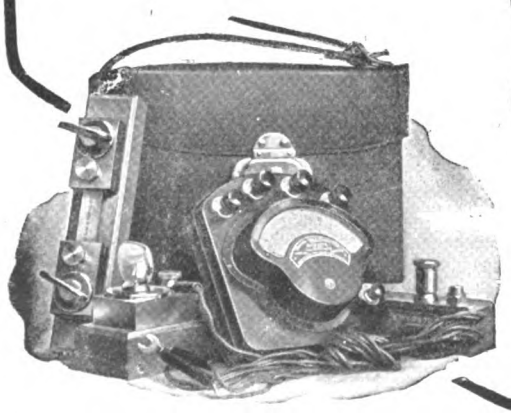
National Spring Oiler

It constantly feeds oil to the place where lubrication is most needed. The leaf surfaces are well covered and **kept** covered. The oiler is adjustable both in width and height, and has no bolt ends or nuts projecting.

The Price is 50c for One Oiler

Dealers, the shrewd ones, are getting our proposition. It is attractive, for the "National" is an easy seller and makes good on the car.

The National Motor Supply Co.
Factory and General Offices: Painesville, Ohio



Will Somebody Else Get Your Share?

If you can repair and adjust Electrical Equipment, you will get the cream of the garage business and make more money. With the increasing demand for service of this sort, you must equip to handle the business, or lose it to your more enterprising competitor.

Weston

Model 280
GARAGE TESTING INSTRUMENT

is your one great and urgent necessity, to enable you to locate electrical troubles quickly and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electrical equipment you can install.

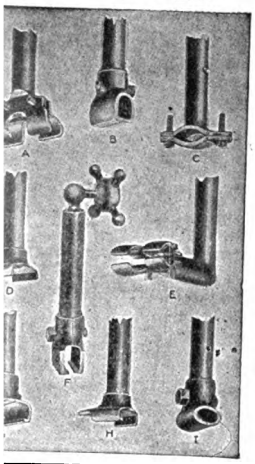
The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.

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A WHITEHOUSE AUTOSCO

is the quickest seller you ever hand

Put one in front of any man—right on car—while he sits at the wheel, and sale is made. Can you beat that? Try it

Write us today for dealers' prices.

List of Cars and Style of Clamp used on same.

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(For all cars.)

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Round Autoscope.

No. 103-A 4-inch Convex Glass $1.00
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All Autoscopes are finished in full black, black with nickel rim or black with brass rim. The price is the same for each. Specify your choice when ordering.

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I Buick	Lozier
I Cadillac	A Marmo
Carter	G Maxwe
Case	Mercer
C Chalmers	Metz
A Chandler	C Mitchel
C Chevrolet	Moline
B No. 490	A Moon
Chevrolet	A Nation
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Crawford	H Olds
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Newark, New Jersey



YOU can work quickly, conveniently and accurately in those hard-to-get-at places without taking the job apart.

The "Yankee" Ratchet device enables you to tap out holes in places where only a two-inch movement to and fro of handle is possible.

The garageman who has a reputation for getting repair work out on time puts his trust in the "Yankee" Ratchet Tap Wrench.

Here's why—The "Yankee" Ratchet gives right- and left-hand and rigid adjustments. The Crossbar is held by an ingenious "Yankee" device in any of three positions or can be removed. It gives ample leverage for large taps. Knurled Thumb Piece, at top, is used to start and back out taps quickly. It has a countersunk center on top face for use of wrench on lathe for holding small drills. Chuck with hardened steel jaws.

NORTH BROTHERS MFG. CO., PHILADELPHIA

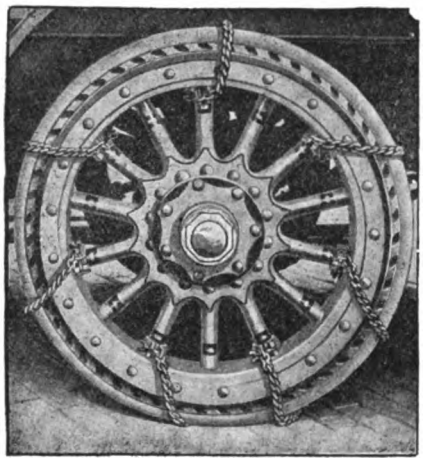
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WAR PERHAPS

Why not provide for such contingencies.

We make MUNITIONS as a sure protection against mishaps, WHICH ARE CERTAIN, unless provided with *"Bro-Gor"* Truck Chains.

Summer and Winter, Spring and Fall, Insure Against Skids.



You should be prepared by having your apparatus equipped with "Bro-Gor" Truck Chains.

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MILLER Originator, Designer, and Patentee of the Standard Adjustable, Sectional, Combination Cavity Vulcanizers, Wrapping Machines and many useful Devices for Tire Factories and Tire Repair Shops.

Complete Cure—
—One Heat
Including Both Beads

We teach tire repairing FREE at Factory or by Mail.

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MILLER'S No. 17
Complete Gas Burner **$112.00**
Gasoline Burner Extra **$2.00**

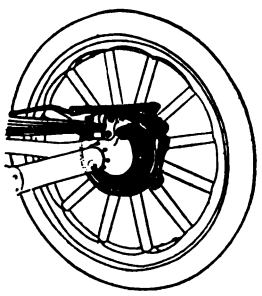


Miller's No. 1A
Repairs 3, 3½, 4 inch tires and all size tubes.

Furnished complete as illustrated, including 24x4 inch tube plate, 4 clamps, 4 pair bead molds, clamp, steam gauge, pop valve, boiler, gasoline burner outfit. . . $44.50
Complete with Gas Burner. $43.00

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MR. FORD OWNER:—

The ***"Improved Emergency Brake"*** is a large external Brake, lined with the best of lining, fitting the drum neatly. Guaranteed to lock the wheels instantly and hold the load on any hill.

Ford owners are usually careless with their Emergency Brakes, allowing them to become worn and neglect to have them renewed, in fact, the great majority of Ford owners have no Emergency Brake. If you think this is an exaggerated statement just try to stop your car on the next steep grade you come to by only using your present Emergency Brake. Let her slide down at twenty miles per hour. If you can stop your car and hold the load we'll treat.

Now then, let us presume you break an axle, drive shaft pinion or any of the gears of your differential, either ascending or descending a hill; then what? Your foot Brake is useless, you reach for your Emergency Brake to find that it is worn out; what next? Well, it's send for the ambulance and in many cases the undertaker.

Why take a chance? Serious accidents are happening every day and ***tomorrow it might be you,*** and your family who will pay the penalty for your negligence.

Go to your nearest dealer and have a set installed. The price is $10.00.

MR. DEALER:—Our co-operation from the home office should sell you 50% of the Ford owners in your district.
Write for our Dealer Proposition and our Wide-awake Selling Plan.

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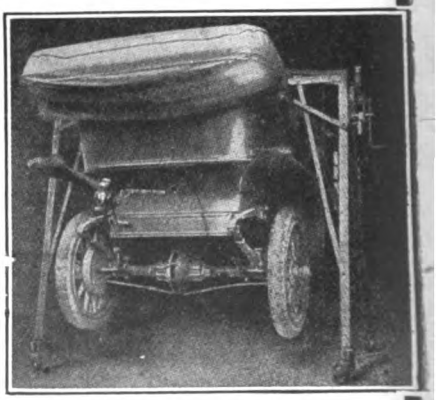
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Do your big jobs quicker and more cheaply.

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Increase your business by giving better service.



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Distributors in United States and Canada, BUFFALO, N. Y.

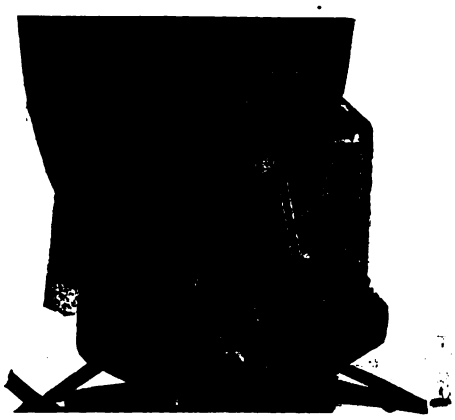
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SAFETY ALWAYS

Cranking a Ford motor is perfectly safe if the spark is properly retarded, but this is sometimes forgotten.

The BILL Automatic Spark Retarder not only retards the spark to a point of absolute safety but instantly and automatically advances it on the first power stroke of the motor.



The BILL Automatic Spark Retarder insures absolute Safety Always by advancing the spark at the proper time, saves you racing along the side of your car to advance the spark before the motor stops.

It is scientifically correct, mechanically right and everlastingly guaranteed to always make good.

It is the most valuable improvement the owner can make in his Ford Car and the best seller the dealer can offer his trade.

Our booklet gives full description. Write for it to-day.

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Gemco MILWAUKEE TRADE MARK

End Thrust Bumpers will almost sell themselves if they are displayed. Every car owner knows that it's cheaper to invest a few dollars in bumpers, for the front and rear of his car, than to buy a pair of new lamps and a fender or two when the inevitable smash comes. Gemco End Thrust Bumpers pay a good profit and bring car owners into the store to buy other supplies and accessories. Made to fi all cars, diamond or channel bars. Ask your Jobber to quote you prices or terms or write to

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When Equipped With a *New*

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Easily attached—new face plate protects porcelain and prevents thieves from breaking into lock. If your dealer is out—Sent prepaid on receipt of price.

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TIRES and TUBES

successfully resist road wear and give **Long Mileage**

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In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into **proper** shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag and** how to make it.

In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets **could** not fail to do a good deal of good.

We will send **a sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

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REVOLUTIONIZES TIRE PUMPING

Every car owner in the country will give *buying* consideration to the Peteler Foot Tire Pump—because it revolutionizes the job of inflating tires.

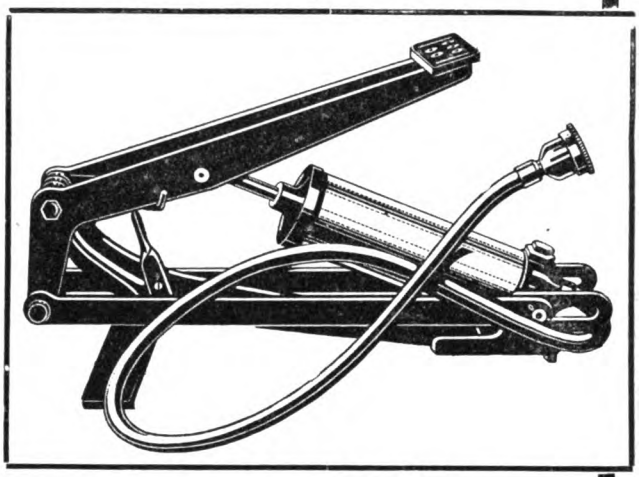
Blisters on your hands, and a crick across your back accompany the longshoreman's job of pumping a tire with even the best of the hand pumps.

The Peteler does it by using your weight and a simple, easy leg motion; you do not bend up and down, you don't *handle* the pump, you don't finish the job wheezing like an old man with asthma. And you finish much *sooner.*

This pump will be the best seller in any line this year—simply to show it and demonstrate it makes a sale. It will sell in every locality to owners of any and every make of car.

The man with a hand pump *needs* it—the man with a motor-driven pump will *want* it when he sees how easily it works.

They'll both *buy* it when they find how efficient it is and note its splendid finish and stanch construction—and remember, *finish* and *substantial construction* are characteristics of every accessory we have ever offered.



The Peteler FOOT TIRE PUMP

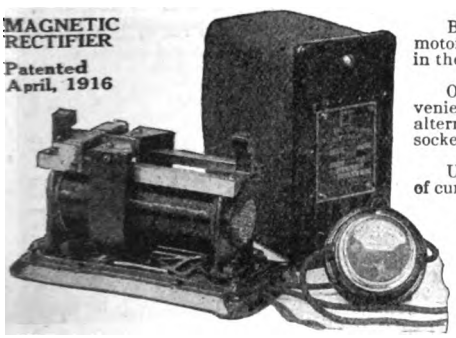
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MAGNETIC RECTIFIER
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Brings up the gravity of motor Car Storage batteries in the shortest possible time.

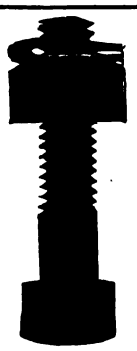
Operates from any convenient 110 volt 60 cycle alternating current lamp socket. 60 watt capacity.

Utilizes the Full Wave of current, has Carbon Electrodes and makes Recharging a profitable business wherebatteries are taken in to charge.

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are the simplest, surest, safest device to positively lock any nut on any bolt. Resist all vibrations. Cannot harm threads. Easily applied. Released whenever desired.

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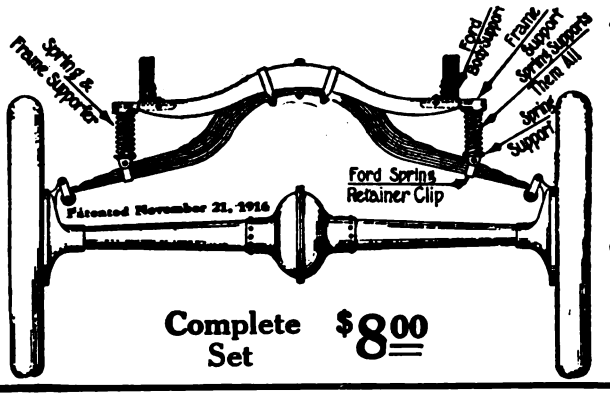


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Prevents striking and breaking housing, axle and Fenders, overcomes shearing of center bolt, sagging springs and tilting bodies. Supports frame, improves appearance and riding qualities. Saves the Tires. Acts as an Ideal Shock Absorber.

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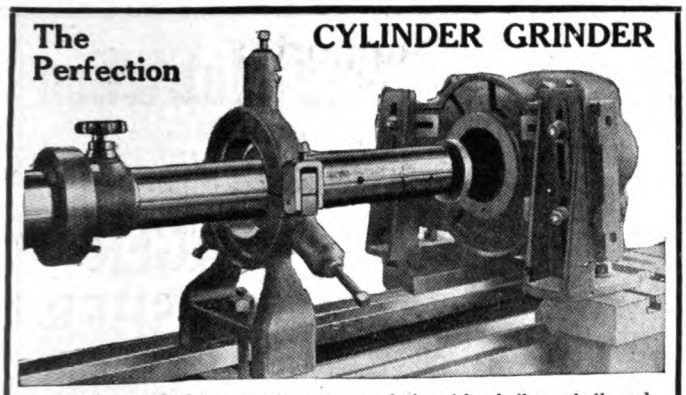
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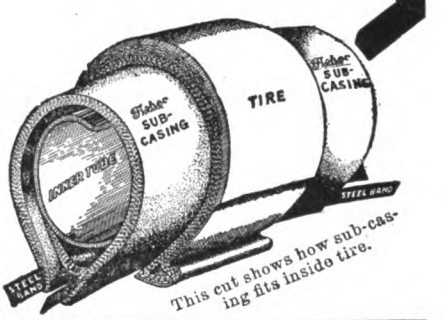
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The Junk Heap is evidence that you do not, and that blow-outs are the cause of your loss by not getting full mileage.

RIM-GRIP SUB-CASINGS are the remedy.

They provide, at a small expense, an additional strength to withstand the strain thrown upon the tires, and prevent the tires from blowing out.
Do not wait until the fabric of your tires becomes broken, separated or blown out, but install Rim-Grip Sub-Casings in time to head off these difficulties. You can get full mileage by wearing out your tires. The sub-casings can be transfered to others.

Fisher Manufacturing Co.
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This cut shows how sub-casing fits inside tire.

COMPRESSED AIR TANKS—

SCAIFE COPPER-BRAZED TANKS are used to the exclusion of all others by the leading builders of Air Compressors.
We positively guarantee them to hold air indefinitely without loss of pressure.
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1917 CASE 40

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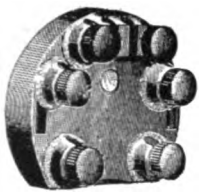


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MAGNETO PARTS

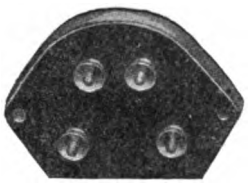
FOR ALL MAKES OF MAGNETOS AND COILS

SPARK COIL PARTS
TUNGSTEN CONTACTS
STARTER AND
GENERATOR BRUSHES



ALL PARTS ARE GUARANTEED AGAINST DEFECTIVE MATERIAL.

Write for our Catalogue and special agency proposition.



GUARANTEED MAGNETO PARTS CORPORATION

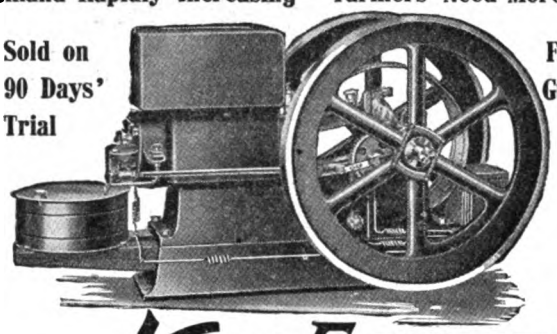
1765 Broadway **New York City**

MAKE BIG MONEY

Selling "MECO" Engines

Demand Rapidly Increasing — Farmers Need More Power

Sold on 90 Days' Trial



Five-Year Guarantee

MECO ENGINES

Gasoline, Kerosene & Gas

Kerosene Engines are big money makers for jobbers and dealers. Best Prices and Best Terms—Thousands being sold. MECO Kerosene Engine cuts fuel cost 65 per cent as compared to gasoline.

We Please You or Refund Your Money.

Ask for our special agency offer and latest MECO prices. Sizes 2, 3, 4, 6, 8 and 12 H-P.—Stationary, Portable or Saw-Rig styles—magneto or battery ignition.

If your jobber does not handle MECO Engines, write us direct. Don't wait for the other fellow—Cinch the trade NOW. Write to-day.

MANUFACTURERS ENGINE CO.

1879 Crystal Ave., Kansas City, Mo.

Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

This Tirefiller is made of the finest quality of pure rubber treated under special processes, never gets "flat" and will last indefinitely.

One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.



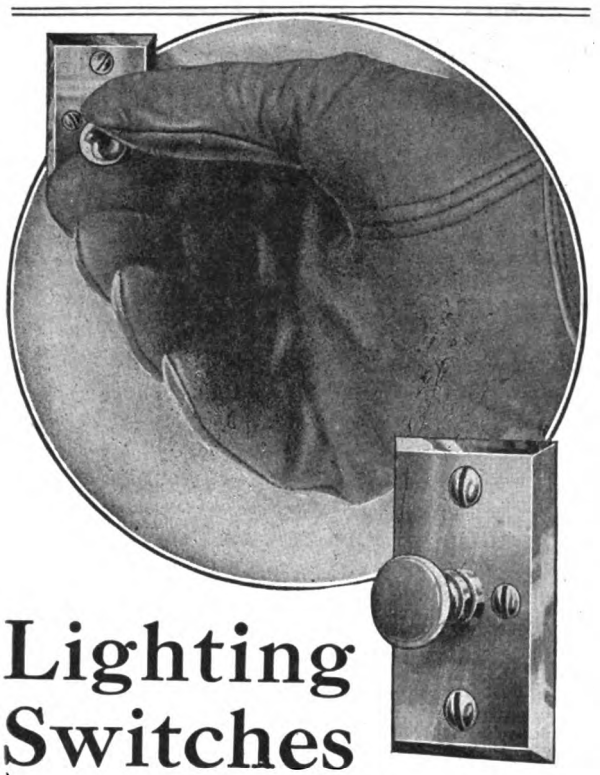
National Rubber Filler Co.

MIDLOTHIAN · · · · · TEXAS.



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CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS

The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

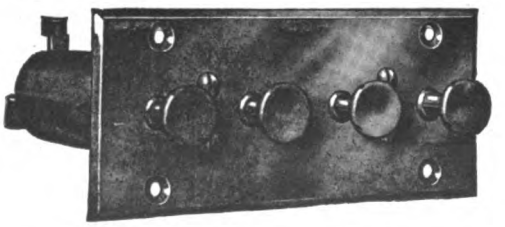
HEAD, SIDE AND TAIL LIGHTS

Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP

Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.

YOU CAN'T BEAT IT!



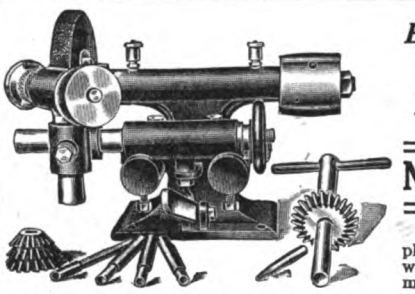
As far as the dealer is concerned—it is the "Velvet" of his stock. The dealer naturally takes pleasure in recommending goods from which he receives no complaints—the "Velvet" is then coming both ways—no kicks and a good profit. The dominant impulse with all dealers is to get the best.

THE LITTLE GIANT STARTER
For Ford Cars

is operated from the driver's seat by a medium-sized foot-pedal just to left of other pedals of the car. This pedal remains locked against the dash, out of the way, when not in use. The remainder of the mechanism is entirely under the hood—out of sight.

You can't go astray if you send for our literature which explains all—dictate a letter to us right now—it's really worth while. **Live Agents Wanted.**

THE LITTLE GIANT STARTER CO.
Factory and General Offices, Canton, Ohio.



Every Valve Regrinding Job
WILL BE
100% Efficient
IF YOU USE A

Nasco Valve Grinder

Your customers will be pleased with the job—which will be your best advertisement.

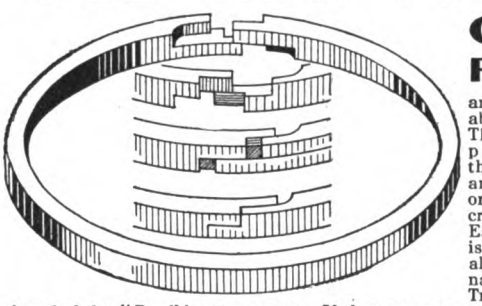
If you ever tried to cut Tungsten Steel Valves with a Reseating Tool or Lathe, you found the surface too hard to be penetrated. A Nasco will grind it with ease and leave a glass-like surface.

Workmanship of this high order gets the repair business.

Write Us Today for Prices. For Sale by All Jobbers.

National Auto Specialty Mfg. Co. - Tama, Iowa, U. S. A.

"SEE THAT JOINT"



GILL RINGS

are one-piece and absolutely tight. They increase power because they do not allow any leakage of gas or oil, and decrease expense. Each GILL RING is cast individually and has natural elasticity. Try a set and then feel the "Pep" in your motor. If they are not satisfactory we will return you your money. ***Dealers Everywhere.***

THE CHALSMITH COMPANY, 3701 S. Ashland Ave., CHICAGO, ILL.

It's EASY with a QUIK-EZY

TO CHANGE TIRES ON A SPLIT RIM



The **Quick-Ezy** Tire Tool with its powerful screw will yank any old rusty split rim apart in a jiffy. It grips at three points and won't bend or slip.

Every garage needs it to give quick service to tire customers and to save time and money.

Every motorist needs it for emergencies on the road.

It's new. *The Quick-Ezy.* Write today for full information.

THE H. L. HURST MFG. CO.
2183 North St., CANTON, OHIO



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NEED a new top? Don't waste your money! Give the old one a new lease on life with

"F-S" "Evernew" Auto-Top Dressing

It gives old tops the brand new look; makes them waterproof, and won't crack in folding. Easily applied and dries quickly.

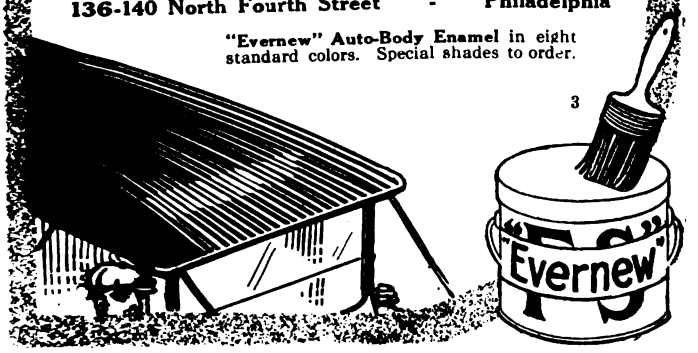
Write for prices

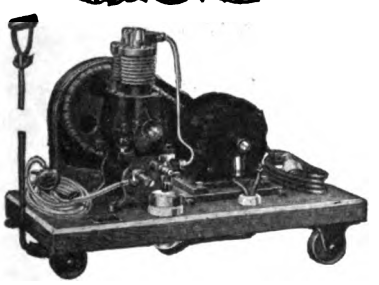
FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints Varnishes since 1863

136-140 North Fourth Street - Philadelphia

"Evernew" Auto-Body Enamel in eight standard colors. Special shades to order.





With competition among garages and repairshops getting keener every day, SERVICE is becoming the biggest factor in *getting* and *holding* new customers.

MAYO ELECTRIC GARAGE PUMP

will put your garage or repairshop in a class by itself. in your town—attracting enough new business to shortly pay for itself. Portable—can be taken anywhere about the garage—out to the curb or into the street.

Operated by ¼ h.p. electric motor with silent chain drive. In ordering state whether for alternating or direct current. 110 or 220 voltage motor is required.

Send for prices and full details

MAYO-SKINNER MFG. COMPANY
2115 Elston Avenue CHICAGO



"This Isn't Ordinary Grease"

"Get rid of that notion! NON-FLUID OIL is a heap better. It's specially made for motor car service. I use it in the transmission, differential and all compression cups. It certainly keeps the car running like a jeweled Waltham! Just try it!"

TRADE MARK REGISTERED IN **NON-FLUID OIL** UNITED STATES PATENT OFFICE

NON-FLUID OIL has been specially perfected for the heavy, moving parts of your car. It is a *pure* lubricant that gets between the metal parts and STAYS there in ALL weathers. It cannot freeze; does not melt. It follows the gears *instantly* and *always.* It eliminates noise, holds off the effect of friction, and reduces repair bills.

NON-FLUID OIL will give *better lubrication* for a *longer time* and at *less cost* than any grease you can buy.

Ask your dealer. He knows the value of NON-FLUID OIL.

Get "K-oo Special" grade for Gears; "K-ooo" grade for bearings.

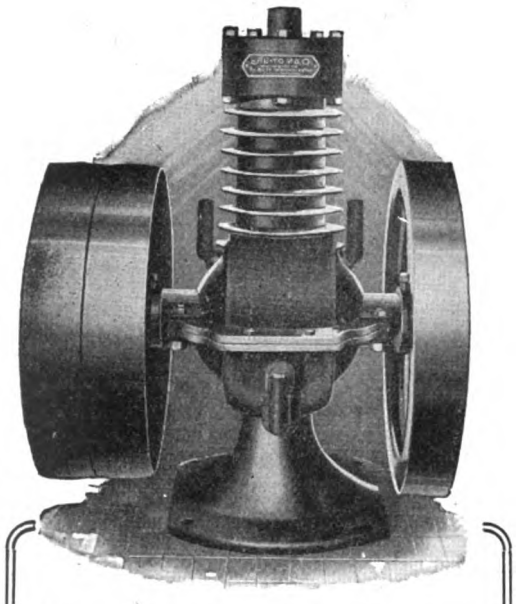
Sold only in orange-colored cans stamped with the sprocket-wheel trade-mark.

Write for a free booklet, "Lubrication of the Motor Car."

New York & New Jersey Lubricant Co.
165 BROADWAY NEW YORK

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Compressed Air *Always* on Tap!



Most any air compressor could be installed in an automobile plant, but there is only one genuine **Au-To Air Compressor.** Remember this and specify the **Au-To Air Compressor No. 0.**

ALWAYS. Not **sometimes.** Air in abundance for every requirement in garage and repair shop with plenty to spare for the man with a soggy tire. No cumbersome truck machine to drag about from place to place, but a stationary plant that occupies very little space in the cellar with pipes extending to shop and street. A dependable, year-in and year-out machine at low cost—it is the

AU-TO AIR COMPRESSOR

Small in Size but Large in Capacity

Built so sturdily that it stands up under severest service. Sold and used wherever motor cars are driven. Every **Au-To Air Compressor** is sold under rigid guarantee. We have never yet made a charge for repairs.

Furnished separately or with pressure tank, relief valve and 3-way cock.

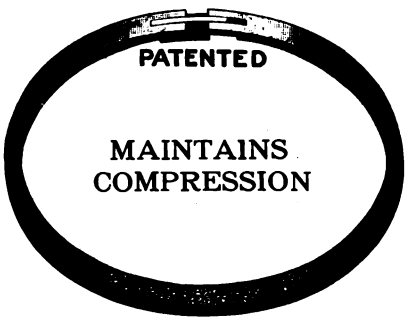
Sold by Jobbers Everywhere—Write for Catalog

The Au-to Air Compressor Co.
SOLE MANUFACTURERS
Department 62 - Wilmington, Ohio, U. S. A.

C. K. TURNER & SON, Export Agents, 116 Broad St., New York City

PEERLESS PISTON RINGS

Are the Best



PEERLESS RINGS are similar to the standard type of rings in every respect EXCEPT—that they will not leak.

Selling them means more money to you—improves your standing with your trade and makes you a better purchasing agent for those depending on your ability and judgment.

Write today for prices and descriptive matter.

LARSON & HILKER, Distributors
19 S. La Salle Street Chicago, U. S. A.

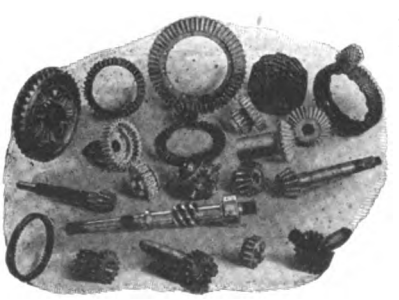


Samson

THE BIGGEST AND BEST LINE FOR 1917.
Protection and Co-operation. ***Write for our proposition.***
AMERICAN ELECTRIC CO., CHICAGO, U. S. A



IF YOU WANT THE DEPENDABLE KIND OF
DIFFERENTIAL AND TRANSMISSION GEARS AND SPROCKETS



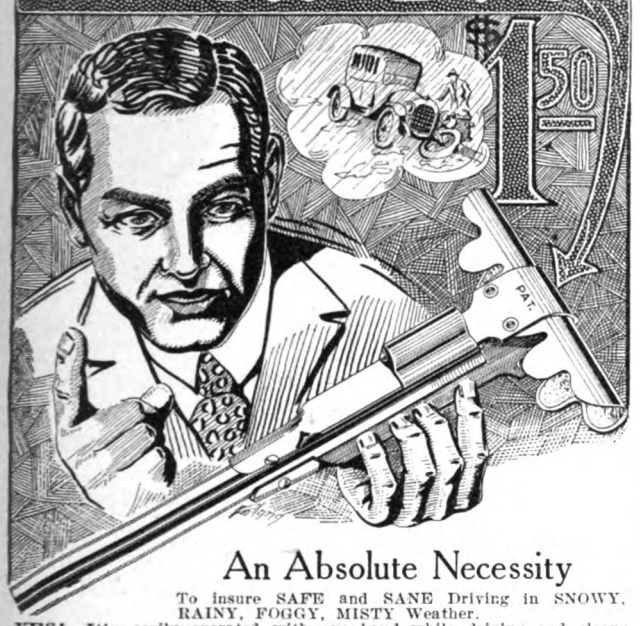
That can be relied upon to be accurately machined, and of the highest grade material, to fit all makes of cars,

Write for prices and terms to

William Ganschow Co.
Morgan and Washington Blvd.
CHICAGO, ILLINOIS

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CLEAR VIEW MEANS SAFETY



An Absolute Necessity

To insure SAFE and SANE Driving in SNOWY, RAINY, FOGGY, MISTY Weather.

YES! It's easily operated with one hand while driving and cleans both sides of the Windshield.

NO! It won't rust. It's copperized first, then nickel-plated and the Wiping Bars are made from Aluminum.

PRICE! One Dollar and a Half—that's all! And new Wiping Bars, when needed, for 25c.

WINDSHIELD CLEANER DEVICE COMPANY
1311 So. Figueroa St., Los Angeles, Cal.

COX "SPLASH-PAN" TYPE BUMPERS

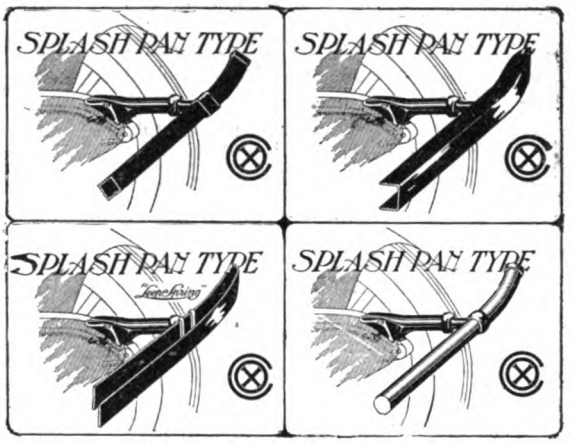
For Chalmers, Hupmobile, White, Mitchell, Oldsmobile, Studebaker, and the constantly increasing number of other cars with splash pan extended to the end of the frame.

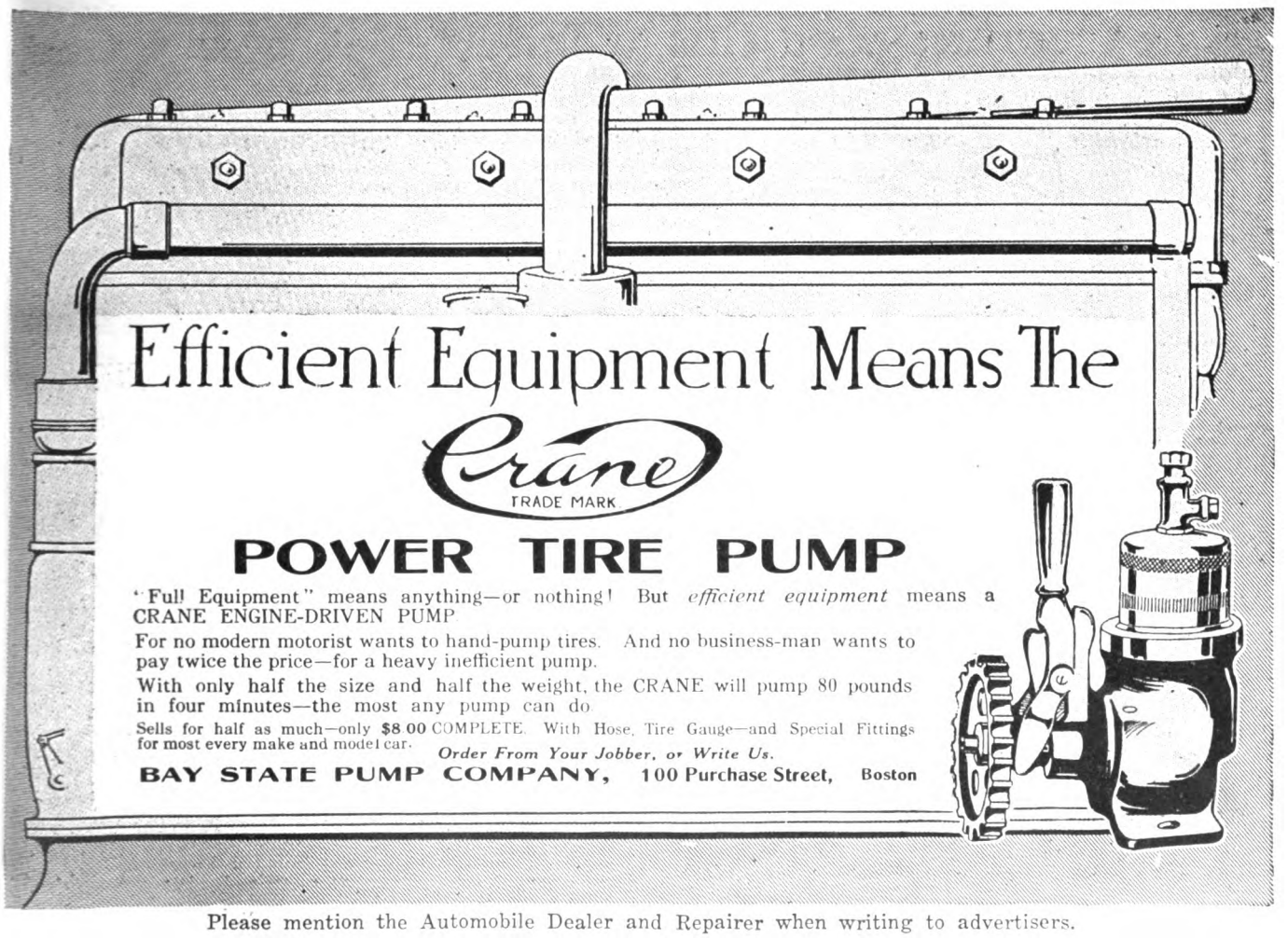
They are firmly attached to the frame without disfiguring the splash pan in any way by means of a special hook and bolt.

Write for prices and information about the whole Cox Bumper line—the most complete line and the best dollar value in the market.

COX BRASS MFG. COMPANY

HOME OFFICE AND FACTORY: ALBANY, N. Y.





Efficient Equipment Means The Crane

TRADE MARK

POWER TIRE PUMP

"Full Equipment" means anything—or nothing! But *efficient equipment* means a CRANE ENGINE-DRIVEN PUMP

For no modern motorist wants to hand-pump tires. And no business-man wants to pay twice the price—for a heavy inefficient pump.

With only half the size and half the weight, the CRANE will pump 80 pounds in four minutes—the most any pump can do.

Sells for half as much—only $8.00 COMPLETE. With Hose, Tire Gauge—and Special Fittings for most every make and model car.

Order From Your Jobber, or Write Us.

BAY STATE PUMP COMPANY, 100 Purchase Street, Boston

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Have You a Ford?

—or a Buick, Dodge, Winton, Chalmers, Oldsmobile? For all of these and many other cars, there are

SPECIAL

RAJAH

PLUGS

The RAJAH for FORDS



You never will know complete plug satisfaction until you put them in your car. Made from the same materials and with the same skill that have won for Rajah Standard and Rajah Giant Plugs the preference of three-quarters of the Race and Test Drivers. Furnished with thumb-nut or stud terminal if required.

All good dealers or by mail.

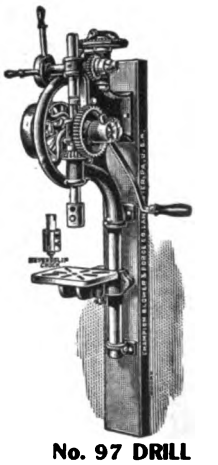
RAJAH AUTO-SUPPLY CO., Bloomfield, N. J.

John Millen & Son, Ltd., Montreal, Toronto, Winnipeg, Vancouver.
Hughson & Merton, Inc., San Francisco, Los Angeles, Portland, Seattle.

THE FAMOUS CHAMPION GARAGE EQUIPMENT



FAMOUS 400



No. 97 DRILL

CHAMPION TOOLS are Noted for Quality.

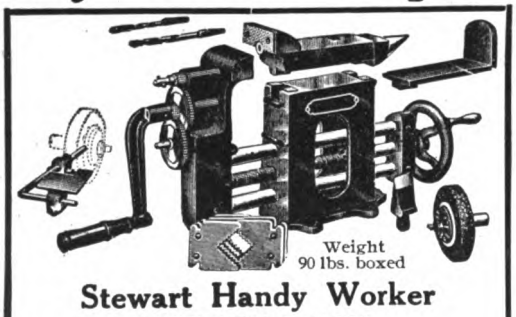
ALL LEADING DEALERS HANDLE THEM.

Before purchasing write for our 350 page catalog. It is FREE.

THE CHAMPION BLOWER & FORGE COMPANY

LANCASTER, PA., U. S. A.

Try at Our Expense this wonderful Repair Outfit



Weight 90 lbs. boxed

Stewart Handy Worker "SIX-IN-ONE"

Price Complete $14

Handiest combination of tools you ever saw. Just the thing for the garage, public or private. Wonderful value for the money. If you were to buy separately all of the tools you get with this outfit, and get tools of the same high quality strength and durability, THEY WOULD COST YOU AT LEAST $25.

A COMPLETE, COMPACT WORK-SHOP

A strong, practical anvil; powerful vise up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ in. pipe; A Corundum grinding wheel 5 inches by 1 inch; a two-speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing handle grip. It operates grinding wheel, buffing wheel, and many other similar tools.

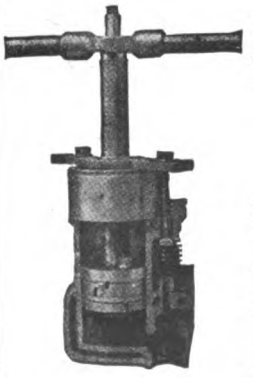
With the STEWART HANDY WORKER you can do car repairing, blacksmith work, home repairing, make plumbing repairs, keep knives and other tools sharp and in good working condition.

OUR SPECIAL TRIAL OFFER

Send for one of these great combination outfits today. Order with this understanding: If you aren't thoroughly satisfied in every way, you can ship it back and we will return every cent you paid out. THOUSANDS HAVE BEEN SENT OUT ON THIS BASIS AND NOT ONE HAS BEEN RETURNED.

Send only $2 with your order, and pay the balance when it arrives. BOOKLET GLADLY MAILED ON REQUEST. But the best way to appreciate this wonderful outfit is to order it, on our special trial offer.

CHICAGO FLEXIBLE SHAFT CO., 320 N. La Salle St., CHICAGO, ILL.



THE STORM & O'HAIR

Cylinder Reboring Machine

is adjustable and will rebore practically all makes of

Automobile, Aeroplane, Motor Cycle, Light Marine, Tractor and Stationary Motors.

It is simple, speedy and accurate and can be used by anyone familiar with tools.

Indispensable in any repair shop

Not an experiment but a thoroughly tested and reliable tool.

FOR SALE BY LEADING JOBBERS

For further information address

Storm & O'Hair Company
Box A 26 Thompson, Iowa



The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. **Try them and prove it.**

Dealers Wanted. Write for prices and discounts.

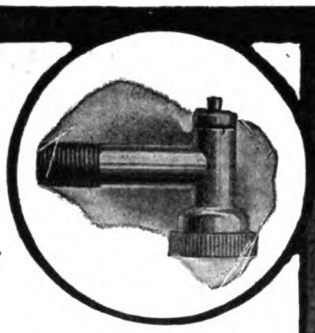
Manufactured by AMERICAN PISTON RING CO., 1925 S. Charles Street
BALTIMORE, MD.

N. A. PETRY CO., Inc.
1309 Race St., Philadelphia, Pa.
Eastern Representative, North and South, East of Denver.

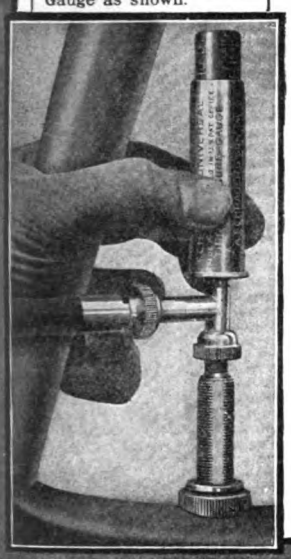
A. H. COATES
444 Market St., San Francisco, Cal.
Western Rep., North and South, West of Denver.

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Tire Pumping And Air Testing Made Easy



Attach Pump Connection to pump hose and apply Gauge as shown.



THE SCHRADER UNIVERSAL PUMP CONNECTION

permits you to measure the air in your tires *without disconnecting the pump.*

It greatly facilitates the work and materially reduces the labor of inflating tires, especially where a hand pump is used.

Ask your dealer to show you how it works.

It fits all pumps.

Price, in U. S. A., 35 Cents

A. Schrader's Son, Inc.
783-803 Atlantic Avenue
Brooklyn, N. Y.

FOR REBORING FORD CYLINDERS



THE DAVIS CYLINDER REBORING JIG AND REAMER

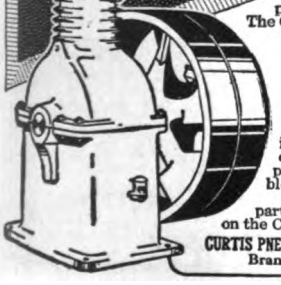
Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

Your Silent Partner

Attracts and Holds Business for You



The Curtis Air Compressor is one of the biggest assests you can add to your business. Attracts trade your way even when you are absent. A poor system becomes a liability—drives customers somewhere else—takes up your time with repairs—and costs a lot of money to keep in condition. The Curtis Compressor furnishing

CURTIS AIR Free From Oil

is built right—by a manufacturer of over 25 years' experience and its design assures a never failing supply of good, clean air. This means minimum tire trouble for your customers, which draws trade your way. Made in 5 sizes and 125 combinations. Write for full particulars. Or ask your jobber for prices, but insist on the CURTIS.

CURTIS PNEUMATIC MACH. CO., 1530-A Kienlen Ave., St. Louis, Mo.
Branch Office: 530-E Hudson Terminal, New York

MOSCO

FLOATING PLUNGER WHEEL PULLER



Makes a "Frozen" or "Stuck" wheel come off easily. Strike the plunger, turn the screw, strike again and the wheel comes off without injury to hub-threads, spokes or axle.

Made for the following cars:

Abbott	Jeffery
Apperson	Jordan
Auburn	Lexington
Briscoe	Liberty
Buick	Maxwell
Case	Moline Knight
Chalmers	Oakland
Chandler	Oldsmobile
Chevrolet	Overland
Daniels	Paige
Davis	Peerless
Dort	Pierce Arrow
Empire	Premier
Ford	Reo
Franklin	Saxon
Hudson	Velie
Interstate	

Your jobber has them in stock.

New models continually being added.

List of models and prices on application.

MOSCO

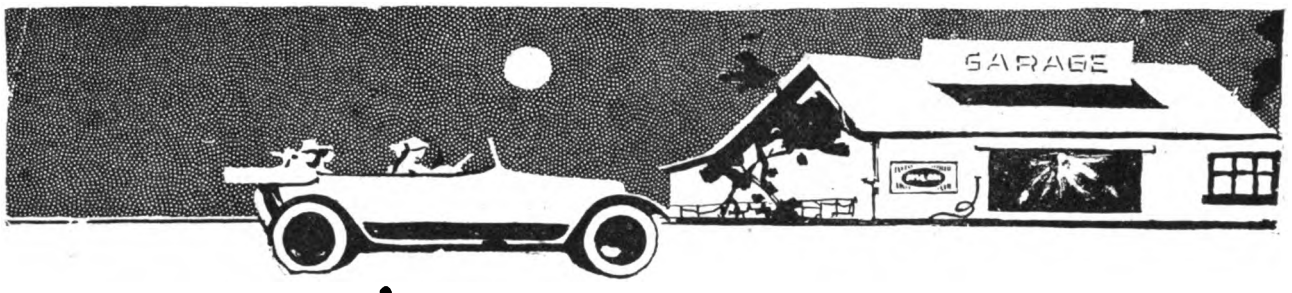
Timer For Ford Car



Extra heavy pressed steel shell, aluminum finish. Insulating ring of gray bone fibre.
Terminals insulated all the way through. One-hand, self-closing oiler. Pressed steel arm and compression spring on brush assembly. Brush assembly sold separately. Interesting prices.

MOTOR SPECIALTIES CO.
MANUFACTURERS
WALTHAM MASS.

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No Matter at What Time of the Night the Brunnerwise Motorist Comes Limping Along the Road With a Big Rear Tire Flat, He Knows When He Sees the BRUNNER Sign His Trouble is Over.

It is a mighty nice thing to know that you are in a position to take care of the motorist at any time of the day or night, Mr. Garageman, and if your compressed air plant is a BRUNNER you know that the Brunnerwise Motorist has played no small part in the building up of your business since you have installed BRUNNER service in your garage and displayed the BRUNNER sign on your garage.

Efficiency is what counts in the modern garage, and with the Brunnerwise Motorist the efficiency of your garage starts at the end of your air hose—if he sees the BRUNNER sign on your garage the question of efficiency is settled then and there because he has always found prompt and efficient service under the BRUNNER sign.

The average motorist is looking for efficient service and if he pulls up in front of your garage, picks up the air hose and finds only a weak, wheezy puff of stale air available, it instills in his mind grave doubt as to the general efficiency of your garage and he passes on. Start at the end of your air hose, Mr. Garageman, and improve the efficiency of your garage.

INVESTIGATE THE BRUNNER AIR COMPRESSOR



The Brunnerwise Motorist

Mr. Garageman, the selection of your air compressor equipment is a matter that you should give your very careful attention, before making your selection you should read Brunner's Garageman's Handbook on Compressed Air and get the facts concerning the Garage Air Compressor situation today—this book with our No. 14 catalogue and the name of the Brunner Jobber covering your territory will be mailed to you upon request.

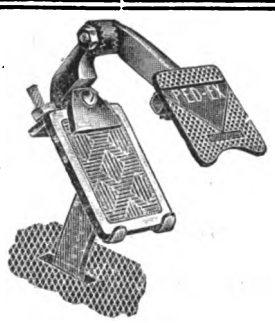
BRUNNER MANUFACTURING COMPANY

Main Office and Plant
UTICA, N. Y.

Cincinnati Branch
CINCINNATI, OHIO



The Brunnerwise Garageman



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THE ADJUSTABLE EXTENSION PEDAL

Garages, Service Stations and Accessory Dealers should all carefully consider PEDEX.

1. *A necessity for the family car.*
2. *Insures proper leverage.*
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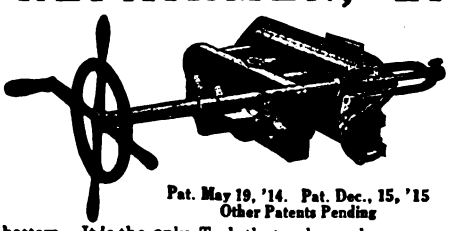
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When Ordering Give Car—Model—Year

Send for Literature, Discounts, Etc.

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THE HEISER IMPROVED CYLINDER REBORING TOOL for Ford Motors is the only Reboring Tool in the world that is self sharpening. It is the only Tool except expensive grinders that will not leave the finished cylinder slightly tapered toward the bottom. It is the only Tool that rebores between centers—this insures a finished cylinder, square with the crank shaft, round, straight and true. It is adjustable, and the only Tool that will rebore different sizes without losing the adjustment.

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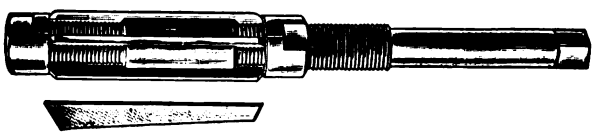
Heiser Special Tool Co., Dept. A, Kingston, Missouri

The best made for repair work

The Critchley Expanding Reamer

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Try One and You Will Want More.



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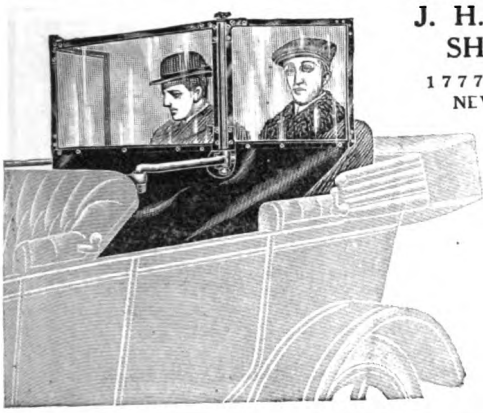
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Gives 100 per cent easier riding

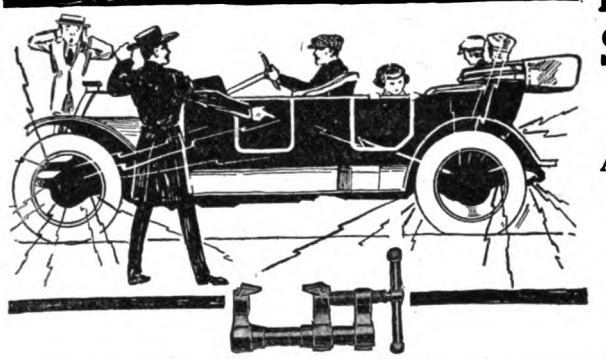
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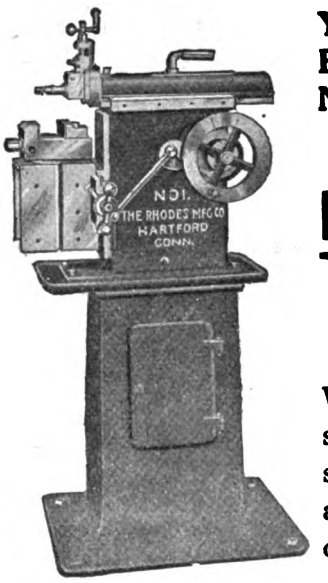
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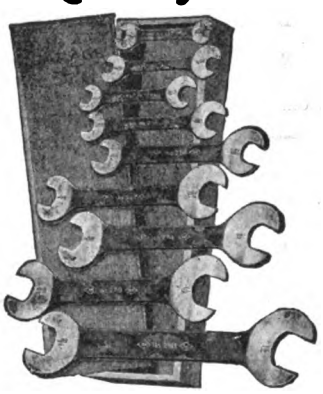
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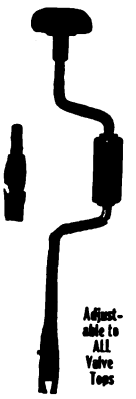
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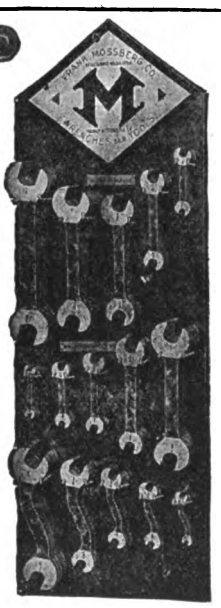
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Just the wrenches that sell

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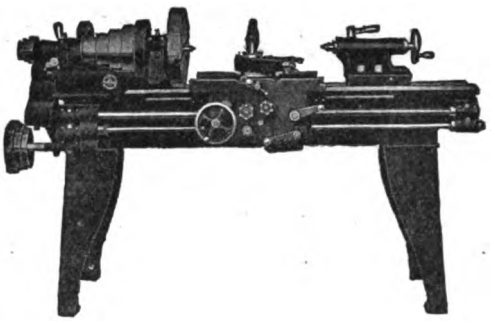




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Other Sizes, 16, 18, 20-Inch

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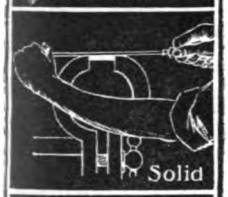


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Prices $3.00 and up at your dealer's.

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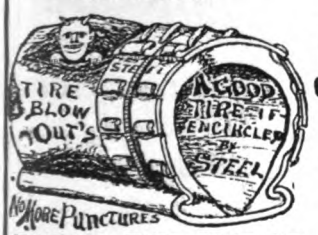
The Allen Auto Specialty Co.

1926 Broadway New York

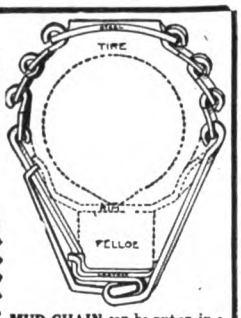
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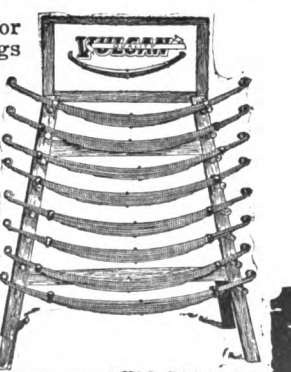
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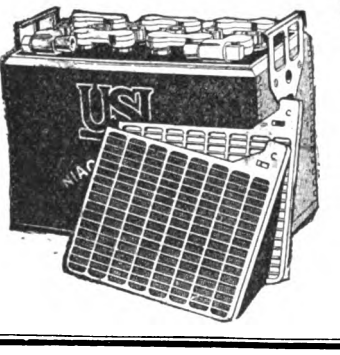
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Why? The answer is found in the exclusive USL Machine-Pasted Plates.

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We conduct a newspaper advertising campaign in addition to other sales helps for the dealer in every city where we have a Service Station.



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MORE SPEED

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Weight 1 Lb. Less Than Standard Ford

Manufactured to the Limit of 2 Ounces Variation in Weight

A PISTON AS FINELY MADE AS THOSE USED IN THE HIGHEST PRICED CARS

A reduction of 4 lbs. weight on reciprocating parts saves a tremendous percent of crankshaft and wrist pin bearing wear.

The DYER LIGHTWEIGHT PISTON for FORDS possesses all the ADVANTAGEOUS features of alloy and aluminum pistons without their BAD FEATURES such as slapping, oil throwing, seizing and poor compression and COSTS BUT LITTLE MORE THAN STANDARD FORD PISTONS.

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This Tire Can't Puncture

THIS IS THE TIRE

that gives you freedom from every kind of tire trouble. Think of driving your car indefinitely without a thought of a pump, patch, puncture or blow-out. Think of driving over any kind of road with a care-free consciousness of perfect tire security

DAYTON AIRLESS TIRES ride as easy as any Pneumatic. They are not solid, but have piers of live, resilient rubber that absorb jars and jolts. No trouble, no repair expense.

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"DEPENDABLE"

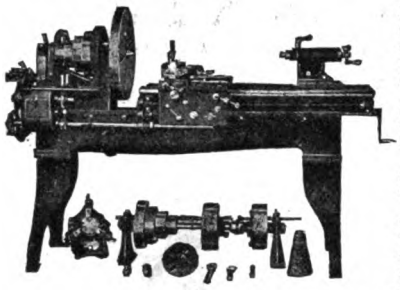
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THE UNIVERSAL GARAGE LATHE
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Cuts right or left-hand threads, and can be furnished with transposing gears for millimeter threads.

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RAIN or SNOW positively will not collect on the WIND-SHIELD of your car when

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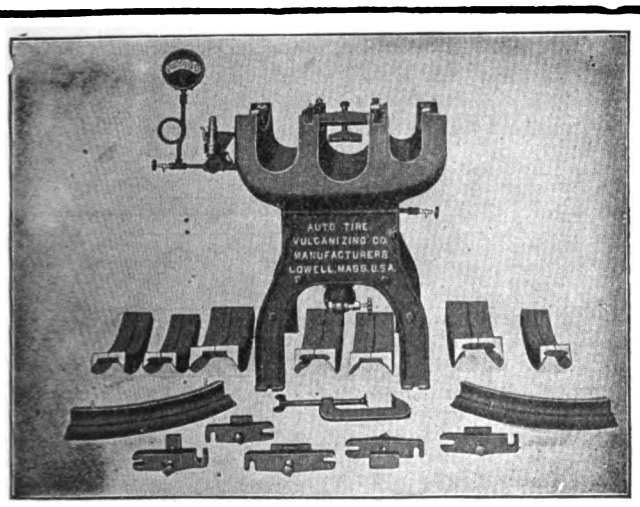
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$2.50



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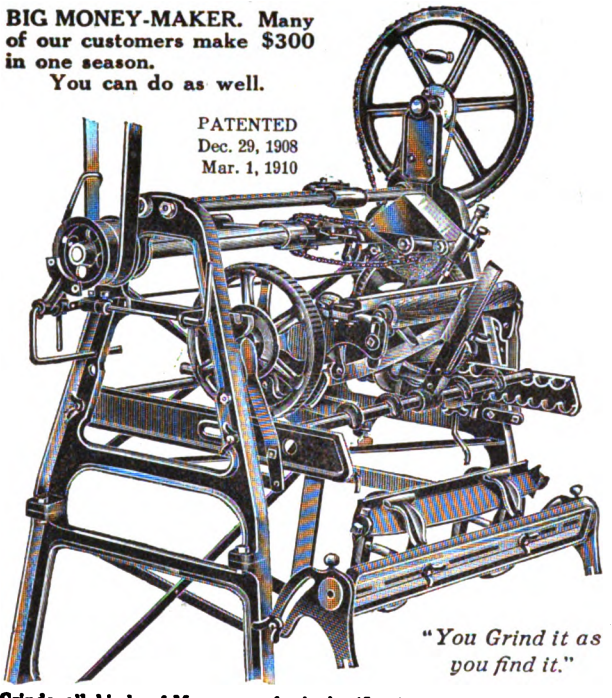
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BIG MONEY-MAKER. Many of our customers make $300 in one season.
You can do as well.

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are used by the leading truck makers in order to insure dependable service.

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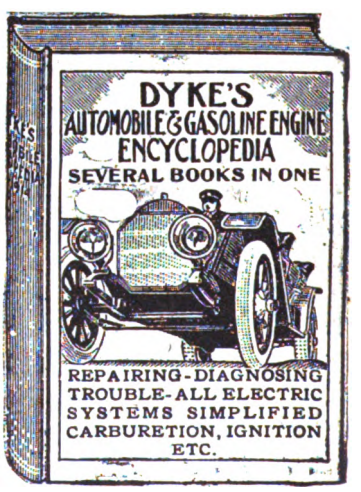
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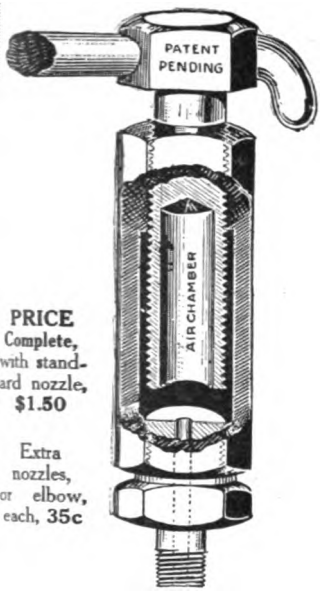
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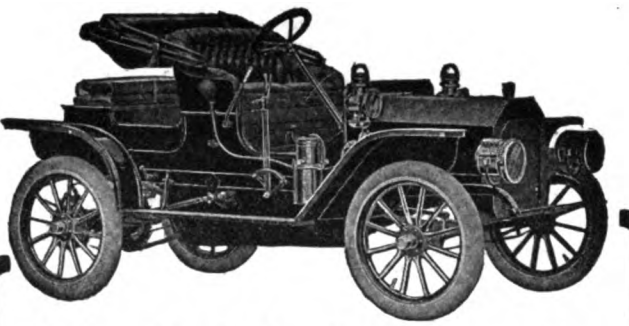
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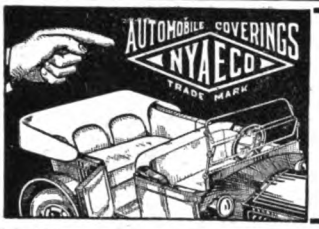
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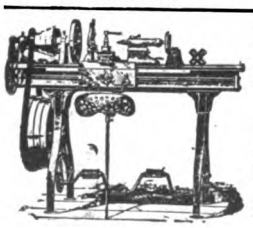
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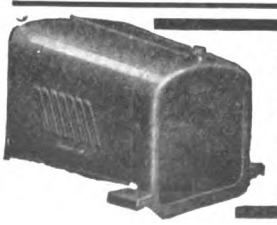


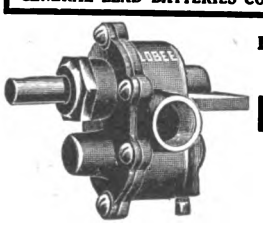
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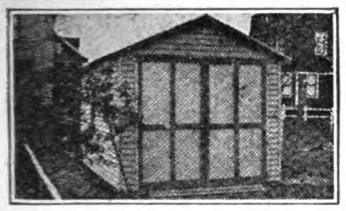

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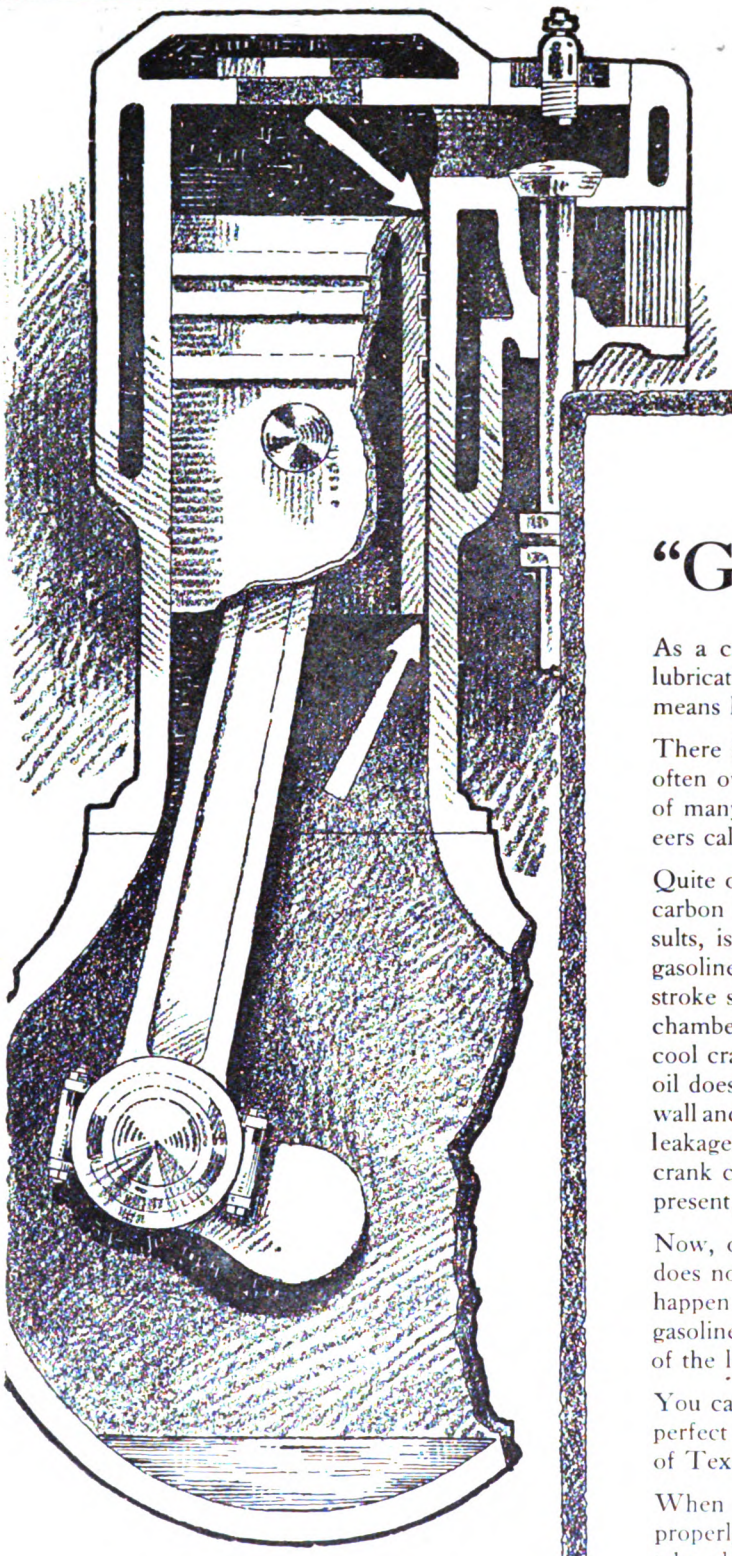
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Now, obviously, gasoline is not a good lubricant. It does not take much speculation to determine what will happen to a motor in which oil is used that permits gasoline to leak into the crank case and become a part of the lubricant.

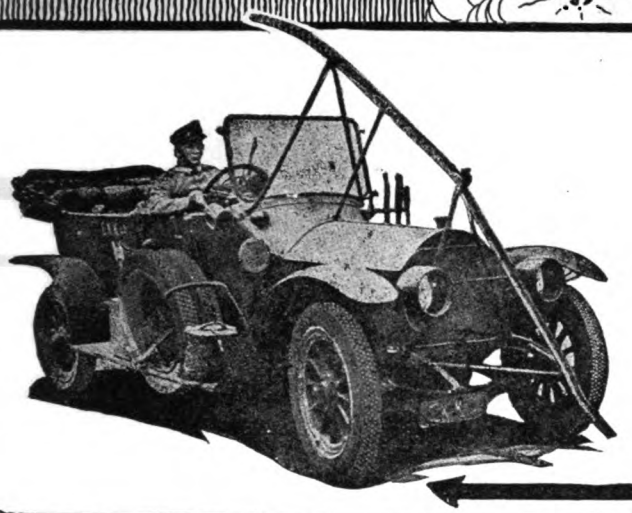
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Tires that have been discarded after only 3,000 to 5,000 miles of wear, can be made to render at least 5,000 miles more service.

England, France and Germany, Austria and Russia—all the fighting nations—have solved the tire problem in exactly the same way; solved it so that they now get at least twice as much mileage out of their tires, few punctures, non-skid service equal to chains, and an enormous saving in money. They did this by using steel studded treads.

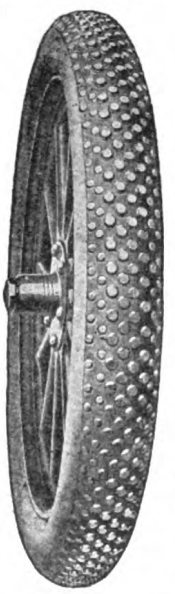
Get 5,000 Miles More

You can get at least 5,000 miles **more** service out of the tires you have been throwing away or giving to the junkman for a few cents after you have driven them only 3,000 to 5,000 miles of service.

Over half the car owners in Europe are doing this by applying steel studded treads to their worn tires, and more than 50,000 American motorists have already taken advantage of this opportunity to save from $50.00 to $200.00 a year in tire expense.

Steel studded treads are a perfected product of the world's war. Take a look at the photograph above showing how the military cars at the front are steel treaded. This new tread has proven its value to the satisfaction of military engineers and to thousands of investigating European and American motorists.

It offers you the same economy and security. You are entitled to these advantages and we stand ready to show you at our expense.



Guaranteed 5,000 Miles Without Puncture

Durable Treads are backed in writing by our signed guarantee for 5,000 miles of wear without a puncture. This guarantee holds good whether your tires are new or old. Think of it—to be able to drive your car without the constant nerve racking dread of tire trouble—it really means a **5,000-mile tire vacation!**

We Deliver Free

Without a cent deposit, we prepay express and allow you to decide. Remember the new Durable Treads—the only tire protectors in America built according to the foreign pattern—are gripped by the rim, just the same as the tire—absolutely water and sand proof—and are **applied in your own garage** in a few minutes time.

Special Discount

To motorists in territory where Durable Treads have not as yet been introduced, we offer a special discount on the first shipment **direct from the factory.**

Will you let us show you at our expense and risk? All we ask is your request for information—the coupon below is for your convenience.

Mail the Coupon

Tear it off and mail it **now**—don't run your tires "bare-footed" another week. We have an interesting book—"10,000 Miles On One Set of Tires," sample and copy of guarantee, ready to send to you FREE.

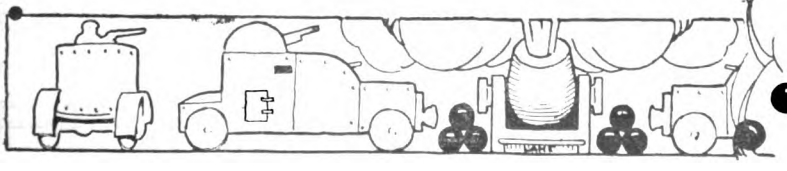
Stop throwing away your worn tires. Let us show you how to get **5,000 miles more service** out of them, just as thousands of other motorists are doing.

Mail the coupon TODAY—do it now—before you turn the page and forget. You will hear from us within a week.

The Colorado Tire & Leather Co.

55 Tread Building, Denver, Colo.

E-5 Transportation Bldg., Chicago, Ill. 720-55 Woolworth Bldg., New York City



COUPON TEAR OFF MAIL

COLORADO TIRE & LEATHER CO.
55 Tread Bldg., Denver, Colo.
E-5 Transportation Bldg., Chicago, Ill.
720-55 Woolworth Bldg., New York City.

Gentlemen:—Without any obligation send me your free book, "10,000 Miles On One Set of Tires," copy of guarantee, and tell me about your special discount offer.

Name .....

Address .....

.....

My tire sizes are .....

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71% Increased Gasoline Mileage

Even Better Than A. A. A. Tests That Showed 42% to 54% Increase

Read This Affidavit:

Results of gasoline mileage test made at Omaha, Nebraska, March 1st, 1917, under the following conditions:

Car used was a Ford roadster with standard equipment, top and windshield up, and carrying three passengers, namely, Joseph P. Woodlock, Herman Beal and R. H. Findley.

First, main fuel tank was disconnected and a two-quart auxiliary tank was attached to windshield and connected with carburetor. This auxiliary tank was filled with gasoline and car run until fuel was entirely consumed, and 6.6 miles were secured, or at the rate of 13.2 miles per gallon. No stops were made.

Second, the exhaust and intake manifolds, which are Ford standard equipment, were removed and the Wilmo combination one-piece manifold was installed. The carburetor was readjusted to meet the new conditions, the gasoline tank filled with fuel and car was driven at same rate of speed as in former test with standard equipment, namely, 20 miles per hour, over same course and under like conditions, carrying same passengers. One complete stop was necessary owing to traffic congestion and 11.3 miles were secured, or at the rate of 22.6 miles to the gallon, or an increase in mileage of 71 per cent.

The above test was witnessed and is hereby attested to by the undersigned.

Herman Beal
Asst. Engineer, City of Omaha

Robt. H. Chamberlain
Asst. Sports Editor, Omaha World-Herald

P. H. Patton

Raymond A. Pagau
Feature-Advertising, The Omaha Bee

R. H. Findley
Supt. Track and Roadway, O. & C. B. St. Ry. Co.

J. E. Light
Asst. Secretary, Omaha Auto Club

Jno. H. Castle, jr.
Publicity, Omaha Daily Tribune

Subscribed and sworn to before me this 3rd day of March, 1917.

L. R. Wilmo
Notary Public

The Wilmo Manifold utilizes the heat of the exhaust to completely vaporize the incoming mixture.

Gasoline mileage wonderfully increased. Carbon troubles practically eliminated.

Attached in a few minutes with an ordinary monkey-wrench. No holes to bore.

Retail prices, $7.50 (Ford size) to $15, depending on make of car.

Well advertised. Sold under the absolute money-back guarantee of the makers.

Dealers: Write for Sales Proposition and Official A. A. A. Tests.

THE WHITTIER COMPANY, First National Bank Building, Chicago

Wilmo Manifold

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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1500 EXTRA MILES

YOU PAY TOO MUCH

per mile when your car springs are inefficient.

With inefficient springs your tires won't give the mileage they should.

If you want to get all the miles out of your tires that are built into them

BUY

DANN INSERT
"The Inter-leaf Shock Absorber"

The saving on two tires pays the cost of DANN INSERT. Our dealers give you the 1500 extra mile guarantee in writing.

With DANN INSERT you get more miles from every gallon of gasoline.





What greater evidence can you ask to prove the real tire-saving merit of DANN INSERT?

GUARANTEED ON ANY NEW TIRE OF STANDARD MAKE WITH

NO ADVANCE IN PRICE

DANN INSERT stops the squeaks between the spring leaves.

DANN INSERT will make any car ride better and can be installed in any make or model. More than 100,000 sets have been sold.

DEALERS—write for proposition

DANN INSERT is standard equipment on the following cars:

Winton—Austin—Disbrow

THE DANN PRODUCTS CO.
1095 East 152nd Street, Cleveland, Ohio

"Demand DANN INSERT in the Car You Buy"

MAIL THE COUPON

The Dann Products Company
1095 E. 152nd Street,
Cleveland, Ohio

Please send me complete information relative to the above, as pertains to my requirements.

I am a { Car Owner. / Dealer. / Manufacturer.

Car.....

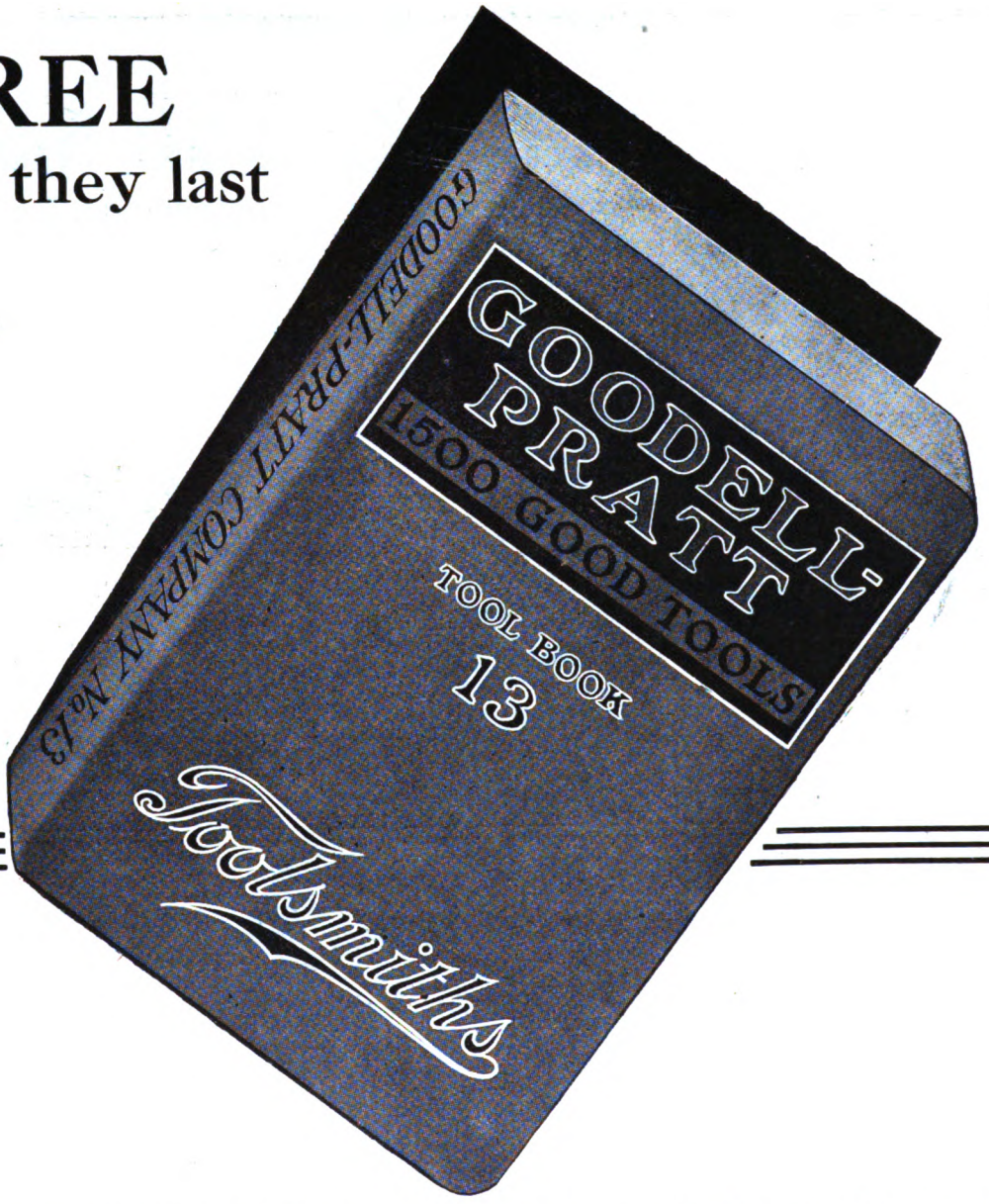
Model..... Year.....

Name.....

Address.....

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FREE
while they last



Our Book of Good Tools has just been received from the printers. It is revised and enlarged, giving full particulars about every tool that we manufacture.

Think of having in this convenient pocket form this handy reference book of tools thoroughly indexed! You need some odd tool—wonder where to get it—and you find it listed with full particulars in this 432 page book.

There is a copy waiting for you, but if you don't write now, you may not get it.

GOODELL-PRATT COMPANY

Greenfield *Toolsmiths* Mass., U. S. A.

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more money for garages

How often are you called on to locate and correct trouble in Electrical Starting and Lighting Equipment? You are bound to have more and more such calls, especially if you earn a reputation for knowing the electrical side of an automobile and handling it right.

There is money in Electrical Installations, Repairs, Adjustments, Renewals, etc. Some of the most wide-awake Garage Men have found it out. This year, more money than ever before will be made that way, because there will be more electrical work than ever for the man who knows how.

Guesswork won't do. Every time you guess wrong, you are likely to make yourself a peck of trouble and lose a customer in the bargain. What you need, and need right now before you find yourself losing opportunities to make money, is a

Weston

Model 280

GARAGE TESTING INSTRUMENT

This complete Electrical Testing Equipment is made by the world's foremost Electrical Instrument designers and makers. It meets every requirement for making electrical tests in the garage. With this *Weston Model 280*, you can handle anything that comes your way in electrical work. And it doesn't cost a small fortune, either—mighty little for what it will let you make.

With the Instrument, we furnish full information, showing you how to use it. And we have a staff of electrical experts whose advice is yours for the asking any time you think you need it.

We Will Make You a Worth-While Offer

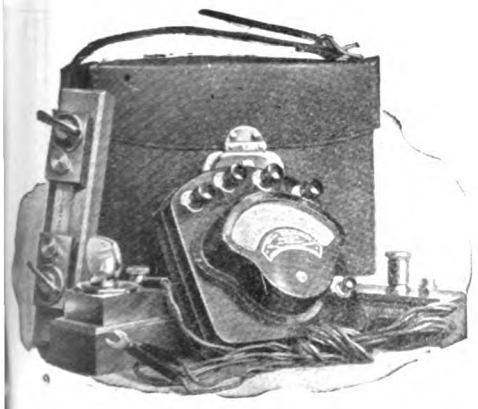
It includes not only the Instrument but Special Service Features which will put you in a position to make the most of this rapidly growing and very profitable business. There is a limit to the number of garages to which the offer can be made, so don't put off looking into it. Write today for full particulars.

WESTON ELECTRICAL INSTRUMENT CO.
2 Weston Ave., Newark, N. J.
23 Branch Offices in the Larger Cities.

Do you want to be able to make quick, accurate tests to locate any defect in the electrical system? Or, do you want to consume unlimited time taking apart every device and running a chance that you will discover the trouble sooner or later?

There are scores of places where trouble may occur. Unless you test electrically, you cannot eliminate any possible source of tronble without taking each device apart.

A poorly made, inaccurate electrical instrument merely adds to the uncertainty. What you need is reliable, positive knowledge. This Model 280 really is the equivalent of six separate Measuring Instruments of different ranges. It is extremely accurate, durable and serviceable. With it, you can do the work quickly and intelligently, putting yourself a long way ahead of any competitor who has not Weston Equipment.



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Harvey
RACINE

20,000 SPRINGS
ALWAYS IN STOCK

There's a Harvey Spring manufactured for practically every make and model of car. Our immense factory stock of 20,000 springs comprises over 600 different styles and sizes. You don't have to depend on the car manufacturer for replacements. You can get better springs and save time and trouble by ordering Harvey's.

Each spring is painted black and is wrapped and tagged—ready for instant shipment. Also, more than fifty large wholesale distributors, whose service covers every point in the United States, represent us exclusively and carry large and complete stocks of Harvey Springs. When you order Harvey Springs for replacements, you have the assurance of getting an exact duplicate and *getting it quick.*

MADE FOR ALL THE POPULAR CARS

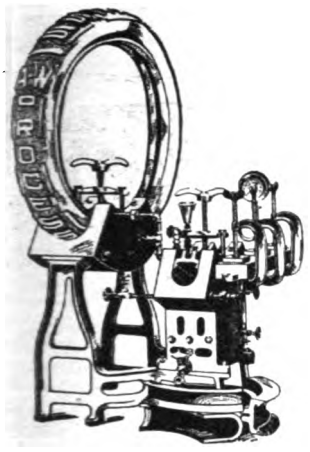
ABBOTT-DETROIT
ALTER
ALLEN
APPERSON
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BRISCOE
BUICK
CADILLAC
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COLBY
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CUNNINGHAM
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FORD
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HUDSON
HUPMOBILE
IMPERIAL
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JEFFREY
KING
KISSEL-KAR
KRIT
LEWIS
LION
LITTLE
MARATHON
MARION
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MARMON
MAXWELL
MERCER
METZ
MICHIGAN
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MONROE
NATIONAL
OAKLAND
OLDSMOBILE
OVERLAND
PACKARD
PAIGE
PATERSON
PATHFINDER
PREMIER
PULLMAN
RAMBLER
R. C. H.
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VELIE
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WARREN-DETROIT
WESCOTT
WINSTON
SPECIAL STYLES AND SIZES MADE TO ORDER PROMPTLY.

Write for Free Book:—Gives complete details about numbers and sizes for all cars—any model. Also ask for name of nearest Harvey dealer. When you need springs, insist upon having "Harvey".

HARVEY SPRING COMPANY
849 Seventeenth St., RACINE, WISCONSIN

5

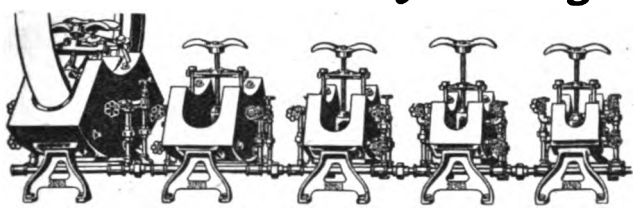
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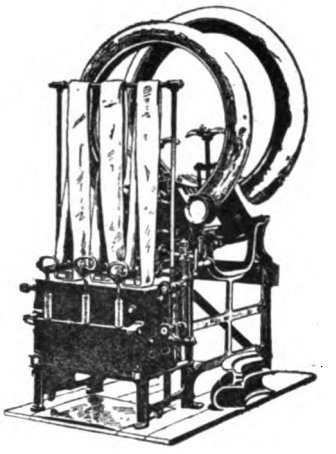


Akron-Williams

TIRE REPAIR EQUIPMENT

A Size for Every Garage





A Sweeping Endorsement!

All these Tire Manufacturers and Many Others Use and Recommend Akron-Williams Tire Repair Equipment—*could any endorsement be stronger?*

Arms Rubber Mfg. Co.	Trenton, N. J.
Arm-Grieb Rubber Co.	New York, N. Y.
Arm Tire Co.	New York, N. Y.
Alliance Tire & Rubber Co., The	Alliance, Ohio
Amazon Tire & Rubber Co., The	Akron, Ohio
American Rubber & Tire Co., The	Akron, Ohio
Batavia Rubber Co.	Batavia, N. Y.
Bowender Rubber & Tire	Rutherford, N. J.
Bucyrus Rubber Co., The	Bucyrus, Ohio
Chester Rubber Tire & Tube Co.	Chester, W. Va.
Cincinnati Rubber Mfg. Co., The	Cincinnati, Ohio
Columbia Tire & Rubber Co.	Columbiana, Ohio
Combination Rubber Mfg. Co.	Bloomfield, N. J.
Dayton Rubber Mfg. Co., The	Dayton, Ohio
Diamond Rubber Co., The	Akron, Ohio
Double Fabric Tire Co.	Auburn, Ind.
Dominion Tire Co.	Kitchener, Ont.
Dreadnaught Tire & Rubber Co.	Baltimore, Md.
Dunlop Tire & Rubber Goods Co., Ltd.	Toronto, Ont.
East Palestine Rubber Co.	East Palestine, Ohio
Empire Rubber & Tire Co.	Trenton, N. J.
Endurance Tire & Rubber Co.	New Brunswick, N. J.
Falls Rubber Co., The	Cuyahoga Falls, Ohio
Federal Rubber Co.	Cudahy, Wis.
Firestone Tire & Rubber Co.	Akron, Ohio
Fisk Rubber Co.	Chicopee Falls, Mass.
G. & J. Tire Co.	Indianapolis, Ind.
General Tire & Rubber Co.	Akron, Ohio
Giant Tire & Rubber Co.	Akron, Ohio
Globe Rubber Tire Mfg. Co.	Trenton, N. J.
Goodrich Co., B. F., The	Akron, Ohio
Goodyear Tire & Rubber Co.	Akron, Ohio
Goodyear Tire & Rubber Co. of Canada	Bowmanville, Ont.
Gordon Tire & Rubber Co.	Canton, Ohio
Gutta Percha & Rubber, Ltd.	Toronto, Ont.
Hamilton Rubber Mfg. Co.	Trenton, N. J.
Hood Rubber Co.	Watertown, Mass.
Independent Tire Co.	Guelph, Ont.
Indiana Rubber & Insulated Wire Co., The	Jonesboro, Ind.
Kansas City Tire & Rubber Co.	Kansas City, Mo.
Kelly-Springfield Tire Co.	Akron, Ohio
Knight Tire & Rubber Co.	Canton, Ohio
Kokomo Rubber Co.	Kokomo, Ind.
Lancaster Tire & Rubber Co.	Lancaster, Ohio
L. & M. Rubber Co., The	Carrollton, Ohio
Lee Tire & Rubber Co.	Conshohocken, Penna.
McClurg Rubber Co.	Coshocton, Ohio
McGraw Tire & Rubber Co., The	East Palestine, Ohio
McNaull Tire Co., The	Toledo, Ohio
Manhattan Rubber Mfg. Co.	Passaic, N. J.
Mansfield Tire & Rubber Co., The	Mansfield, Ohio
Marathon Tire & Rubber Co., Ltd., The	St. Catharines, Ont.
Marathon Tire & Rubber Co., The	Cuyahoga Falls, Ohio
Michelin Tire Co.	Milltown, N. J.
Miller Rubber Co., The	Akron, Ohio
Mohawk Rubber Co., The	Akron, Ohio
Morgan & Wright, Inc.	Detroit, Mich.
National Rubber Co.	Pottstown, Pa.
National Tire & Rubber Co., The	East Palestine, Ohio
New Jersey Car Spring & Rubber Co.	Jersey City, N. J.
Norwalk Tire & Rubber Co.	Norwalk, Conn.
Pennsylvania Rubber Co.	Jeannette, Pa.
Perfection Tire & Rubber Co.	Fort Madison, Iowa
Pharis Tire & Rubber Co.	Newark, Ohio
Portage Rubber Co., The	Barberton, Ohio
Quaker City Rubber Co.	Philadelphia, Pa.
Racine Rubber Co.	Racine, Wis.
Republic Rubber Co., The	Youngstown, Ohio
Rubber Products Co., The	Barberton, Ohio
Rubber Step Mfg. Co.	Exeter, N. H.
Rutherford Rubber Co.	Rutherford, N. J.
Seamless Rubber Co., The	New Haven, Conn.
Southern Tire & Rubber Co.	Augusta, Ga.
Standard Tire & Rubber Mfg. Co., The	Cleveland, Ohio
Swinehart Tire & Rubber Co., The	Akron, Ohio
Ten Broeck Tyre Co.	Louisville, Ky.
Thermoid Rubber Co.	Trenton, N. J.
United States Tire Co.	New York, N. Y.
Victor Rubber Co., The	Springfield, Ohio

Do Tire Repairing the Approved Way —with Akron-Williams Equipment

Three million cars are wearing out tires and tubes every day; motorists are spending over a hundred million dollars this year to keep their tires repaired; and the business is growing by leaps and bounds. Scarcely any other line offers such large and sure profits on such a small investment.

Start a Tire repair shop or add vulcanizing as part of your garage or supply business.

Success or failure depends upon your equipment. Don't risk time and money—get Akron-Williams equipment, and succeed **right from the start. We do not take other equipment in exchange.**

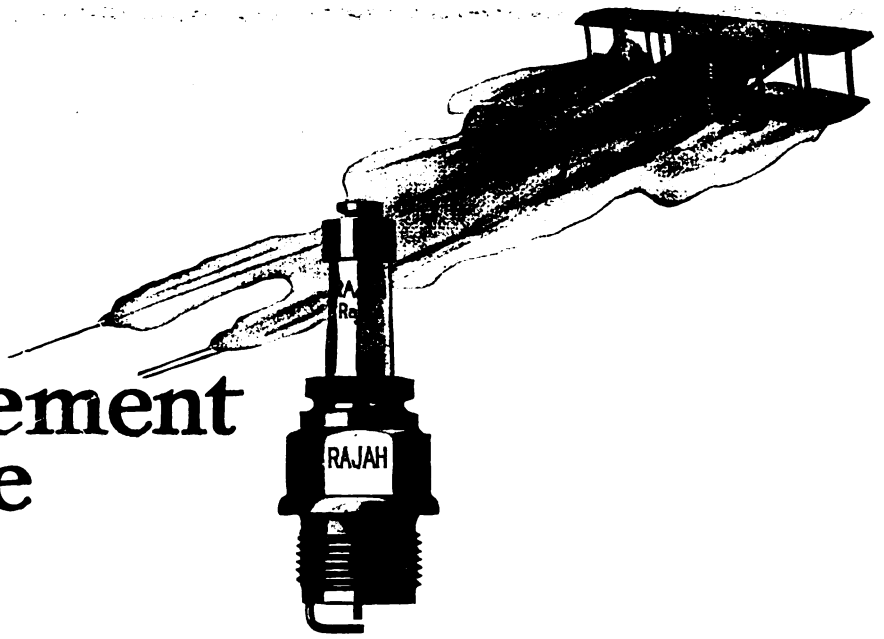
Don't wait for someone else to start in ahead of you—**start first.** Write at once for Free Booklet on tire repairing and Catalog of the latest and most approved equipment.

THE WILLIAMS FOUNDRY & MACHINE COMPANY

GLENDALE STREET **AKRON, OHIO**

Exclusive Distributors for California: The Waterhouse and Lester Co., San Francisco

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An Endorsement from the Sky

Aviators trust their lives to the sure and steady ignition of Rajah Spark Plugs for the same reason that dealers can safely trust their profits to Rajah's sure and steady sales.

That reason is genuine quality. Wherever exceptional demands on a plug are required—in airplanes, in grueling racing contests, in heart-breaking hill climbs—there you will find

RAJAH *SPARK PLUGS*

Wherever the average owner of the average car wants exceptional ignition (and they all do) there you can sell Rajah plugs with absolute satisfaction to your customers and a tidy profit for yourself.

Rajah plugs have achieved an enviable reputation during the past 16 years. Now we are making that reputation known through advertising to the public. We do not expect this advertising to start a Rajah stampede, but we do propose to keep it up until every car owner knows the Rajah and what it promises to do for every car it goes into.

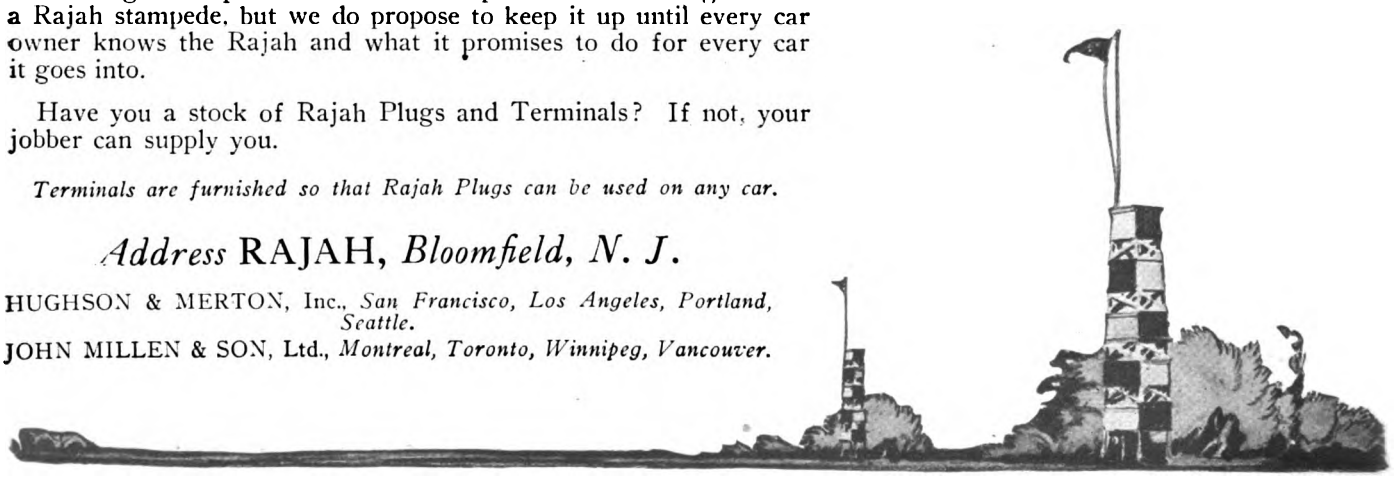
Have you a stock of Rajah Plugs and Terminals? If not, your jobber can supply you.

Terminals are furnished so that Rajah Plugs can be used on any car.

Address RAJAH, *Bloomfield, N. J.*

HUGHSON & MERTON, Inc., *San Francisco, Los Angeles, Portland, Seattle.*

JOHN MILLEN & SON, Ltd., *Montreal, Toronto, Winnipeg, Vancouver.*



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U·S· TWO-STAGE AIR COMPRESSOR U·S·

Consider These Valuable Advantages

Only Two of the Fourteen Superior and Exclusive Features of U. S. Two Stage Air Compressors

Two Stage Feature.—A large diameter **low pressure piston** compresses air to 40 pounds pressure and then delivers it to a small diameter **high pressure piston,** which in turn forces the air into the tank. This gives the greatest possible efficiency, saves power and affords greatest durability.

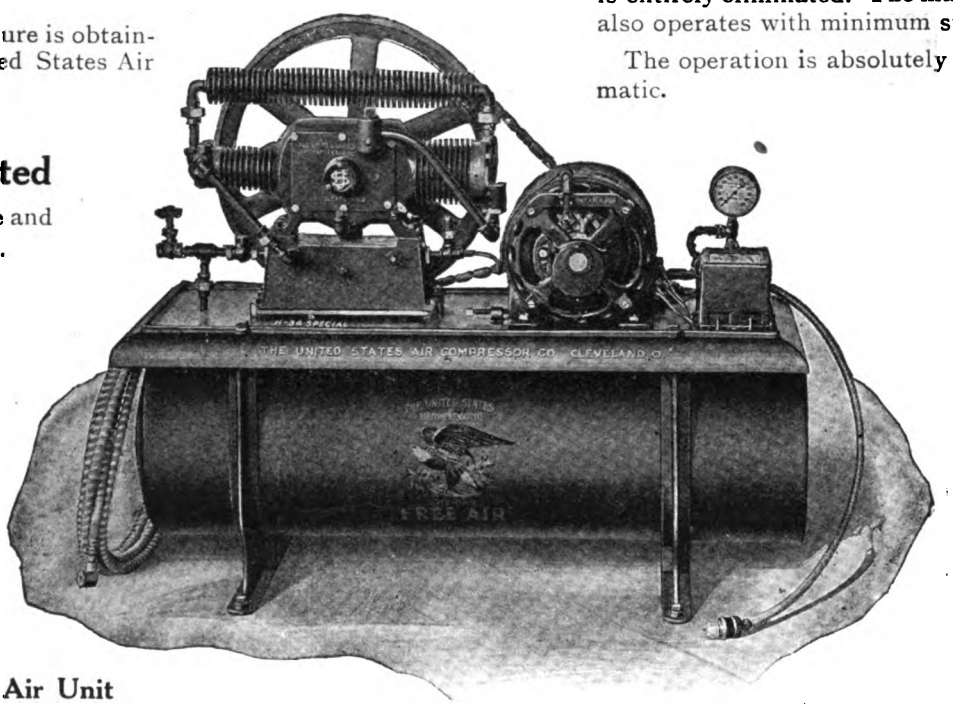
The Two Stage Feature is obtainable only in the United States Air Compressor.

The Automatic Pressure Release.—This device, in conjunction with the auxiliary starting tank, permits the machine to **start against no pressure** and attain full momentum before picking up the entire load. Due to this the cause of burned out motors is entirely eliminated. The machine also operates with minimum strain.

The operation is absolutely automatic.

Jobbers Wanted

to sell this complete and unequalled line.



The U. S. Two Stage De Luxe Automatic Air Unit

THESE two features distinguish United States Two Stage Air Compressors from all others and have been important factors in establishing the position of unprecedented favor in which these machines are held.

In addition to these, however, there are 12 other superior and exclusive features, making U. S. Two Stage Compressors without question the finest outfits in existence.

These machines are made in a range of sizes and capacities to meet every requirement. Literature describing them, in the most understandable manner possible, will be sent upon request, and every prospective purchaser should familiarize himself with these machines before ordering an outfit.

We also manufacture a complete line of Single Stage Compressors to meet the demand for smaller outfits, of lower pressure than our Two Stage Machine.

These outfits do not contain all the features of our Two Stage Air Compressors, but conform to the high standard of quality of material and workmanship adhered to in all United States Products.

We recommend them as the most efficient single stage compressors on the market A circular is published showing this complete line, which **comprises a compressor for every garage, regardless of size.**

UNITED STATES AIR COMPRESSOR CO., CLEVELAND, OHIO
Gentlemen:—Send me your catalog and circular describing the compressor as advertised in Automobile Dealer and Repairer.

Name.....

City.....

My Jobber is.....

U·S· THE UNITED STATES AIR COMPRESSOR CO U·S·

CARNEGIE AVE., CLEVELAND, OHIO.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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586.8 Miles

Through the Heart of Chicago in 24 Hours

A Typical Chalmers Performance

At 12 noon, Monday, March 26, a stock Chalmers seven-passenger touring car with first and second gears removed, was started north on Michigan Boulevard through Chicago traffic.

At noon, Tuesday, March 27, the Chalmers was stopped at the starting point. It had gone 586.8 miles through Chicago's densest traffic. The motor had never been stopped. Nothing but high gear was used.

To prove conclusively Chalmers flexibility on high gear, the low and intermediate gears were removed from the transmission.

The car was a standard Chalmers seven-passenger touring model, complete with standard body, top and full equipment.

An average of slightly over 14 miles per gallon of gasoline was attained, an excellent example of Chalmers economy.

586.8 miles, through the famous congested Chicago "loop" district, is a wonderful feat. This performance on high gear is even more wonderful. It is without an equal.

It is an endorsement of the motor. It proves Chalmers reliability. It demonstrates Chalmers cooling. It shows Chalmers flexibility and perfect control. It is a new achievement.

A condensed summary of the signed certificate issued by the Contest Board of the American Automobile Association, under whose supervision the test was made, is reproduced below.

THIS IS TO CERTIFY that the Chalmers seven-passenger car above mentioned was a fully equipped stock car. It was driven for 24 hours through Chicago traffic. Only high gear was used. The motor was never stopped during the run. The mileage obtained was 586.8 miles. The gasoline consumption was an average of slightly over 14 miles per gallon.

Chairman Contest Board, American Automobile Association.

Some Other Chalmers Achievements

Chicago to New York

On June 7, 1916, a Chalmers stock car set a new record between Chicago and New York, making the run of 1047 miles in 31 hours.

Giant's Despair Mountain Climb

On October 6, 1916, a Chalmers Special captured the free-for-all event at the Wilkes-Barre hill climb on Giant's Despair mountain, winning the $1,000 Hollenbeck Trophy.

Wins at Pike's Peak

August 11, 1916, a Chalmers Special carried off first honors in the 230 cubic inch class on the terrific grades of Pike's Peak in Colorado.

Detroit to Indianapolis

On June 12, 1916, the Chalmers set a new pace over the roads between Detroit and Indianapolis, 305 miles, making the trip in 8 hours, 23 minutes.

Atlanta to Chattanooga

June 24, 1916, a Chalmers lowered the best previous time between Atlanta and Chattanooga. The distance of 125 miles was covered in 3 hours, 53 minutes. This is faster than the time of the Dixie Flyer, the fastest railroad train of the south.

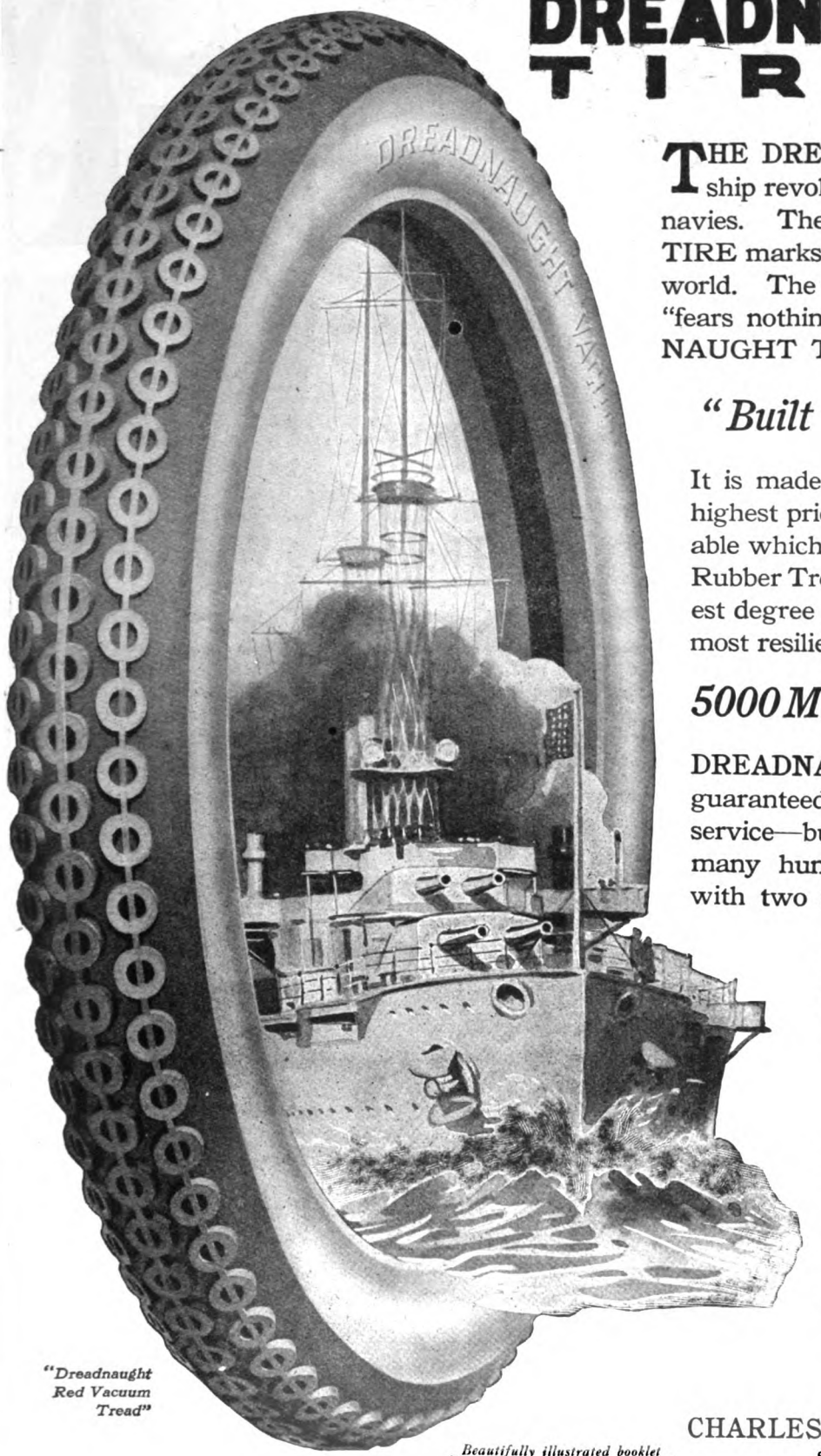
Touring Car, 7-passenger	$1350	Touring Sedan, 7-passenger	$1850	Limousine, 7-passenger	$2550
Touring Car, 5-passenger	1250	Roadster, 3-passenger	1250	Town Car, 7-passenger	2550

(All prices f.o.b Detroit and subject to change without notice)

CHALMERS MOTOR COMPANY
DETROIT, MICHIGAN

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DREADNAUGHT TIRES



"Dreadnaught Red Vacuum Tread"

THE DREADNAUGHT Battleship revolutionized the world's navies. The DREADNAUGHT TIRE marks an epoch in the tire world. The Dreadnaught at sea "fears nothing." The DREADNAUGHT TIRE on the road is

"Built to Conquer"

It is made of the toughest and highest priced materials obtainable which with the famous Red Rubber Tread renders the greatest degree of durability with utmost resiliency.

5000 Miles Guaranteed

DREADNAUGHT TIRES are guaranteed for 5,000 miles of service—but have a reserve of many hundreds more. Made with two attractive red rubber treads — "Vacuum" Tread which is anti-skid, and "Ribbed" Tread.

MANUFACTURED BY
The Dreadnaught Tire & Rubber Co.
Baltimore, Maryland

DEALERS—We have excellent openings for reliable dealers. Write or wire for for our liberal proposition.

Beautifully illustrated booklet "The Evolution of the Battleship" by Harry McDonald Spencer, sent free on request.

CHARLES F. U. KELLY, INC.
Sales Department
1834 Broadway, New York

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DEALERS

When Your Customers Overhaul This Spring Advise Them to Equip Their Cars With

Quality Snap Rings

Explain to them how Quality Snap Rings cut down the cost of upkeep and eliminate endless annoyances. How they mean greater fuel economy. More power. Easier starting. Less carbon deposits in cylinders. Smaller repair bills. How they save their initial cost many times over in the savings they make and the added pleasures the owner gets from his car.

QUALITY
SNAP RINGS

50,000 Rings a Day

We are the largest individual makers of piston rings in the world. We are producing over 50,000 rings a day for every working day in the year.

No better proof of the absolute accuracy and service of these rings could be given than the fact that today more high grade automobiles leave their factory with Quality Snap Rings as a part of their standard equipment than any other make of piston rings.

Get This Business For Yourself

Live dealers everywhere are realizing the opportunities these piston rings offer them.

A satisfied customer is the best advertisement there is. And every motor car owner whose car is equipped with Quality Snap Rings is a satisfied user. One who recommends, not only these rings, but your service as well.

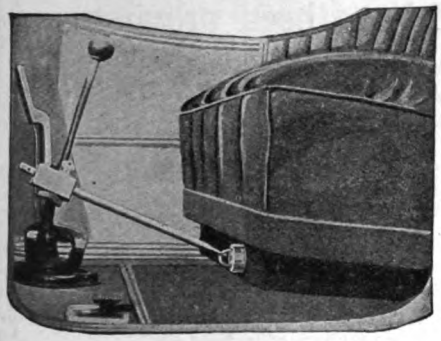
All of which means bigger business and greater profits for you. Write us today for complete information. Address Dept. 123.

THE PISTON RING CO., MUSKEGON, MICH.

Makers Also of Sta-Tite Piston Rings

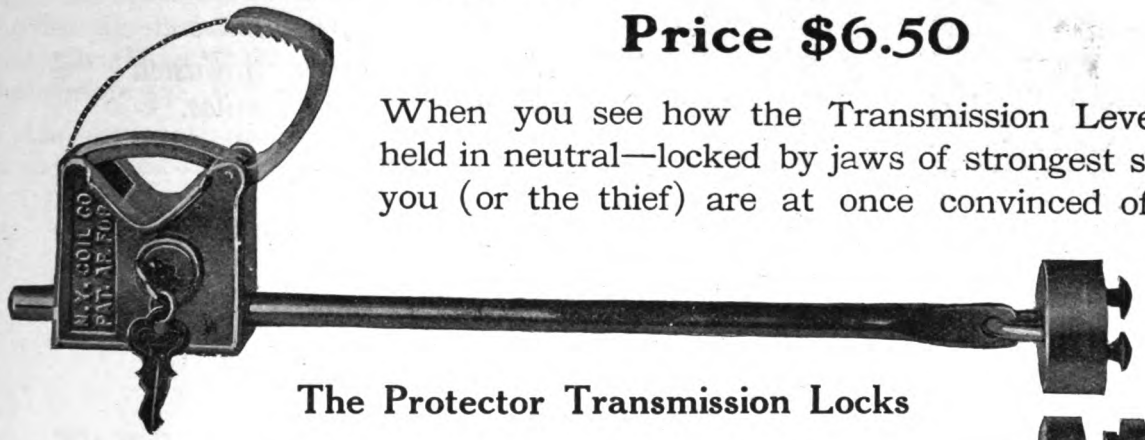
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THE PROTECTOR TRANSMISSION LOCK FOR ALL CARS



Is the lock you have been waiting for—because—it is the *one* lock that really makes your car absolutely "Thief-Proof"—at the same time complying fully with traffic stipulations.

Price $6.50



When you see how the Transmission Lever is held in neutral—locked by jaws of strongest steel, you (or the thief) are at once convinced of its

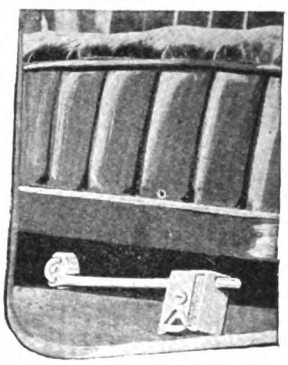
The Protector Transmission Locks

great strength, security and impossibility of operating car until released with proper key (no two of which are alike).



Showing Bolt and Nut Protection

It is put on and off in an instant. Folds against seat panel, when not in use. No drilling, weakening or marring of lever.



Folded Against Seat Panel

Mr. Dealer:—One Model Adjusts to All Cars

(Except Fords)

You do not have to create a demand. Owners are anxious to buy. Order a sample—*to-day*—of the year's biggest seller.

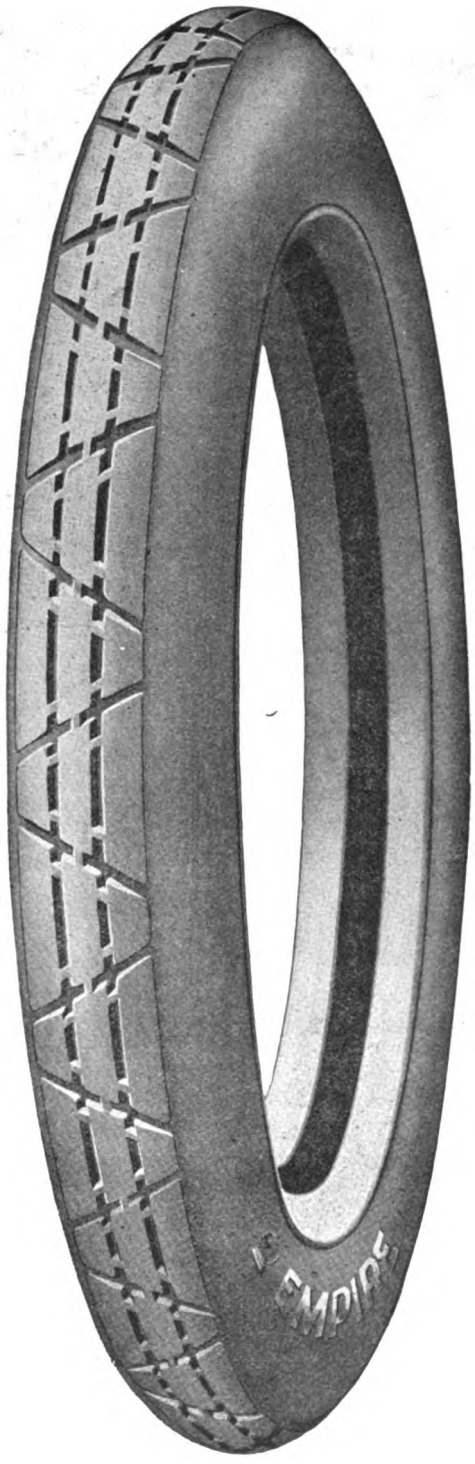
New York Coil Company

338-340 Pearl Street **New York, N. Y.**

Mid-West Distributors

GRAY-HEATH COMPANY, 1440 Michigan Ave., Chicago, Ill.

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Just what do we mean by extra miles—and extra profits?

1. Extra Miles.

For years we have been proving our ability to put extra miles into rubber. Now we have discovered how to put extra miles into fabric. Our new exclusive "equal-tension" process gets rid of the weak spots in the fabric that cause 53% of all blow-outs.

Empire Red Tires are adjusted on a basis of 5,000 miles.
Empire Gray Tires are adjusted on a basis of 4,000 miles.

2. Extra Profits.

You can get a bigger profit *per tire* on Empires than on any other in its class. This is a positive statement. Ask for our prices and see.

Empire Tires

are being widely advertised. They get you more trade. They hold trade. They make more money for you.

Let us prove these statements.

Write or wire today for our proposition.

EMPIRE RUBBER AND TIRE COMPANY

Home Office and Factory, Trenton, N. J.

BRANCHES AND AGENCIES:

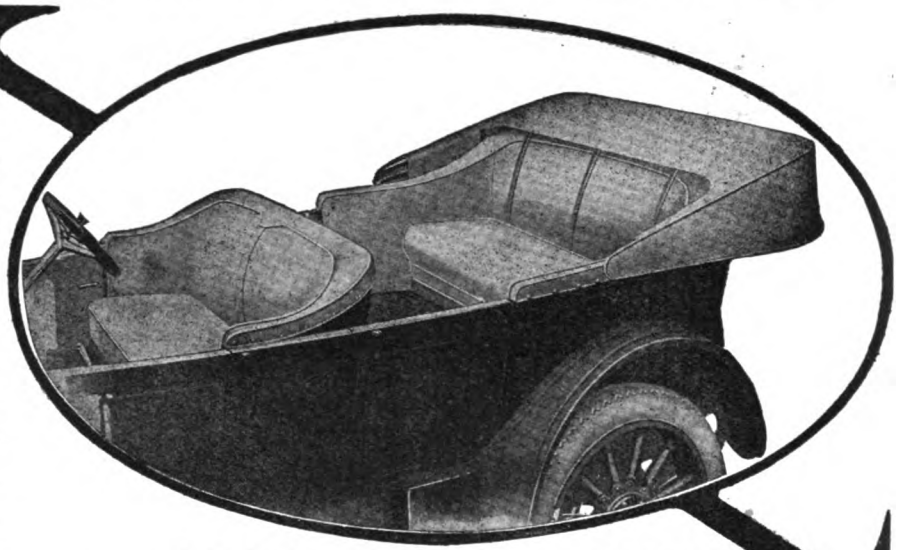
New York City	Philadelphia	Pittsburgh	Los Angeles	Minneapolis
Boston	Buffalo	Chicago	Detroit	Newark

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One Quick Seller Beats A Dozen Slow Movers!

That's a self-evident truth; you know it, Mr. Accessory Dealer, and so does every other wide-awake business man. Goods on the shelf—shop-worn and dusty—have ruined many a promising venture; but a thing or a line which fills a popular need or tickles a popular fancy—never!

Gordon Seat Covers just now loom big in the estimation of up-to-the-minute motorists. Always popular, their bright, cool beauty, contrasted with the dull dinginess of uncovered motor cushions, is fast making them more so.



A Gordon-Dressed Car is a Pleasure to the Eyes

And national advertising is helping the good work on. Thousands of motorists who have endured soiled motor clothes as a necessary part of motor expense are reading about

GORDON Seat Covers
TAILORED TO FIT

in leading periodicals of National circulation, and a great increase in local sales of Gordon Seat Covers is the result.

In view of this and the great previous prestige of the Gordon name, it seems clearly safe to predict a still further increase of Gordon business through local dealers. And here, as in other cases, the one who first lays violent hands on Opportunity will gather the cream of the business.

But what's the use saying more! This is a clear-cut business proposition for business men to consider. Millions of motorists will want—yes! are already wanting—millions of dollars worth of accessories and supplies; and Gordon Seat Covers, Easy-On Tire Covers, Radiator Robes, etc., will figure largely in every deal.

Think what this will mean in cold dollars and cents to the accessory trade—to you if you stock the Gordon line and ***grow*** with the Gordon business.

An old saying reads, "The early bird catches the worm"—why not be the early bird in your locality?

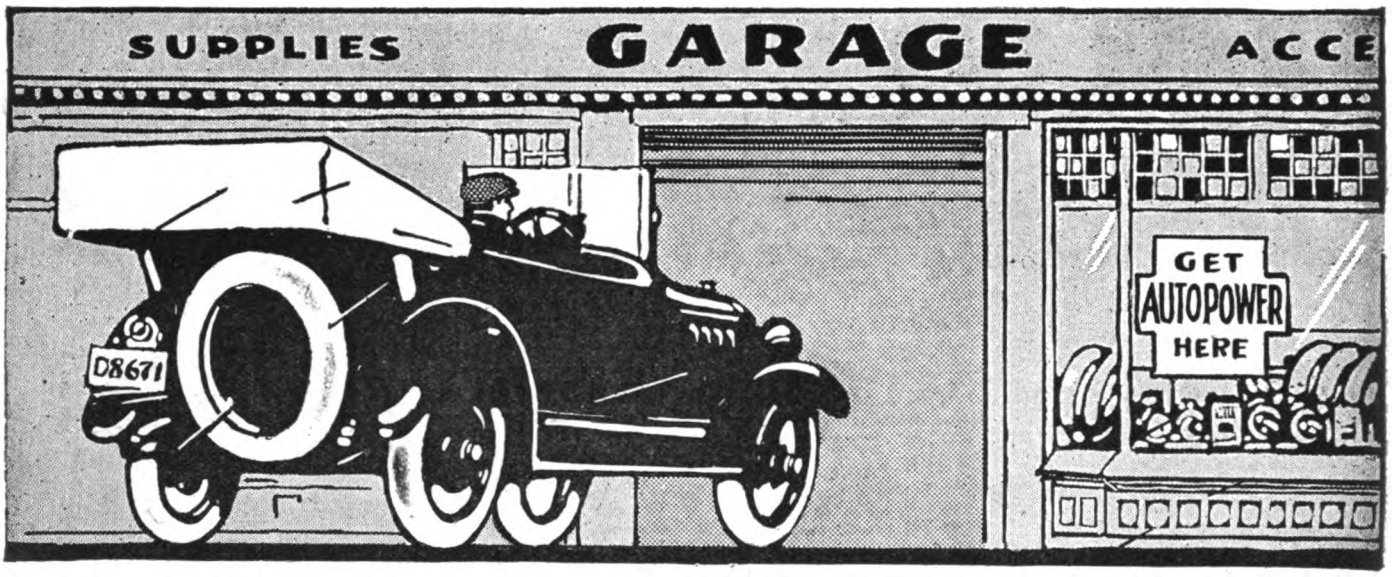


Gordon Easy-on Tire Covers are actual Tire Insurance

THE J. P. GORDON COMPANY

306 NORTH FOURTH STREET COLUMBUS, OHIO

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Turn Carbon Into Dollars

At one stroke you can make a customer and strong recommender of the autoist who is troubled with carbon in the cylinders of his car. And incidentally you make a good, healthy profit with very little effort. This is not only well worth your attention but it's worth—in actual dollars and cents—your *action—now!*

AUTOPOWER
THE REAL CARBON REMOVER

It is a *demonstrated* carbon remover. Many large concerns such as Marshall Field, Simmons Hardware, use it and continue to use it because they get results. Poured into the gasoline tank, Autopower attacks the carbon right away and dissolves it.

The cylinders and pistons are left clean and full power is restored. Moreover, Autopower is a resale proposition. After it has cleaned out carbon your customer will be enthusiastic and use Autopower to *keep* carbon away. A quart—$1.50—is good for 1200 carbon-free miles. Neither you nor your customer take the slightest risk—Autopower is guaranteed and the guarantee is backed up by a sight refund draft for the purchase price. If there is the slighest cause for dissatisfaction, the draft can be cashed at any bank.

Autopower can't damage the metal, upholstery or finish.

Take advantage of this quick seller—we are just starting extensive advertising, and will supply you with folders bearing your own name. Send in the coupon and get full details of our offer to dealers.

CRYSTAL OIL & PAINT CO.
AUTOPOWER DIVISION

GENTLEMEN:—Please send me literature describing Autopower and your Bank Draft Refund Guarantee.

I enclose $1.50 for trial can of Autopower, and if not satisfied will cash your draft and secure refund.

Name.....

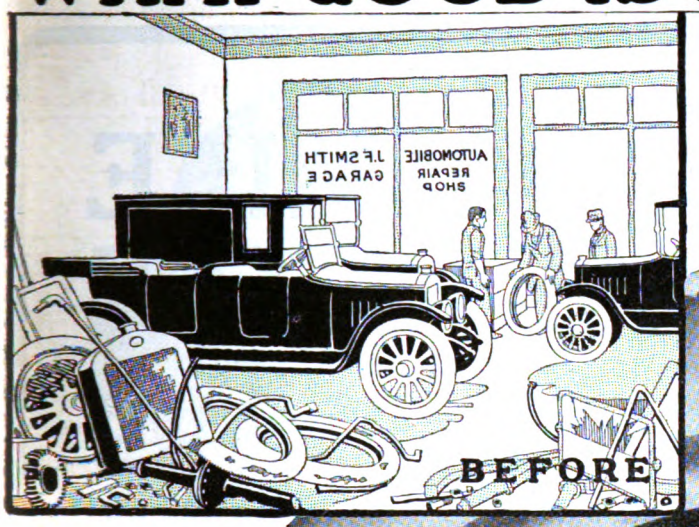
Address.....

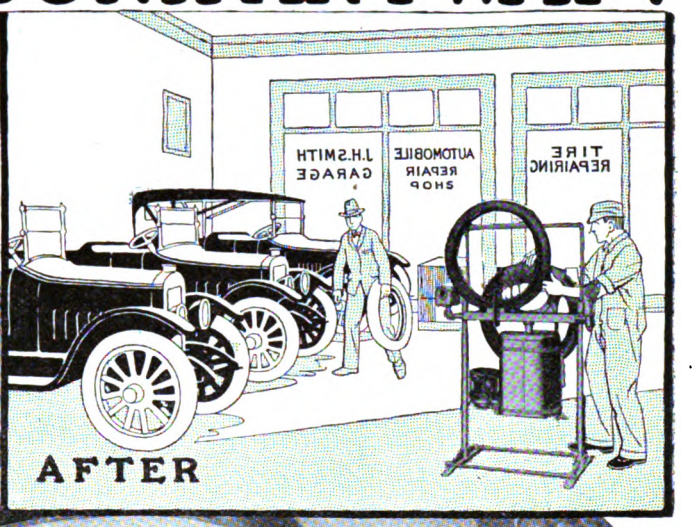
Crystal Oil & Paint Company
Autopower Division
CLEVELAND - - OHIO



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WHAT GOOD IS JUNK ANYWAY?





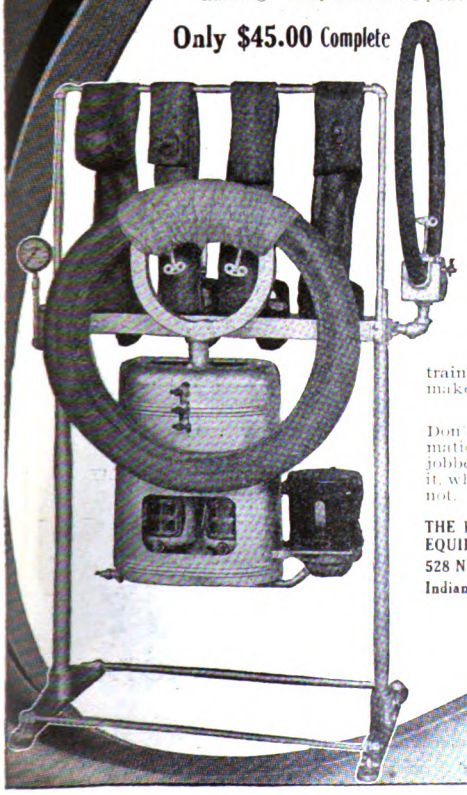
Do you pay rent on the space junk occupies? Better a thousand times to sell the metal for old iron—the rubber for old rubber—and utilize the space to produce dollars.

To be efficient—to make profit—you must use every facility at your command. You cannot waste space any more than you waste your time—it's all money. Better turn the junk into cash and get one of

HAYWOOD'S Model D.B. VULCANIZING PLANTS

The plant will earn every dollar it costs almost any week—every week, if you have the right push and energy. Every customer whose car you now store will let you repair his tires—keep them in order to increase the mileage 25% to 50%. Could you want a better opportunity? Men are getting rich in the garage business, who understand the game—who permit no leakage—no waste of space—who use every bit of energy for dollar making. Why shouldn't you? Every owner who has tried it thought he had no room, but there **was** room, and more money in his business, which we helped him to find.

Only $45.00 Complete



A WONDERFUL PLANT

This Model D-B Vulcanizing Plant is small, compact, especially designed for garages. It will handle almost any kind of repair on casings or tubes.

THE PRICE IS LOW

The price is extremely low - only $45. It is convenient quick—positive—certain—and will earn more money than any other thing you can put in its space.

THE PROFITS BIG

There is almost no limit to the profits it all depends upon the time you can give it—we teach you the whole business when you buy a machine. Its operation is simplicity itself anyone can operate it without any special training—our splendid book of instructions makes it all perfectly plain and clear.

WRITE TODAY

Don't put it off—get complete information and name of our nearest jobber. You should know about it, whether you buy a plant or not. Fill out the coupon.

THE HAYWOOD TIRE & EQUIPMENT CO.
528 N. Capitol Ave.
Indianapolis, Ind.

A BUSINESS OPPORTUNITY COUPON

MR. M. HAYWOOD, Personal
528 N. Capitol Ave. Indianapolis, Ind.

Dear Sir—Please send full details of the Haywood Model D-B Vulcanizing Plant.

NAME.....

ADDRESS.....

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10,000 MILE GUARANTEE Backs This Tire

Every Brictson Pneumatic Tire is sold under a specific 10,000 miles written service guarantee. This guarantee is the ***longest*** and the ***strongest*** ever put behind a pneumatic tire. It is the result of ten years' experience and is a positive protection to every purchaser. Try Brictson Tires on your car at our risk and learn how to cut down your up-keep costs.

"ABSOLUTELY PUNCTURE PROOF"

Brictson Tires are puncture-proof, blowout proof, skid proof, rut proof, rim cut proof, oil proof and gasoline proof. Wonderful resiliency and easy riding qualities as well as economy commend them to car owners. The service and satisfaction they give is rapidly extending their sale.

Retread Your Present Tires

If your present tires are new you should by all means apply Brictson Treads, or tire protectors, thereby making them puncture proof—rut proof—rim-cut proof—gasoline proof and non-skid.

If your present tires have been used and the rubber tread has been worn off or thin, you may get additional service by applying Brictson Treads, also making them puncture proof, oil proof, rut proof, gasoline proof and non-skid.

Free Trial Offer

To convince you that Brictson Tires will give you satisfaction we will let you try them on your car at our expense. Write today for conditions of this Free Trial Offer and full information about Brictson Tires and Brictson Treads.

THE BRICTSON MFG. COMPANY

157 Brictson Building **BROOKINGS, SOUTH DAKOTA**

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There's not a genuine in the lot

A garagemen took this collection of piston rings out of his customers' motors Each and every ring was bought as a LEAK-PROOF.

That shows how the name LEAK-PROOF is being traded on—how owners and dealers are fooled into accepting imitations, thinking they are getting the Genuine.

That proves how necessary it is for you, as an expert repair or garageman, to know the identifying features of the Genuine LEAK-PROOF Piston Ring, made only by the McQuay-Norris Manufacturing Company:

Two concentric sections, — the secret of equal bearing.
Angle-to-angle interlock, — the secret of strength.
Accurate finish, — the secret of perfect fit.
Special gray iron, — the secret of durability.

Send for This *Free* Book.

"To Have and To Hold Power" It will tell you all about the Genuine McQuay-Norris LEAK-PROOF Piston Ring Will save you and your customers a good deal of money, time and trouble. *Write Dept. R.*

Manufactured by

McQUAY-NORRIS MFG. CO., St. Louis, U. S. A.

BRANCH OFFICES:

New York, Pittsburgh, Cincinnati, St. Paul, Chicago, San Francisco, Seattle, Atlanta, Dallas, Philadelphia, Los Angeles, Kansas City, Denver

Canadian Factory: W. H. BANFIELD & SONS, Ltd., 372 Pape Avenue, Toronto.

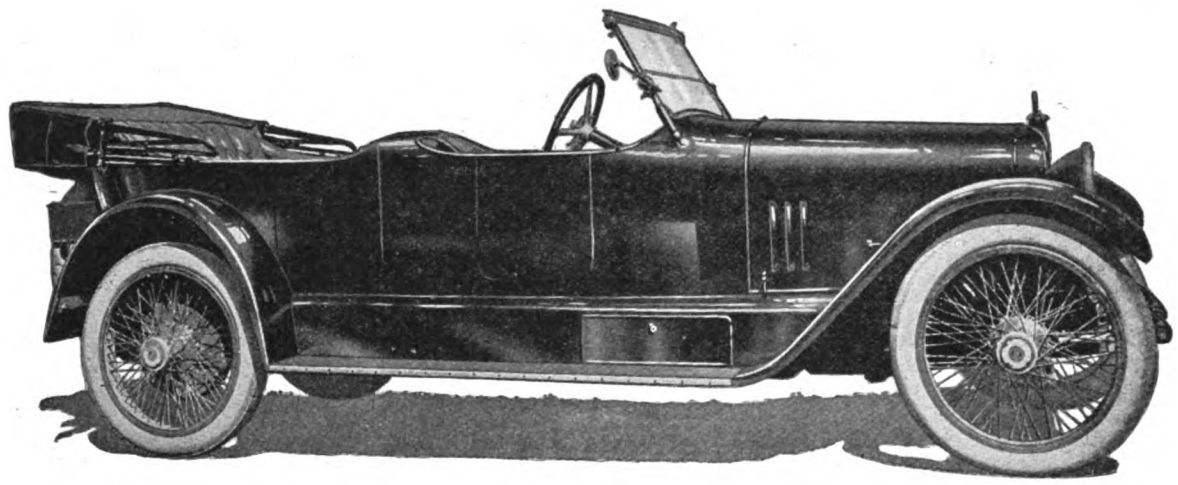


-the genuine

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

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The MERCER Motor Cars Maintain Their Standard



In spite of the abnormal conditions existing in the material market during the past few months, the Mercer cars this year are absolutely held to the high standards of construction for which Mercer cars have long been recognized. No compromise is allowed *anywhere*.

As always heretofore, they are

Painted and Varnished With Valentine's Materials

No Mercer car is built for less than $3,250. Naturally the Mercer people want the best colors they can get, and the finest varnishes. If more money would secure finer, they would have them. The fact that nothing but Valentine's materials go on these "Ideal" cars is worth the consideration of the garage paint-shop.

Contrary to the opinion quite generally held by painters who *do not use* Valentine's, it is economical to run a Valentine paint-shop.

Jobs come out right the first time and do not have to be repainted, for one thing.

Send for our book, "*Automobile Painting Systems.*"

VALENTINE & COMPANY

Established 1832

Manufacturers of High-grade Varnishes and Colors

456 Fourth Avenue : : : : : New York

343 So. Dearborn Street, Chicago **74 Pearl Street, Boston**

TRADE VALENTINES VARNISH MARK

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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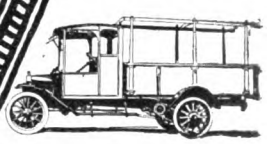
Dealers Can Bank on a Sure, Steady Consistent Income

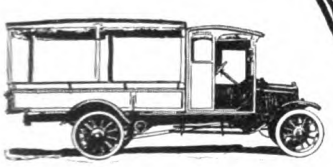
Any dealer who *is* a dealer can make a big success with the Dearborn One-Ton Truck Unit. No dealer need look far for all the good, live, practically sure Dearborn prospects he can take care of. Manufacturers, farmers, merchants, expressmen, lumber dealers, contractors, etc., in *your own locality* will buy the Dearborn One-Ton Truck Unit when you show them its remarkable economy and *unquestionable superiority*. Dearborn prospects will not pay $1500—the ordinary market price for a one-ton truck—the Dearborn Truck Unit (costing $350) combined with a Ford chassis, makes this unnecessary. The Dearborn gives all the service and is more economical to operate than any $1500 one-ton truck. It costs less to operate than a team and wagon and does four times the work. There is also a large field for Dearborn sales among big truck fleet owners.

$350 and a Ford, New or Old, Make a

FORD-DEARBORN One Ton Truck

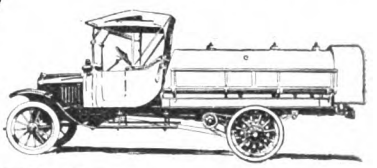










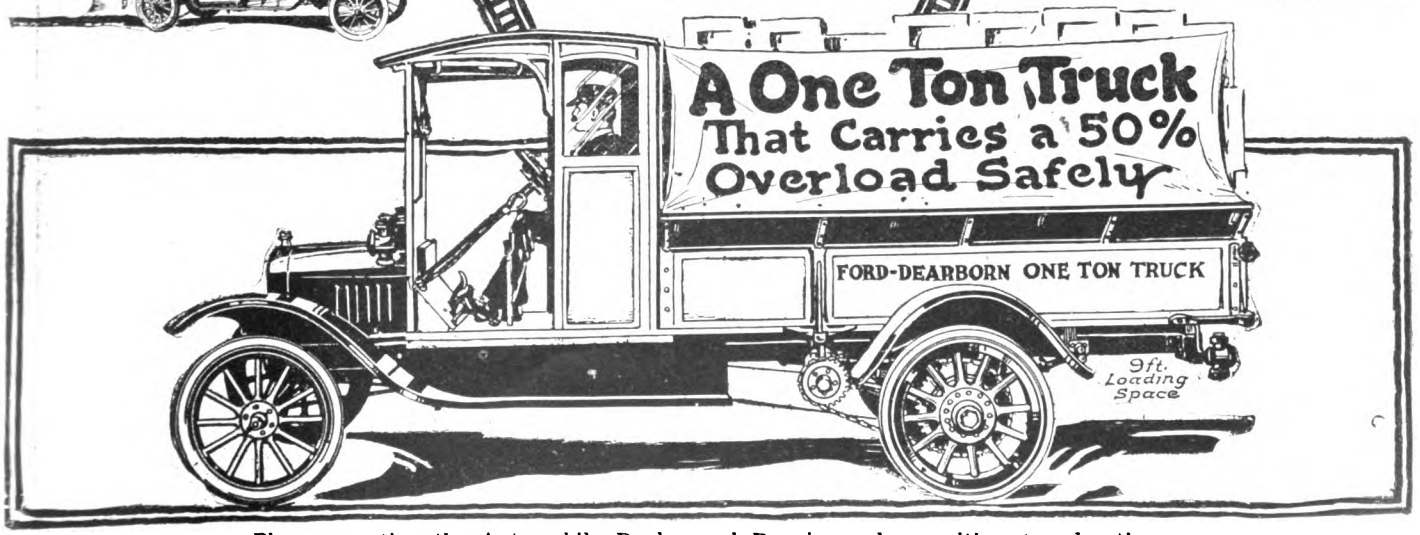


There isn't a weak point about the Dearborn Truck Unit. It is durable, sturdy, honest—every ounce of it. We guarantee its superiority. The Dearborn Truck Company is an established *manufacturing* concern—*not* a stock selling organization.

While the Dearborn Truck Unit is far more staunch and sturdy than others, it is very quickly and easily attached to the Ford chassis. Carries half a ton overload easily; 90% of load carried on sturdy rear axle and heavy truck wheels; full 9 ft. loading space; heavy artillery type wheels with guaranteed hickory spokes and felloes; solid rubber tires; standard tread (same as Ford front wheels); Baldwin roller chains and Baldwin steel sprockets. *All materials used in the Dearborn Unit are of first quality.*

You can make money with the Dearborn. Get the Dearborn Dealers Proposition. Write today

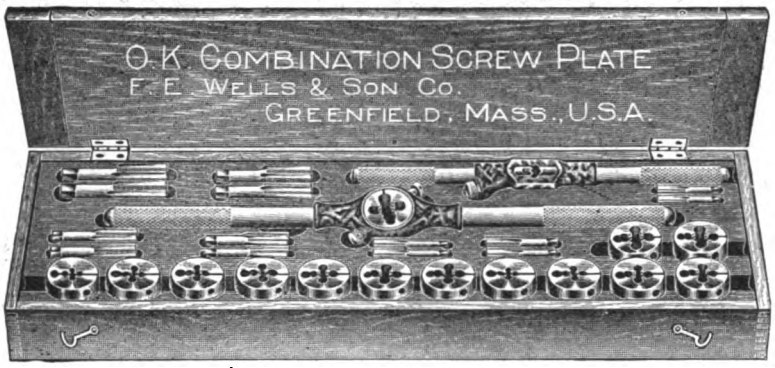
DEARBORN TRUCK CO.
1252 South Campbell Avenue
Chicago, Ill.



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O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

1/4[20], 5/16[18], 3/8[16], 7/16[14], 1/2[13], 5/8[11], 3/4[10], U. S. Standard

1/4[28], 5/16[24], 3/8[24], 7/16[20], 1/2[20], 5/8[18], 3/4[16], S. A. E. Standard

LIST PRICE — $20.00

This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies. This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

F. E. Wells & Son Company

Greenfield, Massachusetts

Two Sales Instead Of One

Don't be satisfied with selling a man a bumper for the ***front*** of his car. Sell him two—one for the front and also the rear—in most cases it's just as easy. For every owner knows that it's important to protect his car from traffic both ways.

Double your sales with Gemco Bumpers. Other dealers are doing it. You can too. Write to your jobber or direct to us for discounts and prices.

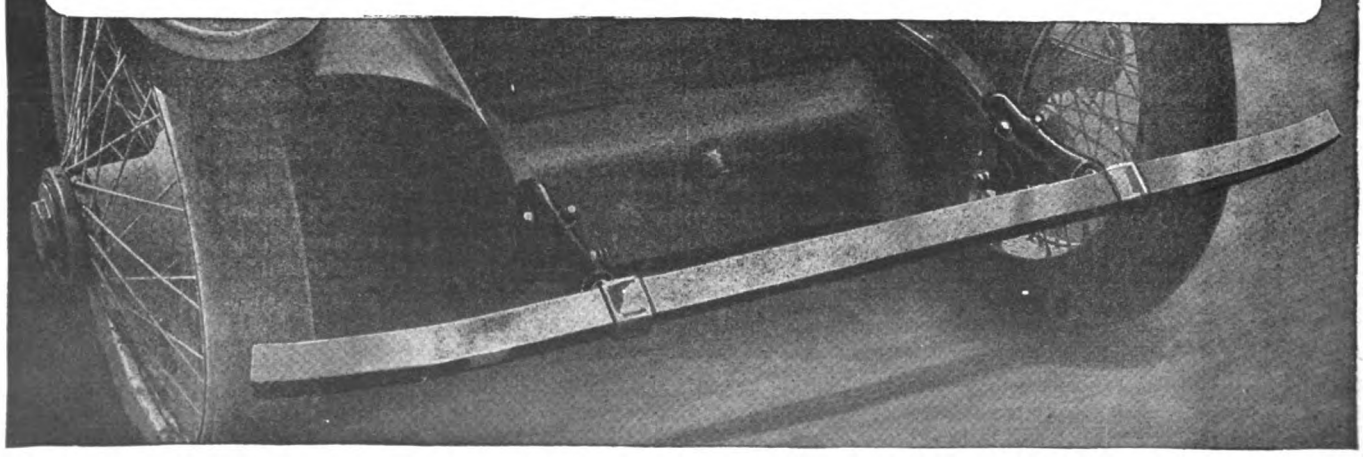
Gemco MILWAUKEE TRADE MARK

END THRUST BUMPERS

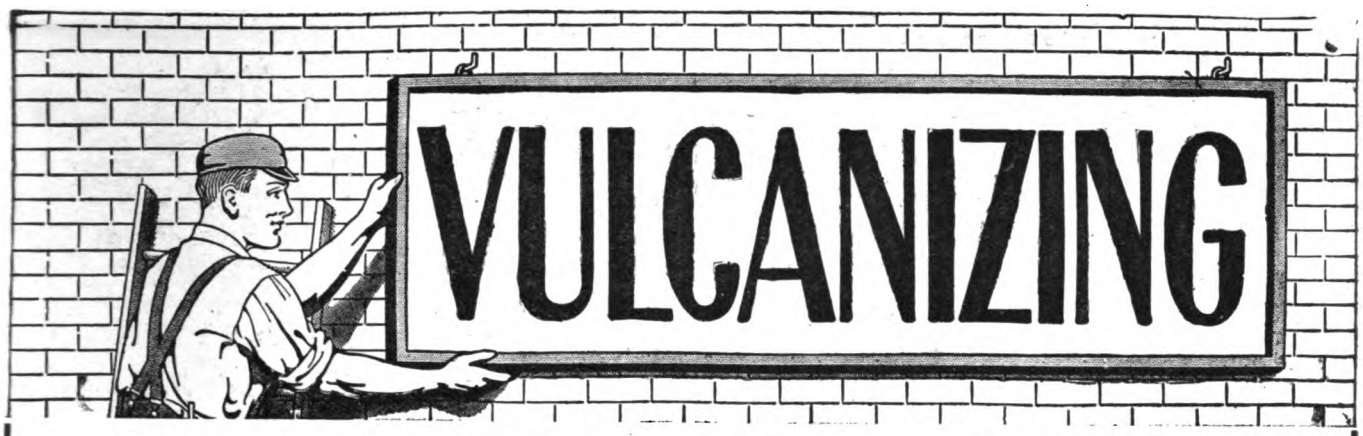
fit all cars. Furnished in diamond or channel bars.

GEMCO MFG. CO., - - 656 So. Pierce St., MILWAUKEE, WIS.

POPULAR AUTOMOBILE ACCESSORIES



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How to Make Bigger Money

Every one of your customers has tire repairing to be done right along. It is a simple matter for you to get this business. Half your problem is already solved. You have the customers and a place of business. Your overhead is fixed. You have workmen that can repair tires as well as they can do any other kind of repairing.

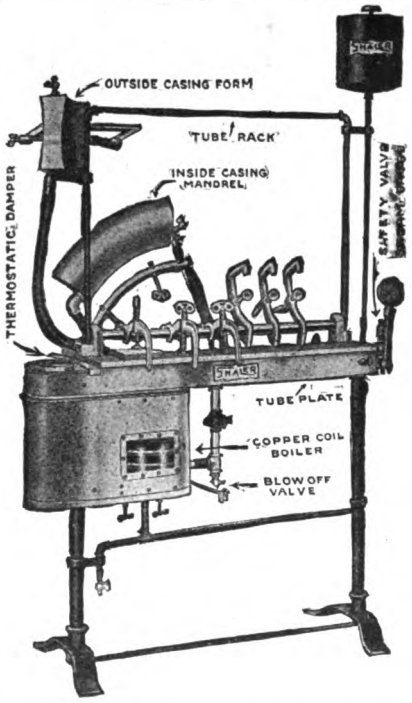
All you need now to get the tire repair profits is a vulcanizer, an economical, simple, inexpensive outfit that will enable your workmen to do every practicable kind of tire work perfectly and at a profit to you. Shaler Vulcanizers fill these requirements perfectly. Casing repairs are made with half the cost of time and material required by old methods. The Wrapped Tread Method is so simple that anyone can understand it. The initial cost of the vulcanizer and its cost of operation are only a fraction of the cost of other equipment that can neither do more work nor make as good repairs.

Resolve now to get the profits on your customers' tire repairs. Send the coupon today for our new 1917 catalog, the most complete vulcanizer catalog ever issued.

SHALER

Vulcanizing Plant $65

Steam heated. Price subject to trade discount.



Repairs 200 tubes and a dozen cases daily. Temperature controlled automatically. Heats in 25 minutes—needs no regulating. Casings repaired by approved Wrapped Tread Method—no airbags.

No other guaranteed steam vulcanizer at near the same price has so great a capacity, heats so quickly, or operates so simply.

Widely used by the United States and foreign governments. Standard equipment in the majority of good repair shops. The only shop vulcanizer sold by 97% of the leading jobbers—year after year.

Ask Your Jobber's Salesman

The Shaler Line of Vulcanizers

(or "Profits for Accessory Dealers")

The Shaler Line includes the most popular motorists' vulcanizers on the market—models selling from $1.50 to $12.50—every one in demand and every one bearing a generous margin of profit.

Our 1917 advertising campaign is going to bring them more forcibly than ever to your customers' attention

Ask your jobber's salesman about the famous "Vul-Kit" and the new "5 Minute" He will tell you what other dealers are doing with them.

Catalog Free Mail Coupon!

Every day you delay is a day of vulcanizing business lost. Get our new 1917 catalog. Mail the coupon at once—NOW

C. A. Shaler Co.

804 Fourth St., Waupun, Wis.

Opportunity Coupon

C. A. SHALER CO.
804 Fourth St., Waupun, Wis.

Send new catalog of Vulcanizers for Motorists and Repair Shops.

Name .....

Address .....

Do you sell accessories? .....

Jobber's Name .....

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WHY TIE PROGRESS TO PRECEDENT?

You *know* that real grain leather is scarce and costly. The price of shoes alone proves this fact. You *know* that so-called "genuine leather", or leather splits, is only a substitute for real grain leather. Knowing these facts then, and realizing that you must knowingly accept a substitute, why not get the best substitute for grain leather that the market affords?

If you can't get real *grain* leather upholstery on your new car, don't take split leather sold as "genuine leather". Get

DU PONT FABRIKOID

Motor Quality

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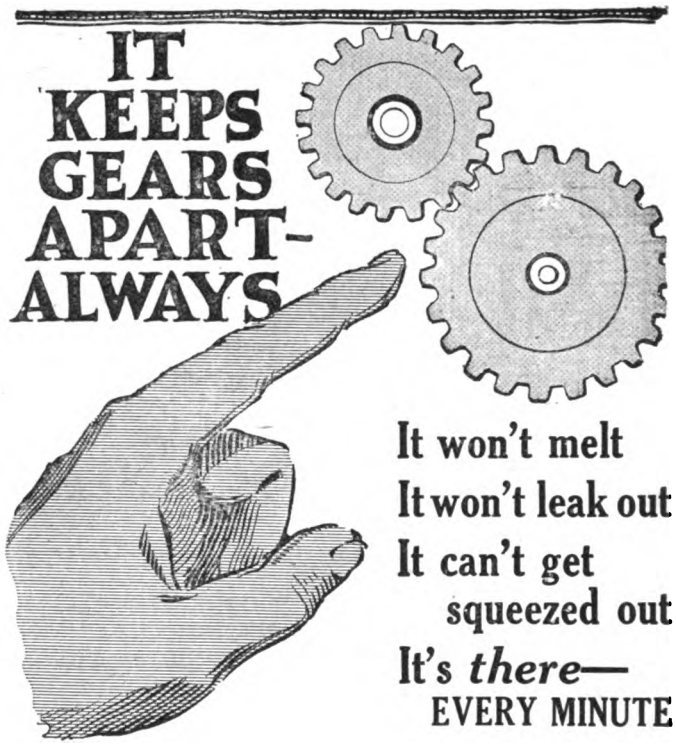
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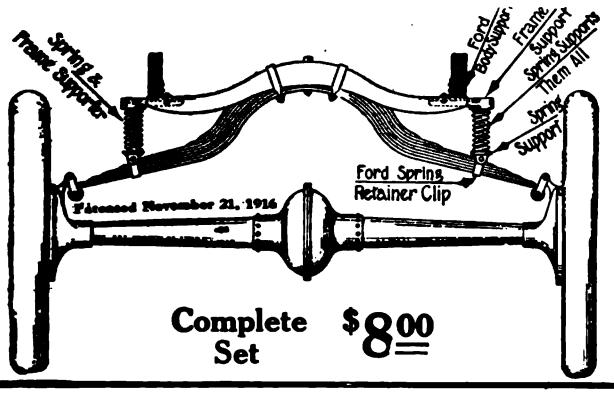
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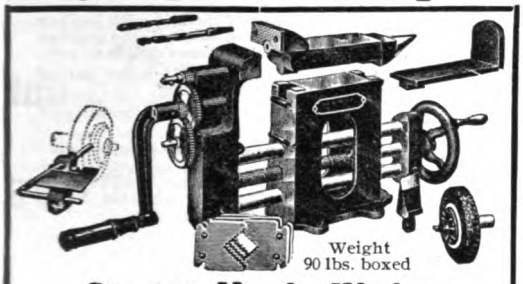
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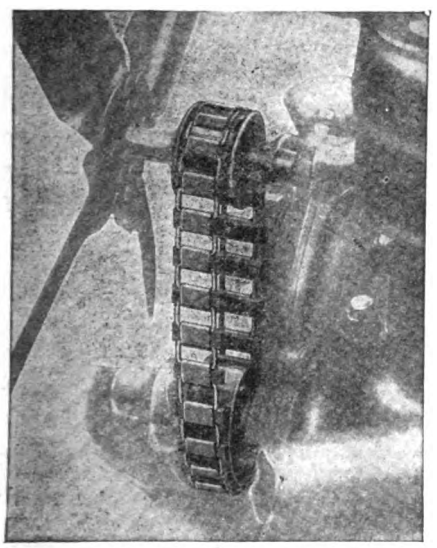
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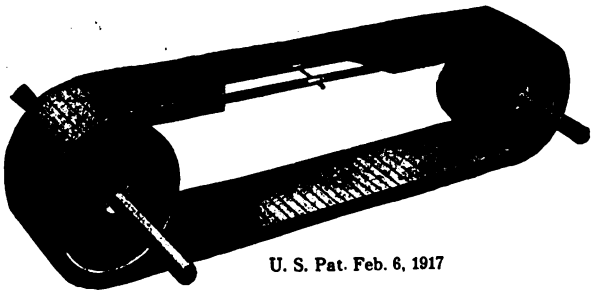
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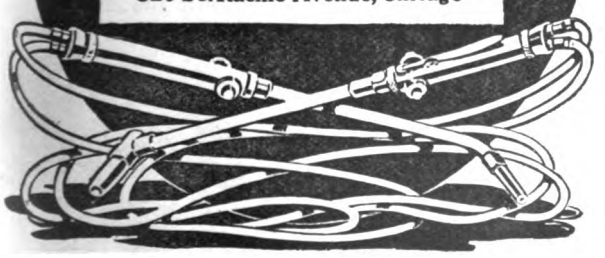
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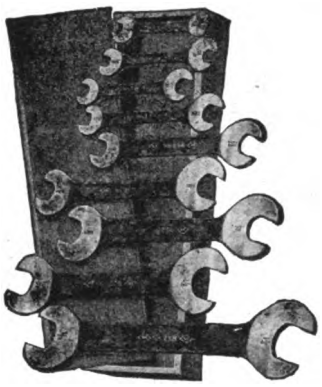
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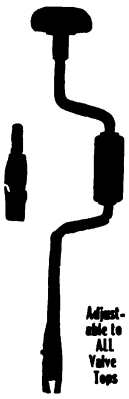
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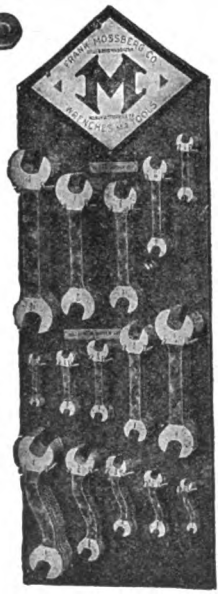


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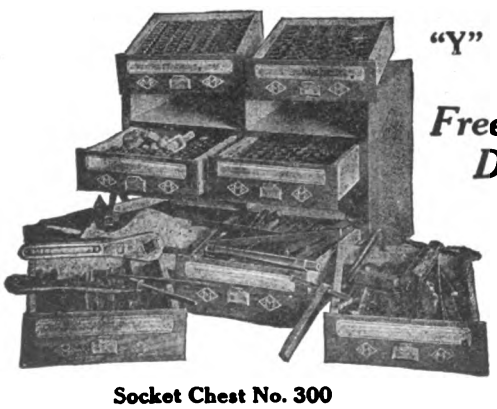
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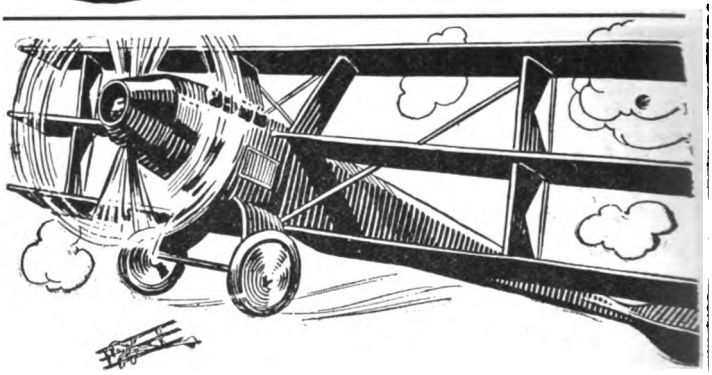
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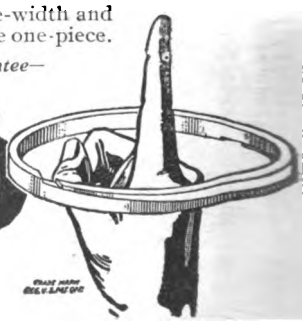
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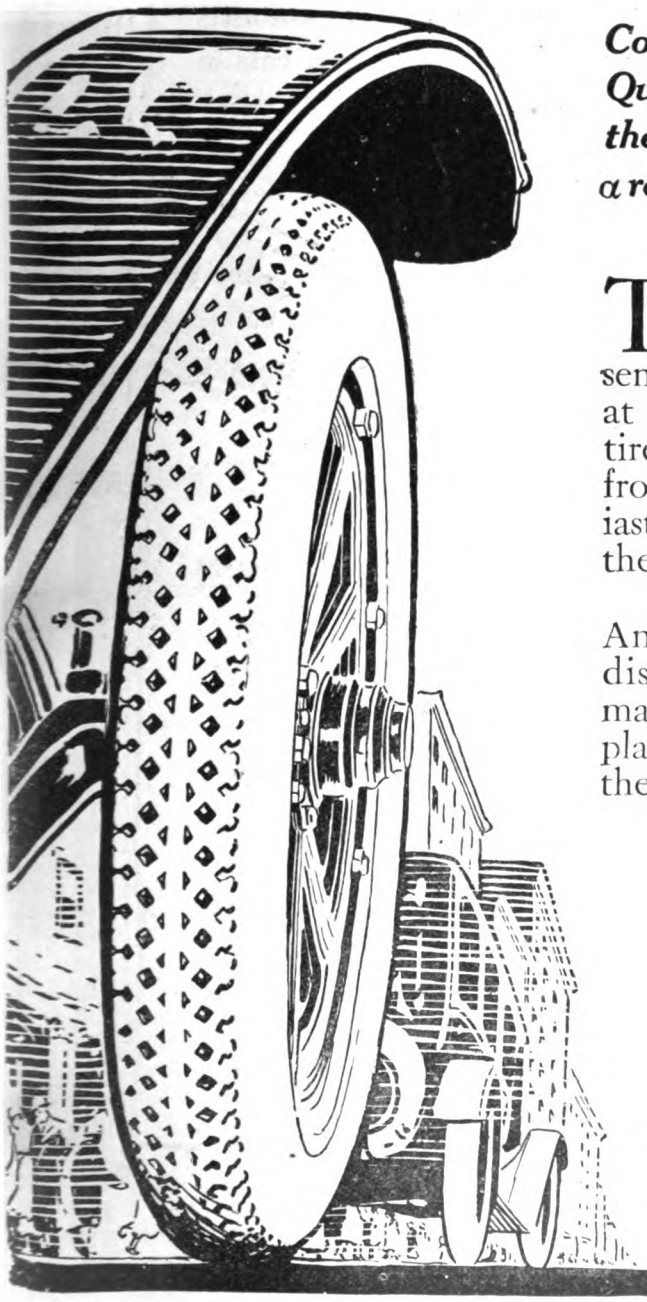
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DELCO IGNITION.

How to Guard Against Overheating When Running on the Battery.

From Charles Leighty, Nebraska.—When a car comes into your shop to have the battery charged, you no doubt know that in almost every case you should not let the engine be run while the battery is off; or if it happens that you must let the owner have the car while you are charging the battery, you must put another battery in its place or you must fix the generator so it will not generate.

A "constant voltage" generator is one that has a voltage regulating system that regulates regardless of the current that is being used. The "constant current" generator used on automobiles is one that has a regulating system that depends for its operation upon the current that is being sent to the battery.

The big majority of electrical systems are of the "constant current" type. Hence, when the battery is removed the only source of regulation is gone. For this reason the voltage gets higher and higher as the speed increases until there is grave danger of burning out the field windings. A good way to get an idea of the rapid increase of voltage on this kind of system is to start the engine when the battery is disconnected, then speed the engine up to about twenty or twenty-five miles per hour, turn on the lights and see how promptly they will burn out.

The instructions given with the various cars usually specify what should be done to prevent the generator from generating under these conditions. In some cases you are told to "ground" the generator. In other cases you are told to raise one or more brushes off the commutator, etc. In the event of your following these instructions you are assured that it is perfectly safe to run the engine—as far as the generator and lights are concerned. But let us consider some of the "Delco" equipped cars.

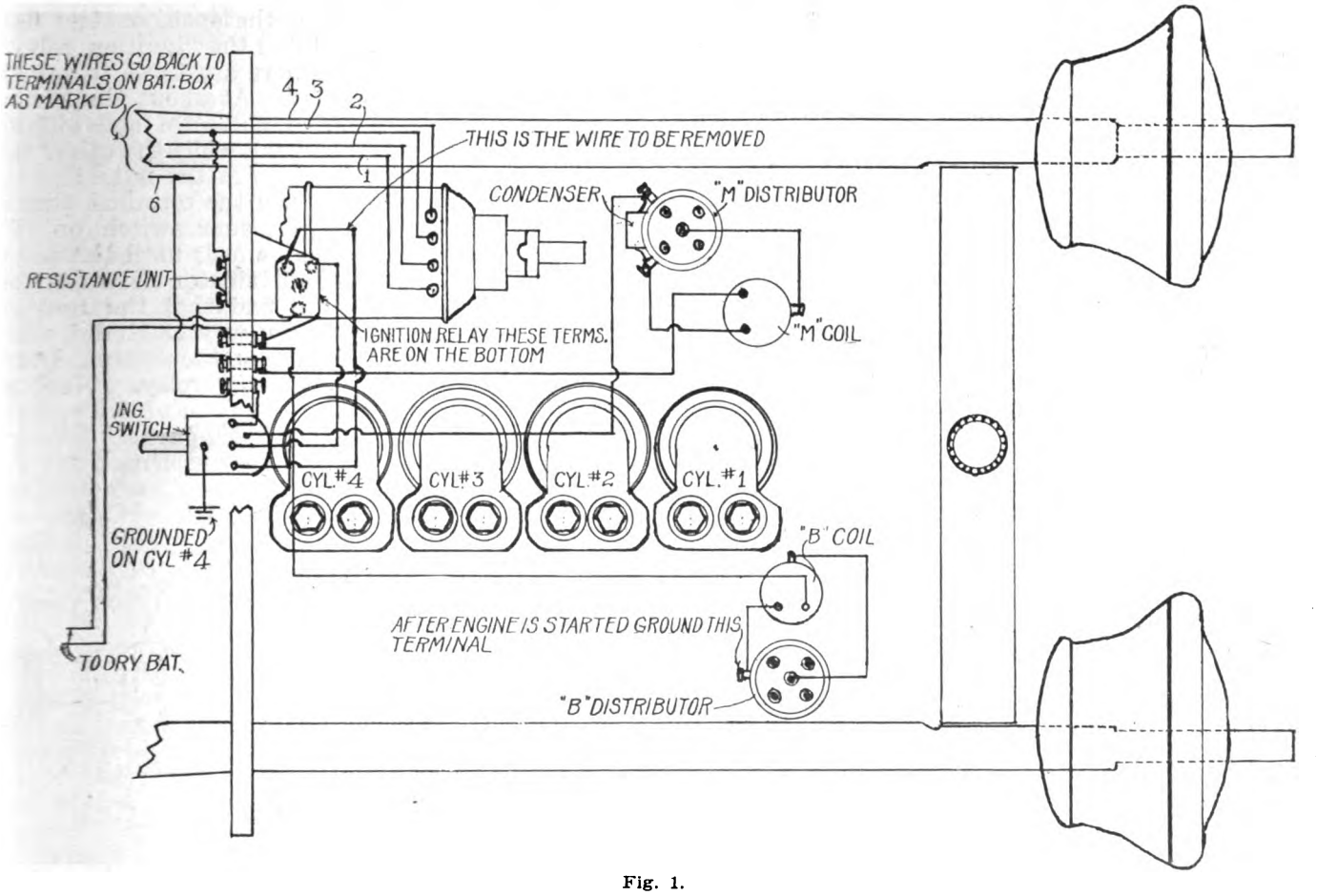


Fig. 1.

If the battery is removed and you wish to use the car you must first protect your generator by raising one of the generator brushes, or by grounding the generator. After you have done this you must depend upon an ignition system that will work without the storage battery.

The Delco ignition systems manufactured in 1912, 1913 and 1914 provide for "dual" ignition. They use the current from the storage battery or generator for what is called the "M" or "Mag" ignition,

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and they use the current from a set of dry cells for the "B" or "Bat" ignition.

In the 1912, 1913 and early 1914 systems, a separate breaker—or interrupter—was used for the "bat." and "mag." ignitions, and when the "bat." ignition was used, the current from the dry cells had to pass through the ignition relay. This relay was simply a vibrator that was inserted in the circuit in much the same way as a master vibrator is used on

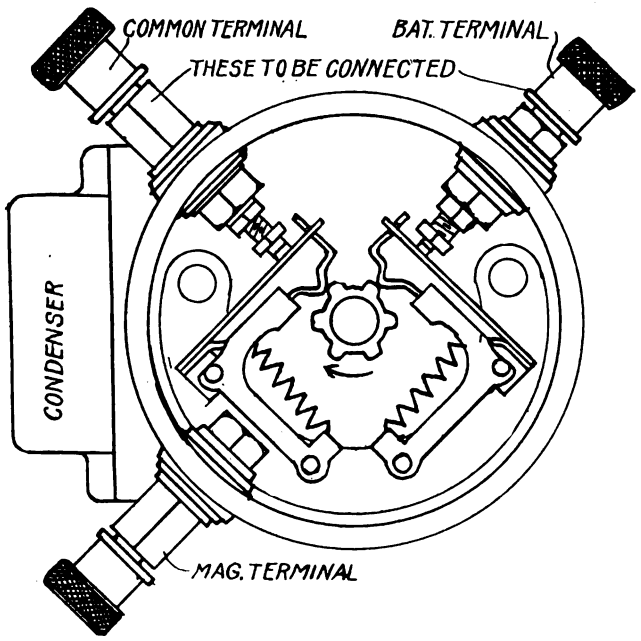


Fig. 2.

a car equipped with a multiple coil system. The chief difference between this relay and the ordinary master vibrator is the fact that the relay has an extra winding known as a "holding coil," and it can be arranged in such a way as to make only one interruption of the current during a sparking period if it is thought desirable.

In the late 1914 systems only one breaker was used, both for the "B" and "M" ignitions, but when the "B" ignition was used, the current from the dry cells was caused to pass through the ignition relay in much the same way as it did in the earlier models. The very fact of the dry battery's current having to pass through this ignition relay causes a certain "lag" in the appearance of the spark. In other words, it causes the spark to be "late."

Ordinarily this fact is of no consequence because the "B" ignition is meant to be used only for starting. But if you attempt to drive one of these cars for any considerable distance on the "B" ignition, you will find that the engine will get mighty hot on account of this late spark. Advancing the spark lever will not remedy the condition, because it cannot be advanced enough. Thus you can see that it wouldn't be good policy to let the car owner take his car and drive it around on the "B" ignition.

If he must have the car you must find some way to prevent the spark from being late. It is not advisable to change the timing permanently, so the purpose of this article is to tell you what to do without going too far into technical details. First of all it is essential for you to know that in some of the Delco systems the relay works when the circuit is closed at the timer or interrupter, while in others the relay works when the circuit is opened at the interrupter points. The ordinary master vibrator works only when the circuit is closed at the timer. We will consider first the 1912 Cadillac. Under the hood you will find two distributors and two ignition coils. The one on the left side of the engine is the "mag." distributor and coil. The one on the right side is the "bat." distributor and coil.

Fig. 2 shows the approximate locations of the various parts of the ignition system of the Cadillac, and shows the ignition wiring. All wiring except the ignition wiring is left out of this figure, also the high-tension wires that go to the spark plugs are not shown. This is to avoid confusion.

Pay attention only to the "Bat." distributor. You will note that this distributor has a low-tension wire connected to a terminal at its side. The other end of this wire goes to one of the low-tension terminals of the coil. By experimenting you will notice that when you place the ignition switch in "B" position and press on the button marked "Start," the vibrator will work and a series of sparks will appear at the spark plug as long as the interrupter points are in contact with each other. As soon, though, as you stop pressing on the "Start" button, the vibrating will cease.

Now look at the front of the dash, on the left-hand side. There you will find the "ignition relay." This is shown in Fig. 1. There are three terminals on the bottom of this relay. At about the center of the bottom is a knurled nut. On one side of this knurled nut is one terminal, while the other two terminals are on the other side of the nut.

If you remove the wire from the terminal that is closest to the dash, then put your switch on "B" position, then turn your engine over until the interrupter points in the "Bat." distributor close (as previously explained) you will find that the ignition relay will vibrate in the same way as it did when you pressed the "Start" button on the switch. Leave this wire disconnected from the relay. Now go

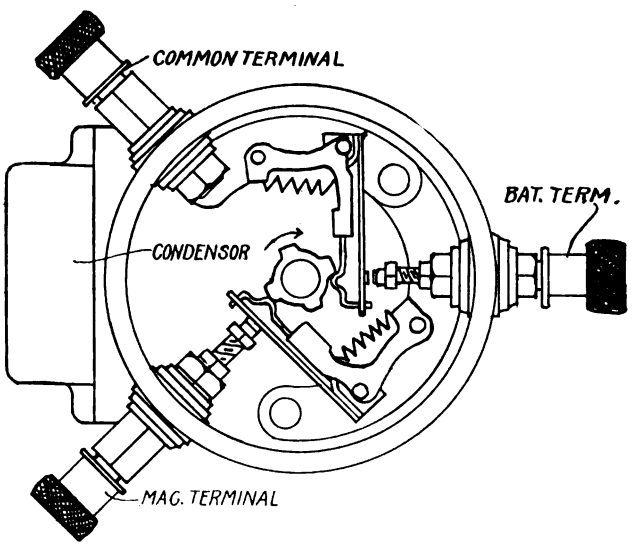


Fig. 3.

round to the "Bat." distributor. You will find one wire connected to the interrupter terminal. Put an extra wire of short length on this same terminal. Keep the other end of this extra wire free from contact with the engine. Now start the engine by cranking in the usual manner. After the engine gets to running, ground this extra wire to any convenient place on the engine or frame. Your relay will continually vibrate, and the distributor will

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distribute the high-tension current to the spark plugs in their proper firing order and the spark will always be sufficiently early to prevent overheating. But should you stop the engine, you will have to disconnect this extra wire from ground before attempting to crank the engine to avoid getting kicked.

On the 1913 equipments practically the same process is gone through. You can always locate the ignition relay with very little trouble, and you

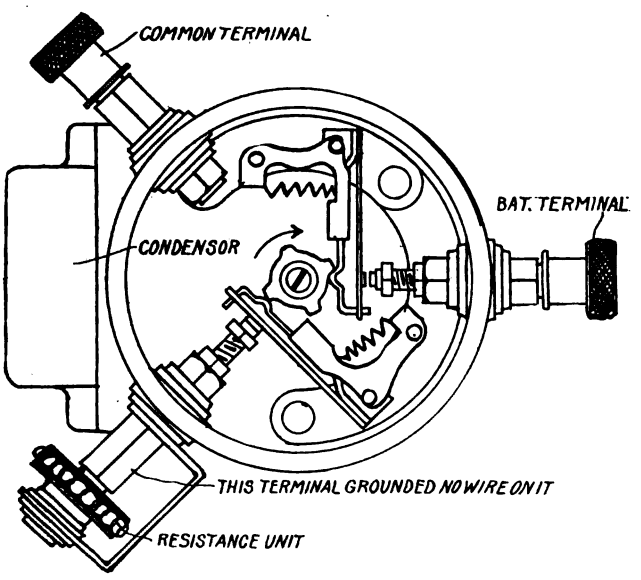


Fig. 4.

always remove the same wire from the relay. The difference in the various installations is chiefly in the location of the various parts and the difference in the distributors.

The 1913 Cole 4-40, 4-50 and 4-60, the 1913 Oakland 4-42 and 6-60, the 1913 Hudson 37 and 6-54, and the 1913 Oldsmobile, all use practically the same starting and lighting system as the 1912 Cadillac, but the ignition system of these cars differs from the 1912 Cadillac in one particular point. These cars use only one distributor and coil, while the 1912 Cadillac uses two distributors and two coils. Each of these cars has a distributor with three low-tension terminals instead of one or two as in the Cadillac. One of these terminals is the "Bat." terminal, one is the "Mag." terminal, and the other is the "common" terminal.

Fig. 2 shows a cut of the distributor used on the 1913 Oldsmobile. This figure will help you to determine which is the "Bat." terminal. Fig. 3 shows a cut of the distributor used on the 1913 Cole 4-40, 4-50 and 4-60, the 1913 Hudson 37 and 6-54, and the 1913 Oakland 4-42 and 6-60.

If you wish to make any of the above cars ready, all that is necessary is to remove the wire from the relay as previously explained, then after you get the car to running join the "Bat." and "common" terminals together with a short piece of wire. Be sure to disconnect these terminals from each other when you go to crank the car.

If you find it difficult (on any of the above cars) to tell which wire to remove from the relay, proceed as follows and you can always find the right one:

1—Turn your switch to battery position.

2—Join the "Bat." and "common" terminals of the distributor.

3—Remove one of the wires of the relay. If it doesn't vibrate, replace this wire and remove another, etc. When you remove one of them the relay will vibrate. This is the one that should be left off.

Fig. 4 shows a cut of the distributor used on the 1914 Buick B54-55, 1914 Cadillac, 1914 Cole, 1914 Moon, 1914 Oakland 48 and 6-60, 1914 Olds 6-54 and 1915 Olds 6-55.

The principal difference between this and the one shown in Fig. 3 is that this distributor has the resistance unit mounted upon it, and the terminal to which the resistance unit is connected is grounded—that is, it is not insulated. This makes a difference in the circuits, but it is just as easy to prepare them to run on "B" ignition as it is to prepare the ones already mentioned.

On the above cars it will usually be more handy to remove a wire from the ignition switch instead of from the relay. These cars have the switch terminals marked. Removing the wire from terminal No. 7 will always have the same effect as removing the wire from the relay.

Fig. 5 shows the distributor used on the 1914 Buick B24-25 and 36-37, the 1914 Cartercar Model 7 and Oakland Model 36. It will not be necessary to disturb the relay on any of these cars. Just turn the ignition switch to "Bat." position and start the car in the usual manner. After it gets to running disconnect the wire from the distributor terminal entirely, and do not allow this wire to touch "ground."

When getting ready to crank the engine be sure to replace this wire to avoid a "back-kick."

This article covers practically all cars using the ignition relay. Cars not employing the relay will not run hot on the "Bat." ignition, because the "M" and "B" timing is taken care of by the same interrupter, therefore they are exactly synchronized, and the only thing necessary to allow you to run the car without the storage battery is to protect the

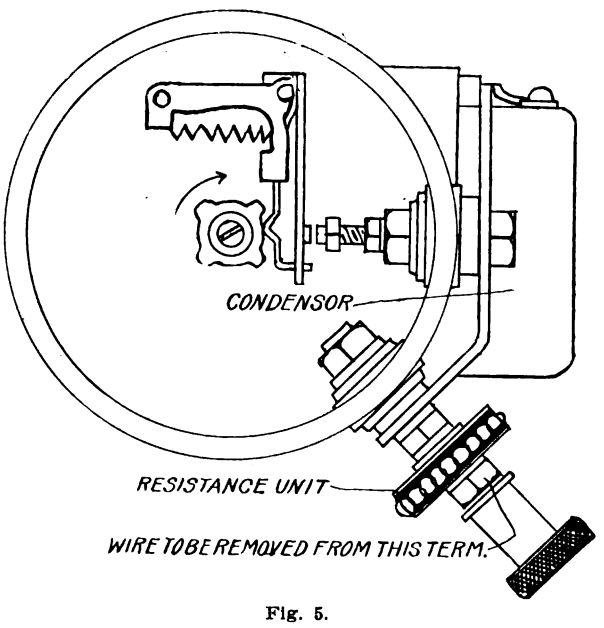


Fig. 5.

generator as mentioned in the first paragraphs of this article.

I have known several cars that have been pretty badly crippled because the mechanic that was working on the car didn't know, and I notice that the shop where a man is allowed to take his car out to be subject to abuse usually loses a good customer. Failure to consider this matter of a late spark is abuse to the car.

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BATTERY RECHARGING.

How Secondary Batteries May Be Charged From Automobile Dynamos.

BY SYDNEY F. WALKER, M. E.

No. 1.

The charging of secondary batteries is a difficult problem under any circumstances, and it is especially difficult under the conditions ruling in a motor car. The first difficulty arises from the fact that while lead cells furnish from two volts downwards when discharging, and Edison cells from 1.2 volts downwards, they will require 2.5, sometimes 2.75 and 1.8 volts, respectively, during charge. The second difficulty in connection with motor car work arises from the fact that the dynamo, which is necessarily driven by the motor car engine, runs at varying speeds, and the variation in speed rarely coincides with the requirements of the battery. With the lead battery, for instance, when charging first commences, the pressure required is in the neighborhood of 2.2 volts per cell, as shown in Fig. 1. It remains at about that figure for a large portion of the charge and then goes to 2.5, and towards the end of the charge to 2.75. With a given dynamo, and a given load, the pressure furnished is approximately in proportion to the speed after a certain critical speed has been passed. The higher speeds, however, are always considerably more than would be required to raise the pressure per cell from 2.2 to 2.5, or even to 2.75, and again, they rarely take place at the time the battery requires them. The battery has to be worked quite independently of the requirements of the car so far as speed is concerned. The same remarks apply to the Edison battery. A third difficulty arises from the fact that with the usual arrangement of electrical equipment the lamps have to be run and the battery take a charge at the same time. This difficulty will be appreciated when it is remembered that the lamps are made for the pressure furnished by the accumulator when it first commences to discharge. In both American and British practice there are two standard pressures at which the lamps are worked, 6 volts and 12 volts, taking three and six lead cells approximately, and the equivalent number of Edison cells.

The incandescent lamp is a very delicate apparatus; its filament is made of very fine wire, principally consisting of the rare metal tungsten. There are some lamps on the market made of tantalum, but tungsten lamps are fast driving them out. A short length of tungsten or tantalum wire is bent into a hoop and connected by a special joint, to platinum wires that are sealed into the body of the glass globe in which the filament is enclosed. The globe is exhausted of air as far as modern air pumps will allow, before it is sent out for use, and the platinum wires forming the connection with the filament are usually soldered to brass caps of some form.

Fig. 2 shows the arrangement diagrammatically. The size of the lamp filament is calculated so that when the current for which the lamp is made passes through it, the filament itself is at white heat, at a temperature of something like 2,000 degrees C. The fine wire also is so delicate that a comparatively small increase of current strains it very considerably. It will be remembered that nearly all substances expand when heated; the rate of expansion per degree is not high, but when the temperature reaches the figure named above, the expansion is considerable, even in small lamps of the size required for motor cars. It will be seen, therefore, that if the lamps which are made for, say, 6 volts or 12 volts, are exposed to pressures of 7.5 and 15 volts, respectively, their filaments will be strained, and it is possible to take out some hundreds of hours of the life of a filament in a few minutes by overrunning in this way.

There is another serious matter in connection with the charging of batteries or accumulators from the motor car dynamo, viz: If the pressure delivered by the dynamo at the terminals of the battery is below that of the battery itself at the moment, currents will pass from the battery through the coils of the dynamo, exhausting the battery in a few minutes. The present writer had an interesting experience of this kind in the early days of electric light. The owner of a country house in the district where he was residing, purchased a lot of electrical materials at a sale, among them being an engine and dynamo, and a lead battery. He had them set up by a local mechanic who knew nothing about electricity, and proceeded to charge the battery, which

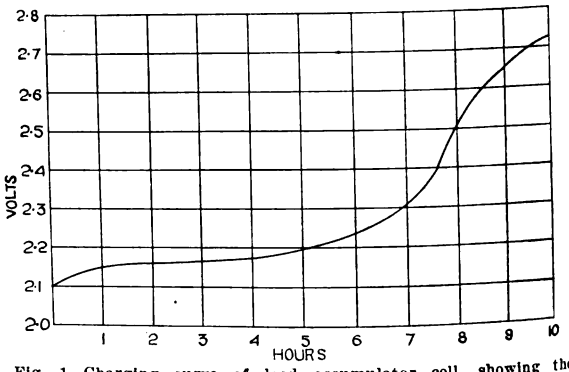


Fig. 1.—Charging curve of lead accumulator cell, showing the pressure required at different portions of the charging period. It will be noted that a large portion of it is in the neighborhood of 2.2 volts per cell.

in those days was not as good by a very long way as they are today.

Incidentally, the mechanic, who knew how to run an engine, did not understand about the governor, and so the governor strap, it was driven by a belt, was not put on. It was understood that the engine and dynamo would have to run continuously for something like forty-eight hours in giving the first charge. At the end of the forty-eight hours, however, the battery was found to have acquired no charge, and on going into the matter it was found that the battery had been alternately charging and discharging, according to whether the man looking after the engine fired up or let it go by itself. When he fired up, the steam pressure rose, the engine speed increased, the dynamo was driven faster, and the battery received a charge, the pressure being at first more than was required.

As everyone knows who has had experience of portable engines, the combined engine and boiler type, if the boiler furnace is left for a little time, the steam pressure soon falls, and in this case the pressure of the dynamo fell, and then the accumulator discharged through the dynamo. The dynamo acting as a motor with the aid of the current supplied by the accumulator, eased the engine, and

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consequently the speed rose and the accumulator began to take a charging current again. Shortly after, the engine felt the increased load, it slowed down, and the accumulator began to discharge again. This see-saw went on for the whole of the forty-eight hours. The writer has mentioned this case as it illustrates so very clearly what may happen if a motor car dynamo is allowed to be connected to the accumulator when the speed of the engine, or the pressure of the dynamo, falls below a certain figure. This part of the problem has been very efficiently dealt with. There are a number of auto switches upon the market which disconnect the dynamo from the accumulator when the speed of the engine falls, and reconnect it immediately the pressure of the dynamo reaches the figure at which the charging takes place. Fig. 3 is a very good example of one of the better forms of auto switch that has been introduced in England. As will be seen, there is a small electro-magnet enclosed in an iron tube faced by an iron disc. The disc is pivoted as shown, and a spiral spring whose tension can be regulated keeps the disc away from the poles of the electro-magnet, except when the required pressure is present. The electro-magnet is wound with two wires, a very fine one connected across the surface, and taking the full pressure of the dynamo as shown in Fig. 4, and a thick wire coil forming part of the accumulator circuit when the dynamo is in connection. When the speed of the engine, and therefore the speed of the dynamo, is at the figure at which the dynamo pressure is equal to that of the accumulator back pressure, the fine wire coil of the electro-magnet receives sufficient current to cause the pull upon the iron disc forming the armature to overcome the tension of the spiral spring, and the disc is pulled sharply up to the iron enclosing cylinder. On the left of the electro-magnet the contact arrangement is shown. The writer has selected this apparatus to describe, as it illustrates the difficulties in the way of operation, and how they have been overcome.

There are two difficulties which arise with apparatus of this kind; maintaining firm contact when the switch is closed, and opening the switch quickly when the speed of the dynamo falls below the critical figure, at which it would be receiving current from the accumulator, if the two remained connected together. If, what electrical engineers call a firm contact is not maintained, an electrical resistance will be set up at the contact, between the contact surfaces, and the current passing to the accumulator will be lowered, while some of the pressure furnished by the dynamo will be taken up in overcoming the resistance. If loose contacts rule, in a case of this kind, sparking at the contacts is almost sure to follow, and sparking leads to the formation of dirty surfaces between the contacts; the dirty surfaces causing the resistance mentioned above.

Fig. 5 shows two sets of ordinary brass contacts, one in which the contacts are firm, and the other in which they are loose. When the contacts are firm, the whole of the two surfaces that are intended to make contact, press firmly against each other; when the contacts are loose, only small portions of the two surfaces are actually in contact, while the portions that are in contact are constantly changing; that is why the resistance is set up, and why sparking takes place. It is very rarely possible to ensure that the whole of the surfaces shall press firmly on each other, but the nearer that this object can be attained, the better is the working result. When the circuit is opened, when the speed of the dynamo falls, a spark always passes between the contact surfaces, as one moves away from the other, and that spark always tends to create dirt, and to set up resistance between the two contacts.

In all automatic switches designed for the purpose, the thick wire coil, which is included in the circuit between the dynamo and the accumulator, the current flowing from the dynamo to the accumulator passing through it, performs a double office; it helps to hold the contacts firmly in position when the switch is closed, and it helps the spiral spring to open them quickly, when the speed of the dynamo falls to the limiting figure. When the current from the dynamo is charging the accumulator, it is flowing round the thick wire coil, in the same direction as the current flowing in the thin wire coils, and so assists them in overcoming the pull of the spiral spring. When the current is flowing from the accumulator to the dynamo, as it does immediately the pressure of the dynamo falls below that of the accumulator, its direction is opposed to

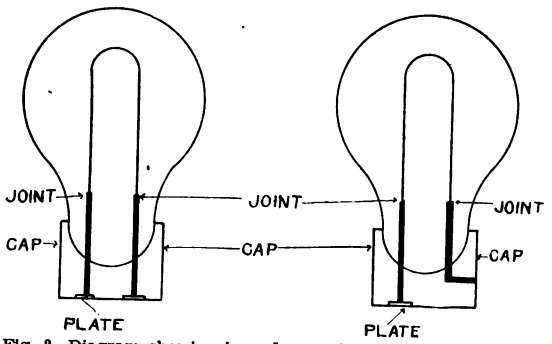


Fig. 2—Diagram showing incandescent lamp filament, in its containing globe, and with its connections to the platinum leading in wires, and the brass cap.

that of the current in the thin wire coils, and it goes to help the spiral spring.

The contacts illustrated in Fig. 3 have been worked out from the practice in large electricity generating stations. Those who have visited generating stations, and who have inspected switchboards there, will have seen what are called circuit breakers; they are intended to open the circuit of feeder cables, lying under the street, say, to cut off the current from them, when something has happened that will cause serious damage to their insulation. The working out of the circuit breaker for electricity generating stations was a very difficult problem, principally owing to what has been stated above, about firm contacts being required when the switch was closed, a quick break when the switch was opened, and as little dirt as possible left behind, after the switch was opened.

Electrical engineers always endeavor to secure, where it is possible, what they call rubbing contacts; the moving surface is made to rub over the fixed surface when the switch is closed, so that it may rub out, rub away as far as possible any dirt left by the spark when the switch was last opened. With large circuit breakers, and under certain conditions, it is not always possible to ensure that the moving contact surface always cleans itself, and the fixed contact surface, when the switch is closed;

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there is always the chance of a little dirt being left behind, a little inequality in the two surfaces, which tends to increase every time the switch is opened, until the trouble becomes serious. To meet this, in electricity generating stations, there are always two pairs of contacts for each circuit breaker, and for each important switch; one pair of copper or brass, which carries the bulk of the current when the switch is closed, and a second pair consisting of carbon blocks that can be renewed.

It is always arranged that the copper or brass contacts move free of each other, before the carbon contacts begin to lose touch, and the spark that is inevitable passes between the carbon contacts. Carbon contacts stand well by themselves, in spite of sparking, for a long time; but, as every time a spark passes, a small part of one or both contacts is converted into vapor, and lost, the carbon contacts wear away in time; and they are then renewed. In the apparatus shown in Fig. 3, it will be noted that there is a substantial brass contact, standing up from the base of the apparatus, to which it is firmly secured, but from which it is also insulated. It will be observed also that this

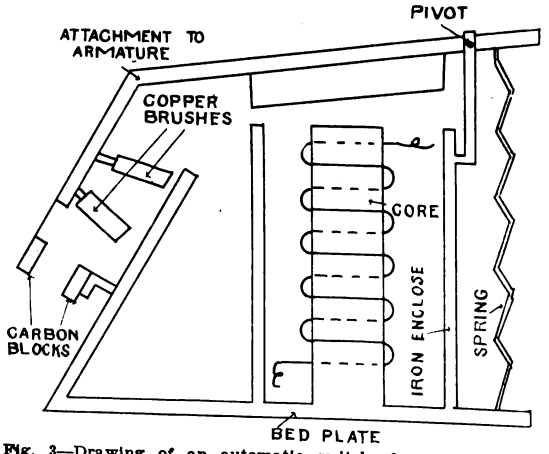


Fig. 3—Drawing of an automatic switch, for cutting in and cutting out the dynamo, when the pressure is above or below a certain figure.

fixed contact bar stands at an angle of about 30 degrees with the vertical; and that it carries at its lower end, a metal shoe which holds a carbon contact. The fixed contact is faced by the moving contact, which is attached above to a lug forming part of the armature disc of the electro magnet, and the moving contact bar carries at its lower end a shoe for a carbon contact, similar to the one held on the fixed contact. In addition, a double copper brush will be noticed, attached to the upper part of the moving contact. When the switch is open, the two carbon contacts are separated by an interval of a small fraction of an inch, and the two brushes are also separated from the fixed lower contact by a similar distance. When the electro magnet pulls, and the armature disc moves down on to the top of the containing cylinder of the electro magnet, the copper brushes rub down over the fixed contact piece, and the upper carbon plate rubs down over the lower one. When the switch is opened, the copper brushes leave the fixed contact bar first, and then the moving carbon plate leaves the fixed one, the spark passing between them.

With the introduction of apparatus such as that described above, the difficulty of the battery discharging through the dynamo may be said to be overcome. There are a number of such apparatus on the market, all of which should protect the accumulator, if they are properly made, and receive a certain amount of attenton. It will perhaps be interesting however to note that the firm whose apparatus is described above, have discarded the automatic switch, the cut in and out, for a large portion of the automobile electric lighting plant they supply. They deliberately prefer to waste the current that will flow through the dynamo, if it is left connected to the accumulator, when its speed is lowered, rather than have the additional complication of the automatic switch. They drive the dynamo by means of a free friction wheel, bearing upon the flywheel of the engine, and they rely upon the driver hearing the noise which the dynamo will make when motoring, that is to say, when it is driven by the current flowing from the accumulator. They say, and with considerable truth, that with a careful driver, the current wasted in this way will not be serious, while when an automatic switch is used, the current flowing in the fine wire coils is a constant charge, which has to be made up by the dynamo. As the dynamos employed for the lighting of motor cars are very small, there is something in this also.

In addition to the other dangers that have been mentioned, in connection with the accumulator, that of overcharging should not be omitted. Accumulators suffer from two possible complaints, not being fed with sufficient current, not being kept constantly under charge; and being overcharged. As explained in the articles on the secondary battery, expansions and contractions of the active material take place during charge and discharge; and they are greater the lower the discharge is carried, and the higher the charge is carried. When an accumulator is fully charged, in the case of the lead accumulator at any rate, what is known as "gassing" takes place; a portion of the liquid is decomposed, and the hydrogen and oxygen gases formed by the decomposition tend to come rather freely, leading to the level of the liquid in the cells being lowered, and to the active material being more inclined to get out of the recesses in which it has been forced in the process of manufacture. The importance will be seen therefore, of preventing overcharge as far as possible. In the problem of train lighting by electricity, which is very similar to that of automobile lighting, except that the plant required is very much larger, most of the systems employed have a special apparatus, designed specially to prevent overcharging. As will be seen later, the construction of the small motor car dynamos tends very largely to meet this part of the problem, without any special additional apparatus.

(To be continued.)

AMONG INDIANA GARAGES.

Several Topics, Mostly Rudimentary, Treated, But They Are All Useful.

BY JAMES F. HOBART, M. E.

"What's doin', Bill? Settin' up nights to run vulcanizers for the fun of it?"

"Not on your life, John! Sleepin's got vulcanizin' skinned a mile this year. I'm mending Black's inner tube off the nigh front wheel. Just look at it, will you? A piece six inches long and three inches wide,

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oval-shaped, torn clean from the tube, and the windtube is right in one end of the torn-out piece."

"What made it do that, Bill? Looks as though it were cut to a pattern with a pair of shears."

"I can't tell what caused such a queer break, John. I only know it is there, but I believe it was caused by a poorly fitting inner tube—one which was much too large for the tire in which it was placed. Look—there are many places where the rubber has been folded right flat over itself—doubled down sharp and then squeezed that way, under, big pressure. I see that the tube is old and rather rotten, so probably the peculiar tear was caused by the rubber being folded over upon itself and strained by the pressure while in that position, until the pressure and the motion sheared out the oval piece along the edges of the folds—looks that way to me."

"Might be that way—but how are you going to fix it? It's a pretty tough chance to make that piece tight again, even with a strip vulcanized all along the tear."

"I'm not going to try that way, John. I've got a piece of another tube here and you see that I've cut a piece about an inch larger, all around, than the piece which was torn out. And I have set the air tube in this piece, with a reinforcing pad vulcanized upon it, right where the tube was before. Now, I've scraped and sandpapered the inside of the tube all along the hole, also cleaned the outside edge of the inset piece in a similar manner. I'm going to vulcanize the two pieces together, with the new piece inside the tube, and if it don't make a good job, then I'll pass up this job to a better man."

"Did you scarf the edges of the two pieces, so there will not be sharp edges along the length of joint, to possibly shear off the rubber?"

"I did that, and scarfed or bevelled the whole length of both pieces with a very sharp, thin knife, which I kept wet with water all the time. In fact, I did the job almost under water. Spread the rubber flat on the sharp edge of a board and had Sam hold it there and keep it wet, while I did the skiving—and I got a right good job that way, too!"

"Suppose you will give the joint a good coat of rubber cement and then vulcanize it good and solid, won't you?"

"Indeed I won't, John. Don't try to vulcanize rubber cement. That stuff wants to be treated in a different way. Just coat the parts with as thin and as even a coat as you can put on, but make sure that there are no places left without cement on them, so, whatever you do, be sure that every bit of the tube and patch have been covered with cement where they lap each other. And, John, be sure that every bit of the liquid has evaporated from the rubber cement before you put the two pieces together. That's the secret of making a good cement joint."

"Say, Bill, the cement can't stick after it has got dry, can it? Won't the joint go bad if you let the cement get too dry before you put the pieces together?"

"Indeed it won't, John! You can't get a cement joint 'dry' in that way. As the gasoline and other solvents evaporate from the cement, it leaves the surface of the rubber, when heated, as sticky as fly-paper, and, like fly-paper, there is no water to evaporate from it, so the more the solvent has passed off, the better will be the joint. Indeed, if you can put on a thin enough coating of the cement, it will make better work to put on two coats, 'drying' an hour between them, and letting the second coat stand two hours before heating and putting the parts together."

"And then, how long before the joint should be vulcanized?"

"Never, John! Didn't I tell you not to vulcanize a cement job? When you are going to vulcanize, don't put in cement. Instead, just use some prepared rubber—that is, pure gum rubber mixed with sulphur and other vulcanizing chemicals and let that preparation form the joint between the pieces of tire. Now, John, don't get those two things mixed up again, for if you do mix 'em you sure will spoil the job!"

"Say, Bill, I always supposed you could cement a joint and then vulcanize it good and solid, same as the rest of the rubber, and it's sure news to me that you can't do it. But what are you doing with that piece of fire hose? I don't see any auto fire truck around here!"

A Fire-Hose Tire.

"Nope, John; no fire wagons around here. That piece of hose brought a man in about fifteen miles after his tire went flat last night. He had a bad blow-out, and had used everything he had with him, but could not fix things so as to run home on air. The one little repair shop he could get to hadn't anything to help him, so he went to a fire house that chanced to be nearby and got hold of this length of condemned fire hose. He cut the couplings off and jacked up the wheel, then he wound the hose over the flat tire, pulling it as tight as he could. He did the winding by putting a tension on the hose, then opened up the compression and cranked the car after blocking the rear wheel, which stood on the ground. After the blocking pulled away twice, he pushed the car against a tie-post and let that take the push of the cranking, which was kept up until all the hose was wound over the tire and fastened by skid-chains and a lot of clothes-line and hay-wire."

"But the guy really got home on that piece of hose?"

"He sure did, John, and the rim wasn't hurt a bit, either. Of course, he didn't do any fancy speeding with the hose-rim, but he got here O. K., and that's all he wanted."

"Well, Bill, I never heard that stunt before, but I did know one man who got caught in about the same fix and he raided a contractor's shanty and wound a couple of hundred feet of one-inch rope on the rim in place of a tire, and got home with it, but the fire-hose stunt is a new one on me. But whatever are you monkeying with those spark-plugs for? You are just taking 'em out and putting them back again without doing a thing to them. What's the lay?"

"Why, this car was reported as having one cylinder 'missing' and I am looking for the one which is doing it."

"How do you find it by taking out the spark-plugs?"

"Why, the cylinder that misses will have a dirty plug, most likely, while the other plugs will look as though they had been heated red-hot."

Stop and Investigate.

"I can't understand the reason," said a garage man recently, "why some men cannot use a little

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'horse sense' in driving a car? When a driver hears a strange noise in the engine or anywhere else, why in the name of all that is good, can't he stop, investigate and find out what caused the noise before proceeding further, perhaps at the risk of his life or at least the destruction or damage of his car."

"I can't see the reason," he continued, "but they won't do it. Now, right here is a car which we have just towed in from a point nearly fifteen miles distant. The engine is a wreck. The top of one cylinder has been torn entirely off and it is very probable that most of the mechanism of the motor has been severely damaged."

"How did it happen? Why, in the usual and fool way, of course. The driver works for a large corporation, to whom the car belongs. He was out last night with three other young fellows, and they were probably 'picking up war paint' for the present outburst of patriotism. One of the young men told me that they were traveling along at a pretty stiff rate when a hard knocking started under the hood. The driver, instead of at once stopping to investigate, put on all the power and smashed ahead at top speed. But they didn't go far. The engine went to pieces almost instantly, and, as you see, we have towed home a mass of junk."

"Had the young man who was driving been content to have stopped and made an investigation the instant he heard the first knock then his company would have had only to pay for a new pin and perhaps one new piston, whereas, by driving ahead at full speed, without the slightest attempt to ascertain the trouble, his company will now have to stand the expense, probably, of an entirely new engine for the car. Luckily the young people escaped personal injury. It was just blind, fool luck. That's the reason."

Carbon Cylinder Deposits.

"Here comes a man whom we call 'the Carbon Chap,'" said another garage proprietor recently. "We call him by that name because he has his car here for removal of carbon cylinder deposits more frequently than any other car user of my acquaintance. He sure is a 'fiend' for carbon deposits, and this garage receives quite a revenue from him on that account. It's all his fault, and he has been told so dozens of times, but it makes no difference. Carbon deposits form in the cylinders of his car every time he uses it, and my men claim that the deposits even grow while the car is idle in his garage. Why, there is another patron of this garage who has kept his car here for nine years and has never had to have carbon removed—not once!

"But the 'Carbon Chap,' why he always puts far too much oil into the cylinders and he also uses just as much gasoline as he can possibly make the engine take, therefore, it is not strange that he is troubled with carbon deposits. There is a starter on his machine and every time he starts the engine the starter has to work overtime to pump the excess gasoline out of the cylinder before the mixture becomes lean enough to ignite. Before he installed a starter, it usually required the services of a strong man for four or five minutes to get the cylinder mixture thinned down so the engine could start. Oh, yes, this man is a great friend of John D., only he don't know it and you can't make him comprehend that it is the excess, the waste of oil and gasoline which he puts into the cylinders of his car which causes the deposits of carbon in the cylinders of his engine."

"And when you come to think the matter right down to bottom facts," added the garage man, "I don't know as it is to be wondered at that the man is foolish in regard to oil, gas and engine cylinders. No, he is not much different from some other foolish men whom I know, only the foolishness takes another direction, that is all. Why, I know a lot of men who treat their stomachs as badly as the 'Carbon Chap' treats his engine. These other men stuff their stomachs with too much food, too rich food and with all sorts of indigestible things just because it tastes good while it is going down. And then these same men run around to the medicine man to be treated for worse carbon deposits than the 'Carbon Chap' ever had in his engine cylinders."

And that was true, for the man who eats too much or of the wrong kind of food is to be pitied far more than the one who only abuses a set of engine cylinders. It is the naked truth that no man ever was ill yet until he had put into his stomach or otherwise into his circulation, something which was not needed or intended to be there. And the same thing is also pretty true of automobile engine cylinders, too. Be careful, both with food and with oil and gas.

Short-Measure Gasoline Pumps.

Just as the writer came to a little garage recently he saw the proprietor at the roadside gasoline pump with a representative of "John D." whose team and oil-tank wagon stood at the curb. The garage man was pumping gasoline into the five-gallon measure which the wagon man had just emptied into the garage reservoir. When the pump had registered five gallons, the garage man stopped pumping and found that the gasoline man's measure had been filled just full.

"I always test out my pump measure once in a while," said the garage man. "Sometimes a registering pump, like any other machine, will get out of order a bit, and I don't want to cheat any man or have any man cheat me, so I test out the pump every little while and therefore am reasonably sure that it is accurate and gives fair measure. At any rate, I have never found it giving short measure yet, and I never intend it shall."

It is to be regretted that all sellers of gasoline are not like this man, for, I am sorry to say, it seems sometimes that measures and pumps give awfully small gallons. The testing of a gasoline pump by the gasoline man's measures is a pretty good idea and it gives the garage man a chance to use a measure which is probably pretty accurate. But at some places where small quantities of gasoline are dealt out by a one-gallon measure, the purchaser will do well to see that the measuring vessel is not too badly dented, for it is quite an easy task to so dent a gallon measure that it will give short measure to the extent of nearly a pint. The man who is in the habit of buying small quantities of gasoline frequently will do well to carry with him an accurate and sealed gallon measure, then he can test out for himself whenever the quantity of gasoline measured out to him appears to be "funny."

Durable Fan Belts.

"I make my fan belts last twice as long as some other belts," said a workman in a garage. "I will take two belts, you select one of them, I will put the other one to work and you will find that mine will

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run about twice as long as yours, and doing the same amount of work. I plane the belt down to nearly one-half its original thickness and then carefully fill the pores of the belt with 'cling surface,' neatsfoot oil or some other good preparation for stuffing leather belts. Then I will put the belt on reasonably tight, but not too tight, and see that it is tightened when necessary. Also, I will keep the belt filled with the dressing originally used. You will find my belt to far outlast the other belt which you put to work, thick and dry and very tight."

GARAGE AND REPAIR WORK.

Choice of Power, the Type of Engine and the Proper Foundation for It.

No. 1.

From J. F. Springer, New York. — The repair shop must, if it is to be really up-to-date, have some means of driving tools and other apparatus by power. There are, it is true, foot-lathes, etc., but the repair shop for automobiles and the miscellaneous work naturally attracted by such a shop demand the power drive. The live question is not, Shall I operate with power? but what source of power shall I employ?

The answer to this question will naturally differ under different conditions. If coal is cheap and gasoline expensive, the steam engine will perhaps make the strongest appeal. Or, if fuel oil or tar is cheap and gasoline high, we may still want the steam engine. On the other hand, if we want power for short periods separated by irregular intervals, the steam engine may prove expensive. The gasoline engine is wonderfully suited for use now and then. It may be started up instantly or almost so. When shut off there is no consumption of fuel needed to keep the engine ready for a summons to start up. Gasoline can be had everywhere that automobiles exist. It is not cheap now, and it is not likely to get cheap. There is too much demand. But, as already indicated, one burns it only when the engine is needed. Furthermore, a gasoline engine may be such as to be rather easily used with other fuels, such as kerosene, city gas and natural gas.

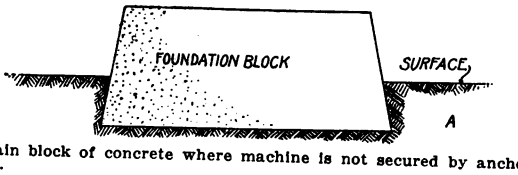
Naturally one cannot give exact figures to cover the cost of operation of all types and makes of gasoline engines. A four-stroke engine requires less gasoline per horsepower than does a two-stroke engine. Nevertheless, some rough estimates may be of advantage. If a gasoline engine is run at an advantageous load, we shall require for each horsepower about 0.13 gallon of gasoline per hour. This may be taken as a pretty good figure for an engine of a few horsepower capacity. Large engines naturally operate more economically—that is, if run at an advantageous load. The actual cost will, of course, turn on the price of gasoline and also on the quality—since there are all kinds of gasolines. With gasoline at 27 cents, a horsepower hour would cost $0.035. Suppose we have a lathe operating at 1½ h.p., a drill press at ½ h.p., a hand miller at ¾ h.p. and a hack-saw at ½ h.p. To operate all these for one hour would cost about 11 1/3 cents. To do this, though, we must operate at an advantageous load.

What, then, is an advantageous load? A fair answer to this may be given by stating that a gasoline engine will run advantageously if operated anywhere from half-load to full-load. Suppose, then, that we have a 6 h.p. engine. The operation of the foregoing machines would barely fall within the required range, since the total load is only 3¼ h.p. If we run the lathe alone, we should be operating at a very distinct disadvantage. We may, in fact, find that it costs just as much for the lathe as for the whole group.

The lesson to be learned is that we should "bunch our hits"—that is, we should seek to have enough machines going at a time to give the engine somewhere near its full load, or at least half its load.

A caution may very well be entered here. The foregoing attempt to give consumption in gasoline per horsepower hour must be regarded as quite insufficient to afford the owner of a repair shop a basis for a fairly accurate calculation for his particular case. He must look on 0.13 gallon per horsepower hour as a good guess for average conditions, but still a guess. It may be close enough to tell him whether he ought to make a real calculation suited to his case.

To make such a calculation, he should determine the horsepower capacity his shop would require. If he has six or seven machines and all are ever to be operated simultaneously, he should have an engine equal to the full job. He must be careful, too, in rating the various machines. The same lathe, for example, will, of course, not require the same power for cutting off thin shavings of soft steel as it will when taking very heavy cuts with the back-gears thrown on. If he has difficulty with the estimates for the several machines, he may apply to the makers of each, when he should be careful to state the character of the work and speed of operation.



Plain block of concrete where machine is not secured by anchor bolts.

When he has secured these data he should consult a reliable manufacturer of gasoline engines as to the size required for his shop.

The purchaser must also determine what type of engine he is going to use. After the decision has been reached to use a gasoline engine in preference to other power producers, it will be necessary to decide between two general types—the two-stroke or cycle and the four-stroke engine. It will be well, then, to have before us summarizations of the main characteristics of these two classes. I follow largely the statements for which Prof. Hirshfeld and Mr. Ulbricht, both on the staff of Cornell University, are responsible.

The two-cycle gasoline engine will ordinarily have a lower first cost and be simpler in design. It is more nearly "fool proof" because of the fewer parts and fewer adjustments. These are marked advantages. On the other hand, one cannot get as much power per gallon of gasoline. Further, irregularities arising out of inexact mixtures in the carburetor are more likely to occur. These irregularities may sometimes take the form of "back firing"; at other times, of complete stoppage of the engine.

The four-cycle gasoline engine will naturally be more complicated in construction and will be a harder proposition to take care of. That is to say, a

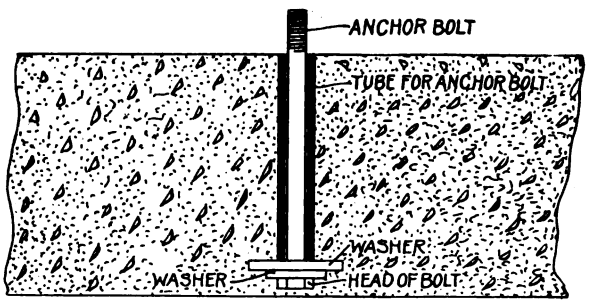
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little more skill and attention are requisite. It costs more. However, more horsepower can be gotten out of a gallon of gasoline. Inexact mixtures will not be so apt to interrupt the smooth working of the engine. Where the load is subject to variations, the four-cycle engine is much better.

On the whole, it would appear that for the repair shop the four-stroke apparatus is the better type, only it takes a somewhat better man to run it. The extra first cost is balanced or more than balanced by the saving in gasoline. We then get smooth operation. However, if the shop has but little call for power operation of tools, then the two-stroke engine will probably fill the bill.

The location of the engine is an important matter. It should be remembered that it is not necessary to put engine and gasoline supply tank close together. Nor is it essential that the engine be very close to the driving pulley on the line shaft. Convenience will naturally be consulted. But there is also the matter of safety first.

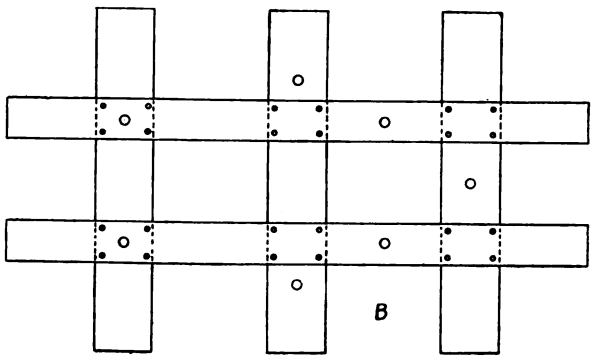
It may sometimes happen that the repair shop is located where it is more or less difficult to get a good solid foundation for the engine or compressor or other heavy piece of apparatus. Thus, such machines may have to stand on unstable earth unless



This view shows bolt in position within the casing, together with the washers. Casing and bolt are held in position during concreting by the template (not shown).

some special arrangements are made. One of the best materials of meeting the difficulty is to provide a concrete foundation block.

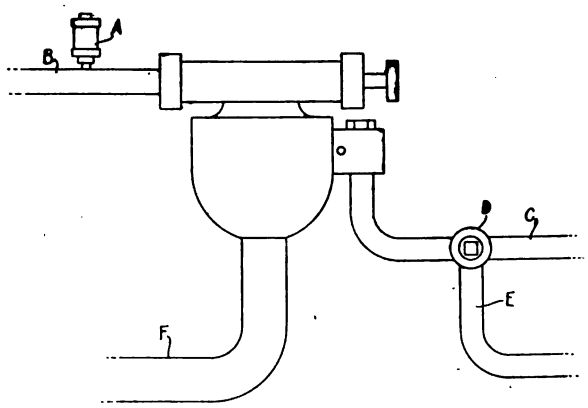
Dig a hole in the earth 12, 15 or 18 inches deep, according to the conditions. This hole is to constitute this form for the concrete. It should, accordingly, have a plan size and shape suited to the bed plate of the apparatus. If the ground at the bottom is not firm and the machine is very heavy, it may be well to enlarge the hole with the purpose of getting a bigger base. Clay that is subject to much softening during wet weather will not be suitable for a support to the concrete block. Sand filled in at the bottom may give a proper support, if the sand will not be subject to wasting away because of the presence of running water. If the bottom is wet all the time, then white oak or yellow pine blocks may be put down to provide a good support. They will not rot if always wet all over. The concrete is poured in to fill up the hole. If the engine or other machine is to be bolted to the concrete, then anchor bolts should be placed in their proper positions before the concrete is put in. These bolts are hung, head downwards, with or without a heavy washer next the head, from a wooden frame extending over the top of the hole. It will hardly be practical to place these with sufficient accuracy to permit the bolts to be concreted all the way from the heads to the top of the block. Short lengths of metal pipe may be suspended along with the bolts. Each pipe envelops a bolt from the top of the block down, say, to the center of the bolt. The bottom of the pipe should be stuffed with cotton waste or other material for the double purpose of holding the bolt central in the pipe and of shutting off the pipe from the entrance of concrete. When the concrete



Plan view of a template used for supporting the anchor bolts during concreting. Circles indicate locations of points of support.

has hardened, we have bolts securely held whose upper halves are free to be bent in any direction to meet the holes or slots in the bed plate. The free ends should have a length equal to 25 or 30 diameters.

The concrete is not at first drilled in so as to bring the top up to the full height desired. Three-quarters of an inch, a little more or a less less, may be left. When the block has hardened, we have a foundation with a lot of threaded stud bolts sticking up here and there over its top. Let the machine down by means of a hoisting block or similar device and shift the bolts so as to engage the holes or slots, but do not let the machine down on the concrete. Instead, block it up with pieces of steel plate and bar steel until it is precisely level and in exact alignment with pulleys or anything else with which the engine, compressor or other machine will have to co-operate. When this has been satisfactorily done, the top layer of the foundation block may be poured. Do not use concrete for it, but prepare a cement mortar—one part Portland cement, by measure, to two parts clean sand. Do not worry about



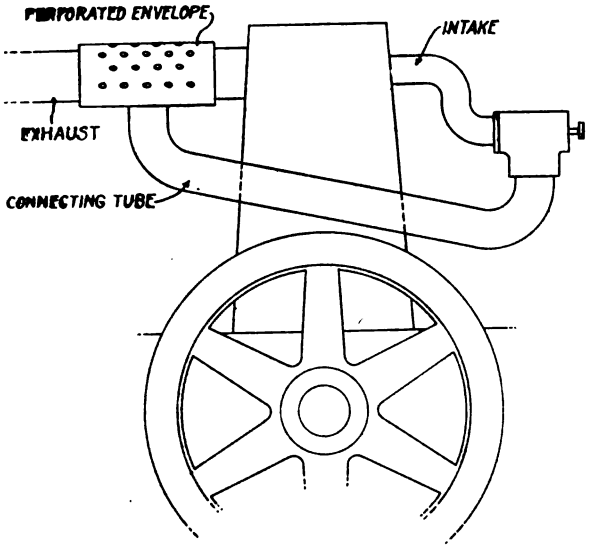
A—Sight feed oil cup used to supply water, drop by drop. B—Intake. C—Gasoline supply pipe. D—Three-way cock. E—Kerosene supply pipe. F—Pipe supplying heated air.

getting too much water into this mortar. If there's too much, the mortar will settle to the bottom and the water will lie on top. The whole top of the concrete may be covered, the steel pieces used to block

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up the machine being involved in the mass of the layer. If the bed of the machine is such that there are good-sized clear spaces where really no mortar is required, we may fence off such spaces by means of a little wall of damp sand. Be sure, in any case, to bring the layer up high enough to provide support for the machine. There is still another way of putting in the cement mortar. By this method the mortar is shoved under the bed and packed in with a suitable piece of metal. Naturally, the mortar should not be over wet. The interior of the short lengths of pipe may be filled or not. The nuts are screwed down over the bolts either before or after the mortar is added. To prevent the mortar from flowing off the top of the block, a rim of moistened sand may be arranged. When the mortar has stiffened sufficiently the sand may be taken away and a tool used to finish off the edges of the mortar layer. The thickness of concrete below the bottom of the metal tubes need not be more than a very few inches. If but little concrete holds the bottom ends of the bolts, it may be well to use rather large washers. We may, if we choose, have the washers tight up against the bottoms of the tubes.

As a rule, turning lathes do not require very solid foundations. They should, naturally, be kept level



Perforated tubular envelope arranged around exhaust and connected with the intake by a suitable tube.

at all times. An engine or a compressor, if heavy, is apt to need a good solid foundation.

In the foregoing, it was in effect, assumed that the sides of the excavation would remain stable and so permit the concrete to be simply poured in. Where the sides tend to cave in, we may use planks to hold them up.

Further—a considerable part of the foundation block may be above ground and exposed to view. Naturally, one would desire it to appear smooth and shapely. To get a smooth surface, the block should be molded against steel plates. These may be somewhat tilted in towards the engine to give a pleasing shape. The form itself may be of wood, the plates being merely set in place just before pouring. The surfaces which touch the concrete should be greased. Crude vaseline, thinned with kerosene, will be a suitable grease.

(To be continued.)

DOES YOUR CAR SMOKE?

If It Does, It Is Liable to Make It Sick to the Stomach.

From H. C. Brokaw, Principal of the West Side Automobile School, New York.—The cop will get you if you don't watch out, if you leave a trail of smoke behind you; then it will be:

"Good mornin', Jedge, your Honor."

"Guilty? Two dollars, please."

"Cheap," you say. Yes, if it were only two dollars; but there is the time lost in appearing in court, and then, really, you know, to make that smoke you were burning money.

Such smoke comes from two sources, burning too much gasoline and using too much lubricating oil; usually the latter. Excessive use of gasoline comes from faulty carburetor adjustment, or poor design of carburetor or intake manifold, or keeping the engine cylinder at too low a temperature, because of the water being too cold in the cooling system.

In the latter case the carburetor may vaporize the gasoline properly, but it condenses in the cylinder and does not burn well and the part which is not consumed passes off as black smoke, which issues from the exhaust pipe.

We must have a certain amount of oxygen to consume the gasoline entirely. The size of the cylinder limits the amount of air (from which the oxygen is taken) which may be taken in and if the carburetor is adjusted to feed too much gasoline, there may not be enough oxygen present to consume it all. Practically speaking, what is not consumed forms carbon or smoke.

The obvious remedy is to supply heat to the ingoing air at the mixing chamber of the carburetor so that vaporization will be complete, or adjust the carburetor so that no more gasoline will be fed to the engine than is required for running. This latter, of course, is the economical thing to do.

A light blue smoke coming from the exhaust pipe indicates too much lubricating oil. This may be due to feeding too much oil or to running the engine a great deal with the throttle nearly closed. In order to draw a charge of gas into the cylinder the piston travels partly out of the cylinder and forms a vacuum. With the throttle wide open a high vacuum is not obtained because a large amount of gasoline and air is allowed to come in and fill the cylinder. The engine is throttled down by closing the throttle so that the air cannot get in in such a large quantity, consequently there is a decided vacuum in the cylinder on each intake stroke of the piston. This vacuum has a tendency to draw oil up past the piston into the combustion chamber, where it burns and forms smoke. This is why, when the machine is left at the curb with the engine running for any length of time, it will often be found to start away with clouds of smoke issuing from the exhaust.

In the same way, when the engine is running slowly, air passes through the carburetor so slowly that the gasoline is not broken up into very fine parts, consequently it does not fully vaporize and is very easily condensed. It forms liquid gasoline in the intake pipe or cylinder. This is called "loading up" and is responsible for black smoke when the machine is started.

One way of overcoming this is to supply a larger amount of heat than usual to the mixing chamber. Most carburetors are not designed to take care of

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this condition and the only remedy would be to stop the engine instead of allowing it to run while standing at the curb.

To overcome smoke from the oil which is drawn up past the piston, it is customary to have a groove turned in the piston under the lower piston ring, with five or six holes drilled in the groove through the piston. The piston ring then scrapes the oil from the cylinder wall into the groove and back into the crank case through the piston walls. This prevents it from working up into the combustion chamber. Many manufacturers do this on the very new models and repair men do it regularly on old models and new models which do not have it.

Sometimes the oil level will be found too high. This may be corrected often by lowering the oil troughs or by filing off the dip on the bottom of the connecting rod so that it barely touches the oil or touches it with a narrowed surface.

In addition to the smoke resulting from too much gasoline or oil there is a large amount of carbon deposited in the cylinder which takes up space in the combustion chamber and raises the compression so high that pre-ignition occurs and the engine knocks. The car must then be taken to a repair shop to have the carbon burned or scraped out. This is expensive work and besides the car is laid up and one loses its use while the scraping is being done. The owner will see that he has been spending a lot of money to supply gasoline and oil that he didn't need to use just to make smoke and carbon and expense and that he is out all around.

Smoke should not be confused with steam which issues from the exhaust pipe in cold weather. One of the products of combustion in the gas engine is water, a natural result of the breaking up of a hydro-carbon. This usually passes off at a high temperature as an invisible vapor. In cold weather it condenses immediately it strikes the air and is visible in the form of what we call steam. Really it is a fog that we create. Therefore do not let the policeman take you in for having a smoking engine, when it is only steam issuing from the exhaust pipe. If he doesn't know which it is you probably can convince him by the color. If it is white it is steam, if it is black it is gasoline smoke and if it is light blue it is the smoke from the lubricating oil. Therefore, watch your exhaust, for there are many eyes watching you just now in parks and city streets.

Remedy for Clutch Trouble.

A repair man says he was recently sent to inspect a car that was fitted with the usual leather-to-metal cone clutch, the trouble being that when the clutch pedal was depressed the cone was withdrawn, but still continued to revolve. He found that no clutch brake or stop was fitted to stop the cone spinning, and that the usual method adopted by the driver was to depress the clutch pedal until its front edge came into contact with the revolving cone and forced it to stop. This had proved to be bad for the clutch pedal, as a deep groove had been worn in it.

He examined the clutch and found that the grease cup, on the central part of the cone to feed lubricant to the spigot or center bearing, was missing. The shortage of lubricant had caused the trouble owing to the excessive friction in the spigot bearing. He had a new grease cup fitted and filled it with engine oil, so that it might have a chance to work well into the grooves and channels of the bearing.

After starting up he kept declutching and letting in the clutch rapidly, so that the oil might get to the required place. After a few minutes the clutch cone slowed down and stopped when the pedal was depressed about half its original travel. Subsequently on a test run he found the clutch was operating quite satisfactorily and left instructions that it was to be run with oil in the grease cup for a day or so, after which the use of grease could safely be resumed, as intended.

Battery or Magneto.

Some years ago it seemed as if the ignition problem had been solved once and for all by the high-tension magneto, and that there would never be any reason to reopen discussion on this subject. Then came the electric lighting dynamo and the starting motor. Their presence as integral parts of a complete motor vehicle involves also the presence of a storage battery. This battery is of an improved type as against the old ignition cells of a dozen years ago. It is also very differently circumstanced as regards care and maintenance. The latter is almost automatic, inasmuch as the first consideration in the maintenance of a battery is to keep it well charged. If this be done, sulphating will be avoided and disintegration of the plates will only occur after a very long period, unless the battery be subjected to perpetual and excessive vibration.

A battery that is always kept well up to the mark by being charged at a proper rate can be depended upon implicitly to supply current whenever it is required. Thus, the old trouble which, more than anything else, killed battery ignition no longer exists when the battery is part of what we may call a complete electrical power station. The old system died because the battery had to be taken to the power station. The new system has great possibilities because the power station is brought to the battery.

Thus, the relative merits of the battery and the magneto systems of ignition are now more evenly balanced than they ever were before, and the advocates of the former system are able to argue that its adoption would mean the elimination of an expensive machine that has become an unnecessary complication. The question has not by any means been settled yet, but it has undoubtedly been reopened, and with it we have other new problems, as, for example, the determination of the proper voltage for the lighting set, and whether lighting and starting should be performed by two separate machines, or by one dynamotor responsible for the dual functions.

In some quarters there is a deep-rooted impression that the magneto spark has a virtue of its own which the coil and accumulator system can never quite equal. This view is not necessarily out of accord with the one already expressed. It means that the magneto will only be abandoned—if abandoned at all—as a method of cheapening car production. In the future we may have one, two or three electrical machines connected with the car engine. Some experts favor the separation of the lighting dynamo from the starting motor except on the very cheapest cars. There is no doubt that the separate machines can be made individually more efficient than the dynamotor, which is inherently a compromise. It is not considered that the

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two separate machines will necessarily involve higher cost.

Possibly the highest priced cars will carry the most effective electrical installation, and this will be found to be best provided by retaining the magneto and by using a lighting dynamo and a starting motor. In connection with the system, there may also be an induction coil, so that two separate ignitions may be available. If full dependence be placed on one it would probably be upon the magneto rather than upon the battery system.

If, for general simplicity in the matter of drives, we want to keep electrical machines down to two in number, it is very difficult to say whether we should be better advised to abandon the magneto, or to combine the lighting dynamo with the starting motor. At the present moment the general tendency is in favor of two separate machines for lighting and starting, although at one time efforts were concentrated mainly on the double purpose machine. This change tends to the conclusion that battery ignition has been found so efficient in every respect as to make it probable that it may become standard not only on cheap, but on medium-priced cars.

GEAR CHANGING.

The Art of Doing It Correctly and Without Damage to the Gearbox.

The car driver is bound frequently, from one cause and another, to change gears. As there are so many cars in general use it is reasonable to assume that the majority of drivers are capable of doing this with more or less ease, otherwise there would be an outcry for further information, or simplification in the mechanism itself. Now, it is quite one thing to change gear, and another matter to change gear properly.

It is a practice which every driver should endeavor thoroughly to acquire; and this for many reasons. In the first place, a bad gear-change is detrimental to the whole mechanism of the gearbox, and the gear control levers, striking rods, etc. A bad clash in gear-changing means that a distinct tendency is set up towards the chipping, or, in these days, perhaps, the scaling of the gear wheels themselves. Then, again, a fiendish noise is made, which is likely to give a very bad impression, both to the occupants of the car and those near at hand, while in the third place the bearings of the gearbox are subjected to an end thrust of considerable force owing to the big leverage provided, and consequently there is also a strain put upon the control mechanism which it is not intended to take.

Gear-changing is very considerably easier on some cars than on others, but so far as the broad principles of gear-changing are concerned the writer, with a large and diversified experience, has not yet found one on which ordinary gear changes could not be made properly with a little practice and reasonable knowledge of the car in question. This qualification is meant to apply only to the gear changes as such, and when it comes to what one may term super-refinement in the art of gear-lever manipulation there are some cars which absolutely refuse to do that which one is endeavoring to accomplish.

It is entirely unnecessary for any noise whatsoever to occur when gear-changing, whether the step be made from neutral to a forward or the reverse gear, or whether it be from a low gear to a higher one, or, on the contrary, a step downwards. Let us, then, go into it carefully and see if we cannot all learn to become expert in the art of changing gears. At the present time quite a large number of drivers, although able to make a gear change, do no care to do so at a high car and engine speed, and consequently do not come down from the top gear on a hill until the severity of the hill in question forces them so to do, although it may be perfectly apparent, even at the start, that a change is bound to be required before the summit is reached. This is not as it should be, and every driver, so soon as he comes to that portion of the hill where his engine tells him intuitively that it is about time to make a change in order to keep the engine running at its best efficiency, should proceed to do so without any hesitation or worry as to the possibility of making a bad change.

To go into this matter fully, it will be well in the first place to endavor reasonably well to appreciate the actual nature of the operation effected from the theoretical standpoint, so as the more readily to grasp

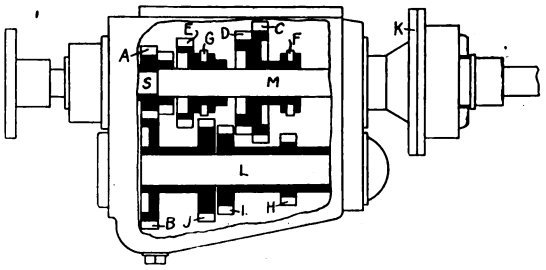


Fig. 1—Gears in Neutral Position.

the practical side of the question advocated. Not only is it desirable to have some cognizance of the actual movement of parts inside the gearbox, but it is as well to be able to appreciate them relatively to their mechanical significance, and the momentary and after effect which such movements produce.

To start with, then, in the vast majority of gearboxes the work of changing gear consists in withdrawing one toothed pinion from mesh with another and making another pair of pinions engage. To first put such a contrivance on to a motorcar, more especially with the metals at that date available, was a bold conception, and could it have been put to most of the engineers of the present day without the light of the practical proof of its possibilities, it would, in all probability, have been decried as a mechanical abomination. But the marvelous state of efficiency and success to which it has been brought in the motor industry is so good an excuse for its existence as almost to give the lie direct to the criticism.

This movement which we have to get is obtained by the simple work of pushing forward, or bringing back, the change-speed lever. It is now necessary to consider the question of speed ratios and their bearing upon the subject, as that is all that a gearbox is. We have an engine which is capable of a certain torque, or power output, and a car of a good weight to be driven along roads of varying surface and gradient, and with different wind resistances, etc. Now, suppose that engine gives off the maximum power it is capable of producing at 1000 r.p.m. Again, suppose that with the final

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gear axle ratio, size of wheels, etc., the speed would then be 30 miles an hour on a level road. For the moment let us carry that imaginary engine and car in our minds and take a homely simile to further us on our course of understanding fully the value of gear ratios.

Suppose we have a large block of rock which it is desirable to move. We find on trying that it is quite impossible to move it with the hands, and we consequently bring into use a crowbar. Having got the crowbar under the rock and placed a stone or similar fulcrum on which to exert the leverage which we are going to put into the crowbar, it is still found impossible to move the rock which we are anxious to get rid of. Obviously, the next step is either more power in the shape of an assistant on the "business end" of the crowbar, or, if an assistant is not forthcoming, then a longer crowbar.

It will be found that the powr which the person in the imaginary case is capable of exerting at his maximum output, although failing to remove the rock with a small crowbar, is still, by bringing into use a longer one, capable of easily accomplishing the work. That is to say, that with a given capacity of power output he is able to accomplish work with big leverage which he cannot do with small leverage. Bringing the simile nearer the subject matter under

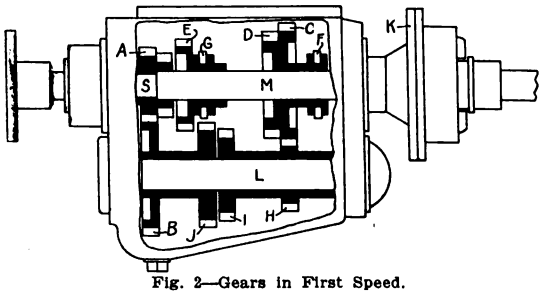


Fig. 2—Gears in First Speed.

consideration, the ratio of gearing is such a thing that when increased the engine is able to do that which could not be accomplished otherwise.

Now, let the engine trying to drive the car up a steep hill be the equivalent of the man trying to move the rock. Neither can accomplish the work in hand. The man, however, with the greater leverage is able to accomplish that which he could not perform before, and similarly, therefore, the engine, if we can provide it with a bigger ratio of leverage, can make the car climb the hill.

It is for neither more nor less than the giving of this different leverage that the gearbox is installed upon a car. Now, in the case of the long crowbar, assuming the man still to exert his given power and to do so at a given speed, the rock will be moved more slowly than it would if the crowbar were, say, only half the length, and the movement where the power is applied to the shorter one carried out at the same speed. It is exactly the same with the gearbox. Assuming the power to remain the same and the speed the same from the engine, then the resultant power output, if it is to be great enough to take the car up the hill which it could not climb before on the direct drive, must necessarily be slower. We get then the cardinal point that the speed of the gear wheels has to vary considerably with the engine running at a given speed. Now, a little consideration will show that, if the gear change is to be effected quietly and neatly, means must be found for making those gear wheels run at approximately equal periphery speed at the point of contact. The full knowledge of this phase of the gearbox is essential to a good gear change.

The Four Speed Type.

Let us now go through a typical four-speed gearbox and carefully follow the theory of the operations, using the illustration as an aid to the study. First of all we have the wheels A and B, which constitute what are usually termed the constant-mesh pinions, that is to say, wherever the gear lever is put, at neutral or otherwise, these two pinions are always in mesh and revolving, on the assumption, of course, in the latter case, that the engine itself is working and the clutch not withdrawn. Now, in the first illustration we see these two constant-mesh pinions in their position for revolving together, but as none of the three gear wheels on the layshaft L, are in engagement with the wheels on the main shaft M, no motion is conveyed to the back axle.

At this point, for the benefit of the novice, it may be pointed out that the primary shaft is divided and that the three gear wheels C, D and E, are in no way connected with the gear wheel A, the end of the shaft on which the said three gear wheels are mounted having a bearing inside the gear wheel A, the bearing in question S, being commonly known as the spigot bearing. Now, by means of the change-speed lever, we are able to move through the medium of the striking lever F, the two gear wheels C and D, while by means of the other striking rod G, we can move the wheel E, forwards or backwards from its position in the first illustration.

Now, just for the sake of argument, we will assume that the wheel A, has 20 teeth and the wheel B 40 teeth, so that when A is revolving at 1000 r.p.m. the wheel B and with it the layshaft and the other three wheels, H, I, J (these are fixed solidly on the shaft with B), are revolving at 500 r.p.m. Now, it is obvious that the slower the universal joint attachment K, revolves in relation to the speed of the engine the greater is the leverage applied to that said universal joint; therefore, we look on the layshaft L, for the smallest wheel and on the primary shaft M, for the biggest wheel, so that the reduction from the layshaft to the primary shaft may be as big as possible for the low gear.

It is easily seen that it is necessary for us to obtain this low gear to move the wheel C, into engagement with the wheel H, remembering, of course, that the wheels on the layshaft never change their position; but the engine is running and therefore the layshaft is likewise running because of the constant-mesh pinions, so that if we try to bring C into engagement with H under these circumstances trouble will ensue. Therefore, we must declutch so that the engine can revolve without any portion of the gearbox revolving. We can now safely move the wheel C, into engagement with the wheel H, as both are stationary. A second or two must be allowed from the time when the declutching movement is made to permit the constant-mesh pinions to cease revolving, as there is a certain amount of momentum stored in the clutch member and these wheels which has to spend itself before they come to rest.

Having moved the gear lever into the first speed position, and thus getting these two gear wheels into mesh, we can now let the clutch in gently, the result being that the engine begins to drive round the

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wheel A, which in turn makes B revolve at half the speed, and then the wheel H drives the wheel C, once again reducing the speed as compared with the engine. If, for the sake of argument, the small wheel H, has only 10 teeth and the big wheel C, has 50 teeth, obviously the wheel C will only revolve once for every five revolutions of the wheel H; in other words, great leverage is provided.

In addition to this, however, we have assumed that the constant-mesh gears already make a gear reduction of 2 to 1, so that if the engine is going 1000 revolutions the wheel B is only making 500, and H likewise goes at 500, the wheel C only goes at 100 r.p.m. This double reduction constitutes the great leverage previously referred to.

It is soon found, however, that the road conditions

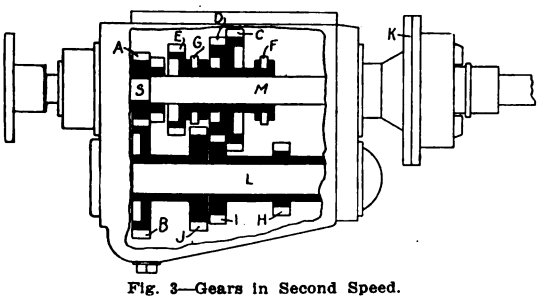


Fig. 3—Gears in Second Speed.

warrant a change into a higher ratio, and we have naturally to look for the second gear. This will be made up naturally by the next smallest wheel on the layshaft, and the next largest one on the primary shaft, remembering, of course, that the constant-mesh pinions never change. Therefore it is necessary to make the wheel D engage with the wheel I.

Obviously, however, these two wheels could not engage at the same time as the low gear ones, so that before they are made to engage we have to declutch and move the wheel C out of engagement with the wheel H. Therefore, we again take our change-speed lever and bring it from where we put it before into neutral position, which has the effect of pushing wheel C forward towards the engine so that it is out of engagement with wheel H, by which time the wheel D is getting quite close to wheel I. We must remember now that when we were travelling along a few moments ago on the first gear the layshaft L, was revolving at 500 r.p.m., while the primary shaft M was only revolving at 100 r.p.m., that is to say, the layshaft was doing five times the speed of the primary shaft.

If, now, the second-speed gear wheels I and D have respectively 25 and 35 teeth, it is evident that if those teeth are to be made to engage while both are revolving the periphery speed (not the actual number of r.p.m.) must be approximately the same. Going back for a moment to our first speed, the gears in mesh meant relative speeds to the shaft of 500 r.p.m. for the little one and of 100 r.p.m. for the big one, and if these speeds were maintained exactly the wheels could be taken out of mesh and brought into mesh again with consummate ease.

Now to get into the second gear. We have assumed 25 teeth for the wheel I, and 35 teeth for the wheel D, in other words, a proportion of 5 to 7. Now, it is necessary to remember that when we declutch to go out of the first gear the car still goes along, and through the tailshaft forces the primary shaft M, with its gear wheels, to continue revolving, although naturally they will slow down a little bit by the time the actual change is made.

If we assume that the car speed falls down to the equivalent of 90 r.p.m. for the primary shaft instead of 100, then for the wheel D, quietly to mesh with the wheel I, it is necessary for the layshaft to run at 7-5 $\times$ 90 r.p.m., in other words 126 r.p.m., so as to bring the actual speed of the teeth equal. But when the engine was running we knew that the layshaft and therefore the wheel I were doing 500 r.p.m. To effect the change we declutched, and naturally the engine is slowed down at the same time, and the slight pause in the neutral which is made allows the layshaft L, to slow down from its 500 r.p.m. to about 126 r.p.m., so that this change up can be made more or less automatically and easily. In other words, the actual order of events is such that the natural procedure in practice fits in beautifully with the theoretical requirements.

Therefore we find ourselves in the second gear with the constant-mesh gears still in mesh and wheel I driving wheel D, and the clutch is let in and the engine again accelerated up to 1000 r.p.m. The result is, therefore, that, while A is still doing its 1000 r.p.m., B is doing 500 r.p.m., and I the same number of r.p.m as B, but I only having five-sevenths the numbers of teeth of the pinion D, it D, only does five-sevenths of 500 r.p.m., or about 355 r.p.m. Therefore we find the tailshaft is being driven faster than it was before, and consequently the leverage from the engine to the tailshaft reduced, but the speed of the car increased.

We now want to get into the third speed. From our previous arguments we look for the next largest gear wheel on the layshaft, which is J, and the next smallest one on the primary shaft E. It is therefore necessary first of all to move D out of engagement and to bring E into engagement. Consequently it is necessary to operate first the shifting lever F, and then the other shifting lever G. In operating the first and second gears, however, we have already been moving the lever F, so that coming back from

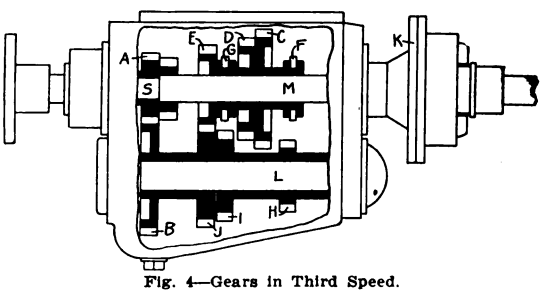


Fig. 4—Gears in Third Speed.

second to neutral we disengage D from I and leave the wheels C and H likewise out of engagement.

We now have to pick up wheel E, and bring it into engagement with wheel J, and to do so it is necessary to pick up the striking bar G, which, of course, means coming through the gate. We do so. Now we will assume that wheels J and E have 30 teeth and 30 teeth respectively. Therefore the two wheels want to be revolving this time at just the same number of r.p.m. in order to make a perfect change.

The procedure is very similar, with this difference. When we were in second we found the primary shaft, and therefore the wheel E, revolving at 355 r.p.m.,

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while the layshaft L, was doing 500 r.p.m. But it will be remembered that when we declutched, the car, through the medium of the tailshaft, still continues to drive the primary shaft and with it, of course the wheel E. If we assume this slowing down process which takes place when the clutch is disconnected to bring the speed of the primary shaft down to 150 r.p.m., then it is requisite for the wheel J, being the same diameter as E, to be revolving at just the same speed.

Consequently, a slightly longer pause is requisite in order to give the layshaft time to slow down a little more proportionately than it did before, and this is happily again provided by the action of going through the gate. Do not, therefore, be in too great a hurry to pass through the gate when going from second to third. On letting the clutch in again to pick up the drive on the third speed, we find wheel A, once more doing 1000 r.p.m., wheel B doing 500 r.p.m., and J, being fixed to the same shaft, likewise doing the same number, J and E, being respectively 30 and 30 teeth, we get the same result of 500 r.p.m. for the wheel E.

We now want to go into top gear, which is commonly known as the direct drive. Just at the back of the wheel A, are seen what are termed dog clutches, and there are slots on the inside of the wheel E, to correspond to these, so that if E is pushed forward to engage those dogs E and A are locked together and the primary shaft then travels the same speed as the engine.

We have, however, to remember here that A, just before the moment of declutching, was doing 1000 r.p.m., while E was only doing 500. Now when we declutch the speed of E will drop to, say, 450, and

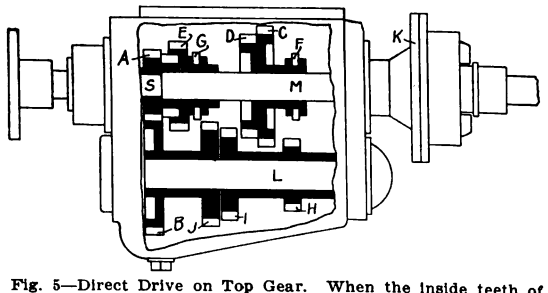


Fig. 5—Direct Drive on Top Gear. When the inside teeth of E are moved into engagement with the smaller teeth on gear wheel A, the direct drive is obtained.

therefore, before the slots in it can be engaged with the projections on the wheel A, the speeds of the two wheels must be approximately equal; in other words, the speed of the engine must drop down to about 450 before the engagement can be made with silence and without jar. Therefore, an appreciable little pause after coming out of third is requisite before engaging the top gear.

We have now been right through the whole theory of the why and the wherefore of quiet gear changes in an up direction, and, epitomizing the theory, in practice we get the following effects:—(1) To come through neutral into first, having declutched, wait a moment for the constant-mesh pinions to come to rest so that the low gear wheels may be engaged. When one is in too great a hurry to get into low gear and a little noise results, it is because the layshaft has not stopped revolving and one tries to bring into engagement with the revolving pinion on the layshaft the stationary first-speed wheel on the primary shaft, which is in direct engagement with the tailshaft of the stationary car.

To get into second a slight pause is requisite to allow the layshaft to slow down, which is usually provided sufficiently by the practical movement of changing the gear and the passage through the neutral position. To get into the third speed again a little pause is requisite—provided kindly by the natural order of affairs—in this case by having to pass through the gate.

To come into the top speed, still another pause is requisite, which should be made in this case by allowing the change-speed lever to rest for a second, or it may be two seconds, in the neutral before putting it into the top gear notch. The amount of time for resting between the changes depends largely on the type and efficiency of the clutch stop fitted. The ratios of the gear wheels selected are taken rather on account of their simplicity than as exemplary of an ordinary proportion for actual use.

Now, this has all been fairly straightforward and plain-sailing work, as beyond the mere question of waiting a moment before engaging the first gear and waiting a moment before engaging the top gear, the theoretical requirements are automatically accomplished by the natural construction of the gearbox and the conditions which obtain.

In our next issue will be considered the work of changing down, which is a more difficult art, and although so much time has been spent on the explanation of the comparatively simple changes, nevertheless the knowledge gained will help us greatly in coming to a complete understanding of the more difficult operation of effecting a perfect change from a higher to a lower gear.

PAINTING THE CAR.

If You Must Do It Yourself, Do It According to This Method.

It is seldom advisable for a car owner to paint his own car. He can usually give the job to an experienced vehicle painter and the real cost will be less to him than if done by himself. Moreover, the result will be far better than the "home-made" work, for it must not be expected that the surface of the panels and other parts can be brought to such a degree of excellence as is secured by a coach painter. Years of experience, the best materials, and a special workshop are necessary to obtain the glasslike finish associated with professional coach-painting; but it is not every motorist, by any means, who desires to secure this high finish, a very large number merely wishing to obtain a finish which is quite presentable and a protection for the metal panels, wings and wheels.

Importance of Rubbing Down.

There is no doubt that after repainting two or three cars one becomes more experienced and accumulates certain little wrinkles during the progress of operations, and the writer has reason for saying that on each occasion he has attempted to paint a car he has been able to improve still further on the result of his initial efforts.

One little point may illustrate the contention, and that is it was found when too late, when the first car was being treated, that better results could have been secured if the initial rubbing down of the old paint had been more thorough. It is firmly believed

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that if another couple of hours had been put into this work a fifty per cent. better result would have been secured.

Preparing the Car.

The first thing to be done is to remove certain detachable portions of the car, so that they may be treated more conveniently and allow access to other parts which they would screen if left in position. For example, the wings, back and front, should be detached and treated separately. The same applies to the wheels, although these need not be removed all at one time if means for jacking up each end of both axles be not available. When such parts as the wings, lamps, horn and hood have been removed, the next thing to do is to remove all traces of mud and grease from every part to be painted. It may be thought that there would be no necessity for removing all signs of grease from the center of the back axle, for the reason that as the axle casing is not prominently in view under normal conditions it would not matter if the paint at this part were a little discolored. This, however, is very bad reasoning, for although it is quite true that blemishes in the paint on the back axle will not be noticeable afterwards, yet if such a part were left with a small amount of grease upon it such grease would work into the brush, and not only cause blemishes on the parts to which paint is next applied by the same brush, but the grease would to some extent get into the unused paint and have a bad effect upon it. The same applies to dust and mud on inconspicuous parts. A few grains of dust would not matter if they were left on one of these inconspicuous places and remained there, but a hundred chances to one, particles of this dust would be picked up by the brush and remain embedded in it for some time, subsequently to make their appearance when the same brush was being used for a part where blemishes would form a very visible disfigurement.

Care with Brushes.

On a second-hand car from which it is almost impossible to remove every speck of dust, dirt and grease from the parts to be painted, it is distinctly advisable that one or two special brushes should be reserved for such details as the axles, steering connections, springs, and fixed hubs, so that if by chance dust or grease were picked up by the brushes on these parts it would not be transferred subsequently to such conspicuous parts as the wings or body panels. It should be borne in mind however, that it is no use having separate brushes for axles, etc., if these brushes are, when in use, dipped into the same pot of paint or varnish as the brushes used for panels. In dipping a brush into the paint pot one usually picks up too much paint and removes the surplus by scraping the brush against the edge of the pot. In doing so any dust or grease which is in the brush may be wholly or partly scraped off into the pot, to be picked up later when another brushful of paint is taken. Therefore, for use in connection with parts normally in a greasy condition and places where one cannot ensure the removal of every speck of dust special brushes and a special pot of paint should be reserved.

The Cleaning Process.

To return to the cleaning process, after the usual cleaning methods have been adopted—sponge, leather and water—some gasoline or turpentine, a brush and a clean dry piece of cloth should be used to go over every part once more. Even then it is not advisable to be satisfied that all grease has been removed, but another clean piece of cloth should be taken and all the more conspicous and important parts, the panels and mudguards especially, should be gone over carefully with this rag, which should be damped with turpentine.

The Rubbing-Down Process.

Assuming that all grease and dust have been removed from the chief details the next thing to be done is to smooth down the old paint. There are three means available in connection with this rubbing-down process: (1) glass paper, (2) pumice powder, (3) pumice brick. With a piece of medium glass paper any prominent blemishes should be smoothed off, but there are usually numerous small blemishes on the surface of a second-hand car which can far better be treated with pumice powder, or with pumice brick, the latter having certain advantages in revealing any hidden blisters of old paint which, sooner or later, usually develop even on the best work. The best way to use pumice powder is to tip some into a saucer and make it thoroughly moist with water, and then to use a piece of thick felt which can be obtained from an oilman or a paint shop. This felt is a quarter to three-eighths of an inch in thickness, and should be cut up into two or three small pads; one pad, for instance, may be 2 inches long by 1 inch wide, another may be 4 inches long by about 2½ inches wide.

Removing Old Brush Marks.

The pad of felt to be used should be thoroughly moistened in water and then one face of it dipped into the moistened pumice powder and used thus on the body panels, rubbing the latter by a circular motion where possible, and exerting a fair amount of pressure. The smaller pad will be used for getting into corners and other places where the larger pad, which enables large surfaces to be treated more quickly, cannot be used. After about three or four minutes' work on, say, a door panel, it will be found that the rubbing-down has brought into prominence blemishes which were unnoticed before. In the case of one car the writer dealt with, the original applications of paint and varnish had not been very skillfully laid on, and the rubbing-down process revealed many hitherto unnoticed brush marks. Unfortunately, on this occasion the writer formed the opinion that these brush marks would be filled up by the paint which he intended to apply, and therefore he took no trouble to flatten them down, only to find subsequently that the streaks were perpetuated and showed up very prominently after the new paint had been applied. Consequently, on subsequent occasions he took greater care to see that any existing brush marks in the old paint were completely removed.

Care Necessary with Small Parts.

In order to ascertain whether a panel, for instance, has been well flattened, a sponge and water must be used to wash off the pumice powder adhering to the panel, and then the water dried off with a wet leather, as when washing a car in the usual course. What is called a water brush is generally used in washing off pumice powder, etc., but for the amateur who wishes to limit his purchases of tools and materials, a leather will serve quite well.

Here a warning may be inserted in connection with little parts which stand out rather promi-

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nently from the main panels, for if care be not used more effect will be made upon the paint on these prominent spots than upon the main surfaces; such things as the beading of panels and the rivet heads on the bonnet will very quickly be bared to the metal if treated as part of a large surface. Therefore, the beading and any prominent spots should be rubbed down separately and avoided as far as possible when the main panels are being attended to. This also applies to the beading of the wings. Some mudguards are stiffened by having a ridge formed in the metal near the edge of the guard, and if an attempt be made to rub down this ridge at the same time as the main surface of the guard, the top of the ridge will speedily be cleared entirely of paint.

A Warning.

No attempt should be made to apply new paint to any portion of the car until the rubbing down process has been absolutely completed. For instance, when the body panels and mudguards have been done it is very inadvisable to start off by painting those parts before the wheels, springs, etc., have also been rubbed down. The reason for this is that when the unflattened parts are dealt with subsequently a certain amount, probably a good deal, of dust will be flying about and will settle on the freshly painted portions and cause blemishes on the surface. Therefore each process should be completed before another is commenced. So much trouble in the rubbing down need not be taken in the case of the wheels, but usually these require some fair amount of treatment on the beaded edges of the rim, as there is usually very little paint remaining after a couple of years' service if tires have been changed on many occasions.

After the rubbing down has been completed steps must be taken to secure the removal of all the pumice powder remaining on the panels by the generous use of water, sponge, wet leather and brush. The pumice will be found to have worked into every nook and cranny, but it must be removed before any attempt is made to apply the fresh paint.

The Dust Evil.

When, therefore, one has made a good job of the rubbing-down process, or at any rate has spent as much time on it as one is prepared to devote thereto, the next thing to do is to clean up the garage. The reason for this is that it is most important when applying paint that the air in the workshop or garage shall be as free as possible from even minute specks of dust, which float in the air almost unseen except in sunlight and settle upon the freshly treated surface. The floor of the garage should be swept very thoroughly, not merely with a hard bass broom but with a soft house brush as well. Whilst this sweeping is being done it is advisable to push the car well out of the way, as otherwise an unnecessary amount of dust will be deposited upon the surfaces to be treated.

So important is the question of keeping down the dust in a paint shop that in the course of his training a professional coach painter is taught to avoid, if possible, moving the whole length of his arm when making a stroke with the brush; one object of this is that in completing a very high finish even the fluff on the clothing, loosened as the arm is moved to and fro, will cause a blemish if it settle on the varnish.

The foregoing, of course, is carrying matters to extremes, so far as the amateur layer on of paint is concerned, but it is mentioned to give some idea of how careful one should be to remove from the workshop or garage as much dust as possible before the actual painting operations are commenced, and to avoid disturbing any dust which may unavoidably remain.

(To be continued.)

A FEW KNOCKS.

Different Kinds, But None Can Be Considered Less Than an Injury.

From H. C. Brokaw, Principal West Side, New York, Automobile School.—There is a Bowery missionary who tells his audiences that "every knock is a boost"; that may be true of verbal knocking, but I am inclined to think that auto knocks do not do much boosting, but have a contrary inclination.

Do not imagine if your engine starts knocking while you are out on the road that your cylinders are filling up with carbon, or that the main bearings are worn loose. The knock may be from a totally different source. In fact, there are so many different kinds of knocks that even an expert cannot tell always just where it comes from without totally disassembling the engine. Even then it sometimes puzzles him a lot by its elusiveness.

Most engines have a knock of some sort which annoys the driver, which might vary from a barely perceptible click to a blow that may be heard by persons standing on the sidewalk. A great many of the knocks do not do any harm; that is, they are not causing any damage to the engine parts; but there are some knocks which require immediate attention to prevent the demolition of the engine or seriously damaging it. Some of these are loose connecting rod bearing; cylinder loose on its base; lack of lubrication and consequent overheating; and a broken revolving or reciprocating member, which might tear things up if allowed to run. The spark advanced too far puts an excessive strain on the crank shaft and a short circuit in the ignition system does the same.

On the other hand, there is no immediate danger if there is a piston slap, though pretty noisy; nor is there when the oil pump gives a thump or loud click at the valve seating. But on general principles when there is a knock its cause should be ascertained at once and expert advice obtained as to whether it is dangerous. If so, it must be fixed before running further. If it is only a minor knock the repair can be left to a more convenient time.

So many of the knocks are only a matter of annoyance; that is, they do no more harm than to cause the driver unnecessary nerve jars and to spoil the pleasure of riding. But he will bother the various garage men and everybody else he can get to listen and then will not accept the assurance that the knock is not doing any harm.

As a matter of fact there are knocks peculiar to certain makes of engines that the manufacturers have not seen fit to eliminate because they are not harmful. Among these is the so-called "gas knock." Now I do not know what a "gas knock" is, and I doubt if anybody else does. But it is a common term for the kind of a knock which cannot be located anywhere and it is laid to some action of the gas.

Sometimes the knocks are hard to locate. One of our cars needed a new cam shaft gear to replace

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a worn one which produced a knock. It was put on, but when the engine was started it was found there was a worse knock than before. It took a long time to find that it was the new gear. It fitted very tight on the shaft and had to be forced on. Without being noticeable the forcing had cracked the hub and this cracked through the rim, so that two of the teeth were out of true and had spread enough to pound when that portion of the gear came into mesh.

Another knock difficult to locate is caused by sticking exhaust valves. One of the valve stems had been oiled and this had been allowed to burn to a nice sticky paste. Now, when the push rod opens the valve and starts down the valve does not follow closely. The spring brings it down, of course, but more slowly than it should, because of the sticky stem, and when the stem and push rod meet there is a thump.

It is ordinarily said that a lean mixture of an overadvanced spark will cause knocking. As a matter of fact they do not do anything of the kind; but it is true that these things bring to our notice other faults, such as worn piston or cylinder wall and consequent side slap, or they magnify some other worn part so that it becomes audible. As a matter of fact it is possible to advance the spark so far that it will try to reverse the engine and not have a particle of knock. And it is possible to have so lean a mixture that it will hardly run the engine, without a knock; but if there is something else wrong it will bring that out. Some of the causes of knocking discovered at the school have been collated and are given for the instruction of the novice:

Mechanical Looseness, Due to Improper Adjustment or Wear.

Loose connecting rod bearing, crank pin end.
Crank pin bearing out of round.
Main bearings on crank shaft loose.
Bearings too tight.
Wrist pin loose in piston.
Wrist pin loose in upper end of connecting rod.
Wrist pin not in line with crank shaft, causing side slap.
Piston ring loose in slot or broken.
Cam follower guide worn.
Cam loose on shaft.
Cam shaft bearing worn.
Worn cams (flat spot).
Flywheel loose on crank shaft (old models with keyed on wheel).
Flywheel out of balance.
Timing gears loose on shaft.
Worn or broken timing gear teeth.
Cylinder loose at its base.
Engine loose from frame.
Piston too small for cylinder, causing side slap.
Poor push rod adjustment—gap too great.
Exhaust or inlet valve sticking in guide.
Spark plug touching valve.
Magneto coupling loose.
Fan belt coupling striking a pulley.
Fan blades striking something.
Worn cylinder, causing side slap.
Bent crank shaft.

Faulty Ignition.

Spark advanced too far.
Spark too late, causing overheating.
Short circuits in ignition system causing irregular spark.
Spark plug points constructed wrong, causing them to overheat.
Spark plug in poor position.
Wrong timing of ignition system; too early, too late, or wrong order.
Dirty distributor, misdirecting the current.

Faulty Carburetion.

Pre-ignition, due to excessive carbon deposits.
Rich mixture, causing overheating.
Lean mixture, in conjunction with worn parts.

Faulty Lubrication.

Lack of oil.
Lubricants of poor quality.
Excess of oil, causing carbon deposit.

Overheating of Engine.

Fan not working.
Pump parts not revolving.
Radiator clogged.
Pipe lines clogged.
Rubber hose defective inside, blocking flow of water.
Ignition timed too late.

Faulty Compression.

Engine designed with too high compression, causing pre-ignition.

There are, of course, many other causes which contribute to the little noises which accompany the car along the road, but the novice will find here the most common ones, and by a process of elimination may arrive at his particular bane; to find it naturally suggests the cure. Therefore, stop that knocking.

A Gasoline Conserver.

N. R. Grimshaw, Detroit representative of the Standard Oil Company, after a personal inspection of the radiator shutter in use on the Columbia Six, informs officials of the Columbia Motors Company of Detroit that the shutter was an invaluable aid to the complete consumption of the low-test gasoline which motorists must use. He highly recommended the shutter as not only a great gasoline conserver, but also as an aid to more efficient lubrication.

Mr. Grimshaw pointed out that the radiator shutter was useful in warm as well as in cold weather—a feature that is not generally noticed.

"With the heavy grade of gasoline now in use, it is of prime importance that the motor be heated as quickly as possible to just below the point where the water will boil over, and this the radiator shutter accomplishes," said Mr. Grimshaw. "This is not only that greater efficiency may be secured from the gasoline, but also that gasoline may not be given opportunity to leak down into the crank case, where it will thin out the lubricating oil."

J. G. Bayerline, president of the Columbia Motors Company, says that the radiator shutter ranks in importance and in the comfort and convenience which it affords the motorist, with the self-starter, and is without an equal among attachments of its nature in the extent to which it contributes to the greater economy and efficiency of the motor car.

"A cold motor can be forced to run by choking the carburetor, but this is a dangerous practice and often results in serious lubrication difficulties and excess carbon deposit," says Mr. Bayerline. "Besides, a cold motor will not run sweetly nor show any power. The shutters on the Columbia radiator keep out the cold air from the cooling system until the motor arrives at the proper working temperature."

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M. T. RICHARDSON, President and Treasurer — F. R. WHITTEN, Secretary

A. A. HILL, Editor

F. R. WHITTEN, Advertising Manager

F. M. DAMPMAN, Eastern Representative — H. F. LUDINGTON, Western Representative

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK MAY, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

LET US HEAR FROM YOU ON THIS VITAL QUESTION.

If the proposal of the Ways and Means Committee in the House of Representatives to increase postage on second-class matter from 300 to 400 per cent., goes through Congress, it will probably be necessary for us to raise our subscription rate to at least $1.50 a year.

We should like to learn from our readers what they think of such an increase in rates. How many of you will stand by us if we raise the rate to $1.50 as you have been standing by us on a dollar a year?

Of course, you know that the price of everything has increased. White paper is in many cases fully a hundred per cent. higher than it was, and other things entering into the publication of our journal have increased in similar proportion.

If we were able to keep the price at a dollar, we should like to do so, but if the postage goes up to the point contemplated, there would seem to be no alternative on the part of publishers everywhere except to raise subscription rates.

We want to hear from our readers about this. Write us a letter and tell us what you think of it.

We would also suggest that you write to the two Senators from your State at once and protest against this increase in postage. There are plenty of other ways of raising money besides killing the publishing business of the country by such an unjust increase in postal rates as is contemplated. Nobody objects to paying the income tax or the excess profits tax, but the publishers want to live, and unless they are allowed to do so, they cannot pay any taxes whatever.

SIGN YOUR NAME PLAINLY.

The perversity of some people in writing letters and signing their names is positively astounding. It is no unusual thing to get a letter written so distinctly all the way through, that every word disconnected from the letter would be recognized, and then have the writer sign his name in a combination of hieroglyphics it would be impossible for anyone to decipher. In point of fact, the name of a person writing a letter should be the one thing above all others to be signed distinctly, because there is nothing connected with it, as there is with the text of the letter, to enable the recipient to recognize what it is. It is not an uncommon thing for us to get a letter typewritten and have a name signed to it, as the saying used to be years ago, that would "puzzle a Philadelphia lawyer," although why a Philadelphia lawyer is any smarter than any other lawyer, we have never been able to find out. We want to ask our readers to kindly bear these reflections in mind in writing to us.

THE GOSPEL OF SPEED.

In automobile driving as is the case with all other vehicles, the safety of the streets or highways invariably depends upon the speed with which the automobile is driven. The car may be driven fast or slow, but no matter what the speed, the accident might have been avoided if it had been driven slower. "But," says some one, "suppose the car is being driven slow and some one suddenly runs right before it and gets killed, who is to blame?" We reply: In nine cases out of ten, the car driver. Instances may be conceived where if a human being is bent on suicide, he might accomplish it by being run over. Yet if a car is being driven carefully, and the possibility of some one taking a notion to dash into it be borne in mind as of course it should be, no accident need occur unless something is wrong with the car.

One of the police magistrates of this city has moved to have the proposed auto law in this State changed so that in the city of New York it will contain a speed limit. But why a speed limit in this city more than anywhere else? A car is always being driven too fast if liable to cause an accident, and it cannot be driven too fast if not liable to cause such accident—except to the driver or the owner of the car, which of course the law is not bound to shield; the punishment in such case simply fits the act.

It is true that driving in this and in all other large cities should be at far less speed than in the country or in less congested localities. But a clause in the law forbidding any one to drive at such a speed as would endanger other users of the street or highway, would amply cover the requirements. And who should be the judge of such dangerous speed? Why, if the police or other guardians of the peace if any were around to note the violation, and if not,

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any reputable citizen. And the word of the citizen or the police should be taken as against the car driver in every case.

Rather drastic and unusual, we hear some one say, but the situation itself is decidedly unusual, and on the whole, we know of no better way to handle it. Anything of this sort is so infinitely to be preferred to speed limits, that there is no comparison. A car may on a given occasion or place be driven far faster than a speed limit, and still not be driven dangerously, or it may be driven far slower than the speed limit and yet be driven at a risk. One of our city magistrates says the proposed law might well be described as "a bill to license the maiming and killing of the people of the City of New York," yet if such a law were well enforced it would make the streets far safer than at present.

FARMERS AND THE CROPS.

The American Steel & Wire Company of Chicago, has just issued a circular with a report of crop conditions as observed by its travelling salesmen all over the country. At the date given—April 28—the indications promised well for large increase of acreage and efforts, but of course this does not necessarily mean increased production, for "Paul planted, Apollos watered, but God giveth the increase." In any event, whether there be much or little production of foods, the prices will be high. Yet in order to give confidence to the farmer it will surely do no harm for the government to fix minimum prices. We take pleasure in quoting from that part of the circular which covers the subject from the standpoint of the farmer:

"The farmer is just a human being; he is contemplating affairs as other do—perhaps with little more intelligence—and he is going to solve his problems from personal consideration just as others do, despite loud talk to the contrary. Don't apply special rules to understand his motives. An analysis of the farmer mind at the moment will be helpful to all. He must be amused at the sudden deep solicitation of the banker for his welfare, for he remembers the interest and renewal commissions he has paid this man. Looking backward he sees 1893 when he sold his corn for 16 cents or burned it in the kitchen stove. The hogs went for a pittance.

"Rightly or wrongly he suspects, or believes, he has no part in naming the prices for his produce. Speakers and newspaper headline writers have made him believe the 'Board of Trade' has priced his grain, the 'Packers' priced his live stock, and the 'Elgin Board' his butter fat, the free lance speculator his eggs. He cannot forget when he sent that carload of apples to Market Street expecting a good return, and in place of which he received the polite request to send his check to cover expenses. He has never been able to see why his potatoes must remain on the ground, unsold, when the Chicago man, a hundred miles away, can't afford to use them on account of high price. Suspicious by nature, he is doubly suspicious of the hue and cry, from every side, that he grow crops to the limit of his financial ability; breed all the brood animals on the place, etc., etc. Isn't he doing as much as the other fellow?

"Manufacturing and merchandising are always paralyzed by uncertainty, the currents in the channels of commerce at this very moment are slowing down on account of price uncertainty. The farmer isn't a fool, what of his prices? Business has the machinery to stabilize and will soon run on as usual. Provide the machinery to stabilize the prices of the 1917 farm crops and the farmer will take care of the rest.

"Give the farmer a chance to brace himself and you can lean on him, and 'business as usual' may once more be the order of the day. You won't have to worry about enough to eat for our people and allies. For years he has had preached to him, by Government and State official, 'Don't follow Europe in securing large yields per acre. Remember prices are best obtained by holding down production.' Let the Federal Government establish prices of crop and live stock, help the farmer to credit and labor, and the farmer will do the rest."

Let us all rejoice that at last a great business firm gives without stint what is due the farmer. In too many instances those who provide the food that gives us sustenance have been the mark of derision and jeer of every alleged wit of the press and of the cheap and brainless vaudeville shows to say nothing of others who have a better quality of brains but who ought to know better. The average intelligence of the farmer is today higher than the average intelligence of the city bred, and to be successful in his calling requires closer study and wider information.

The statement made that "rightly or wrongly, the farmer believes he has no part in naming prices for his produce," is important and true. Moreover, when the purchaser alone fixes the price for any commodity whatever, the owner and seller is invariably at a disadvantage, and often at a loss that means ruin or distress. The writer well remembers when a lad that his father used to go to town with farm produce, and invariably he said to the merchant: "What are you paying for butter"—or whatever produce he had—"today?" Of course, he always accepted the price offered by the merchant. And still worse—when he came to spend the money thus received for farm produce, he asked: "What do you ask for sugar"—or flour, or groceries of any sort—"today?" Moreover, he incariably took what the merchant offered for the thing he himself owned and gave what the merchant asked for the things the merchant owned.

A more unfortunate condition can scarcely be imagined than one where the owner of a commodity is obliged to sell what he owns at such price as the purchaser chooses to pay and where he is obliged to pay for such things as he needs at such prices as the owner asks.

How long would the automobile manufacturer exist if he were obliged to ask purchasers: "How much are you paying for automobiles?" How long would the grocer or the doctor or the shoe dealer or the baker survive in business if the price for his product were to be fixed by the purchaser?

Yet it is expected that the farmer shall be so inflicted and that the man who works for wages shall suffer it, except in cases where "union rules" fix arbitrary wages, and the worst of this last is that if employers do not choose to pay what is demanded, lawlessness is often practiced in an effort to compel them to do so. Imagine a grocer or an automobile dealer attempting, by boycott, personal attack, or other lawless methods, to compel a purchaser to pay more than the market rate for groceries or automobiles. Could anything be more

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absurd or reprehensible? Yet such acts and feelings are common among sellers of labor, although its sale or purchase is of absolutely the same character as that of the sale or purchase of any other commodity. When anything is such a drug on the market that the owner and seller can have nothing whatever to say as to the price he shall receive for it, the only remedy is to take steps to either increase the demand or decrease the supply. The abnormal condition must be corrected by economic methods only. An attempt to correct it by crime or wrong is as futile as it is reprehensible.

We are glad to know that the farmers have awakened to the fact that when they are unable to control the prices for their products they can under no circumstances prosper.

CHEAP PRODUCTION.

Fiddling while Rome was falling was merely an innocent pastime compared with this country taking no account of the wonderful strides Japan is making in cheap production of manufactured goods.

We have never shared with others the feeling that Japan has any sinister designs toward this country. To imagine that she will ever attempt to invade the United States transcends the limits of reason; that such an attempt would be successful is as preposterous as it is humiliating. One does not like to harbor the thought that this great nation, by far the most enlightened, progressive, resourceful, rich and powerful of any on earth, has anything to fear from a little nation 10,000 miles away.

But that Japanese industries will give us trouble unless we return to a genuine protective tariff goes without saying. According to the computations of reliable investigators, the total capital invested there in new industries during the first nine months of 1916 amounted to $487,000,000. Not long ago the Japanese government issued a regulation for the promotion of the manufacture of dye stuffs, drugs and chemicals, and thus under a subsidy new undertakings have rapidly appeared with immense capitalizations when it is considered that a dollar will go much further in that country than this.

We might cite many instances of Japanese competition with products of the United States, but two or three will be sufficient. In the matter of safety razor blades a New Britain, Conn., manufacturer closed down because he can have them landed at his own door far cheaper than he can produce them. In the case of snap fasteners, Japan is supplying them in this country at the astonishingly low price of $24.33 per hundred gross, or about 2½ cents a gross. It is easy enough to see how it is done: An American workman gets more in a day than both a husband and his wife get for the work of a week in Japan.

Just as soon as this war is over the tariff on manufactured goods must be raised two or three times—it can't be too high if we want to keep the goods out—or American workmen must have their wages cut to an extent with which a condition of slavery would be far preferable.

THE GASOLINE SITUATION.

The man who inordinately uses his car for pleasure riding just now is not a good citizen; the man who uses it or allows it to be used for whatever military purposes may be needed, is an admirable citizen.

According to a high Standard Oil official, the gasoline production of 1917 will not be sufficient to last through the year unless radical conservation measures are taken. He estimated the 1917 production at 2,500,000,000 gallons, of which American automobiles would use 2,000,000,000 gallons, leaving 500,000,000 gallons for use by military trucks and for export to the Allies. He added:

"The conservation and hoarding of our gasoline supply is an important question. The supply of oil cannot be increased. Either strict measures must be taken by the government or double the amount of value extracted from the oil."

This last statement is important if true. It indicates a commendable interest in the public welfare, but an interest not borne out by the enormous profits exacted by Standard Oil practice.

A compilation of statistics shows that since the government dissolution of the old Standard Oil Company, the component parts have distributed $629,000,000 in dividends. Of this enormous total, approximately $406,000,000 has been in cash and $223,100,000 in stock. The magnitude of this return made to holders of the shares is emphasized by the fact that the oil trust's capitalization when the dissolution occurred, in May, 1911, was less than one-sixth of the dividends which had been distributed.

During 1916 and the first quarter of the current year, the various concerns have disbursed $119,192,328 in cash and $65,000,000 in stock dividends. This total of approximately $184,000,000, disbursed in slightly more than one year, is more than one-third of the aggregate paid out in the preceding four and three-quarter years.

This is exactly what this magazine claimed would happen when the dissolution was ordered. It ought to be plain to everybody that identical interests cannot be made to compete with one another, and it seems to be equally plain that unless there be some method of curbing it, any monopoly will take as much profit as it dares to.

If the railroads are to be forbidden by the government to raise dividends during the period of this war, even though they are not now earning enough to keep up their rolling stock and road beds, together with the necessary betterments that make for permanency, why should the Standard Oil components be allowed to earn such enormous dividends? The Standard Oil Company is just as much of a monopoly as it ever was, and it is a pretty decent monopoly at that; the railroads are largely competitive. Why restrict the competitors and allow the monopoly to exact whatever it feels like taking from the helpless public?

FRACTIONAL CURRENCY NEEDED.

There is a great need of some kind of fractional currency more convenient and safe to send by mail than anything that now exists. A decidedly large portion of the public are not fortunate enough to possess bank accounts, and even if they were, many do not like to draw a check for less than a dollar, nor is a check always considered reliable by the recipient. Postage stamps are not always readily at hand and they are undesirable for mailing purposes. Postal or money orders cost something in cash and more in the time and bother it requires to get them.

Neither are silver coins satisfactory for several

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obvious reasons. Paper dollars are the most convenient form of currency for mailing, and when the amount needed is even dollars they cannot well be improved. Here at this office we invite the sending of cash in this way, and the loss by such means is trivial. It is only when the amount to be sent is in fractions of dollars that trouble, waste of time, and a liability of loss exists. Coin cards are little less than a nuisance. The cards are expensive, not always at hand, they often add to the cost of postage, they are liable to break through the envelope, and they are something of a temptation to any weak will through whose hands they pass, for they can invariably be detected through the enclosure.

By far the best form of fractional money to send by mail from one place to another would be paper currency. In these days of the universal use of the mails for business transactions, a decidedly large portion of the public, particularly those living in rural districts, who have occasion often to send money in this way, would welcome it. There would not be the slightest doubt as to its face value, and the objection made that it is not durable applies with equal force to paper dollars. A twenty dollar bill will wear out just as soon as a twenty-five cent piece of paper money.

As is well known, the only reason why this convenient form of fractional currency, in use for some time after the Civil War, was abandoned, was the objection of the silver mine owners. They preferred the silver fractional currency simply because it supplied a market for their bullion. But that reason no longer exists. They can now find a market for their product at a far better price than during the time the fractional paper currency was in circulation.

The only forms of such currency needed are 50, 25 and 10 cent denominations. Publishers as well as the general public would be benefited by the issue of such currency, and as there can be no possible objection to it, they should unite in an effort to secure it.

TOBACCO AND WHISKEY.

Just at this time every foot of soil devoted to the production of tobacco, and every bushel of grain used for the purpose of producing alcoholic beverages, should be used for producing sorely needed food.

The hundreds of thousands of acres of land now used for tobacco, with its unusually large amount of necessary fertilization and cultivation, would produce millions and perhaps hundreds of millions of dollars worth of potatoes and what is called "garden truck." A soil and an intensive cultivation necessary for the successful production of tobacco must be sufficiently rich and well worked to raise enormous crops of garden products. In fact it is richer than need be to produce the ordinary cereals.

Now lest the writer be accused of wild and fanatical notions upon the subject of smoking and drinking, he will say with some humiliation that he has been a moderate drinker and somewhat immoderate smoker all his life, although he is inclined to think the smoking and the drinking have always done him more or less harm. But be this as it may, both tobacco and whiskey are at least of doubtful value to human beings, and just now when every acre of land is sorely needed to produce food, and possibly to produce sufficient food to prevent a world famine, it is little less than a crime to devote rich and necessarily highly fertilized and cultivated land to tobacco raising.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2135 A Mysterious Sound.

From Lyman M. Smith, New Jersey.—I have a 1917 little Six Buick car. I have noticed that when I increase the speed of the car above twenty-five miles an hour, what seems to me to be a dull thud or pounding sound in the motor, similar to the sound which would be produced by a loose bearing except that the sound is of low pitch, that is to say, it hardly seems like a clapping sound of one metal pounding on the other. This sound only occurs when the car is speeded up above twenty-five miles an hour and of course increases with higher speed. I have run the car about three hundred and seventy-five miles and I have taken it to the agent of whom I purchased it, who has examined it and says he can find nothing the matter with it and that there are no loose bearings and that most Buick cars make this noise. He did say that the spark was a little late and he corrected this fault but even then the sound is in the motor. Can you suggest what the cause of this might be? I might further say that the agent adjusted the carburetor but before he adjusted it I was only getting ten miles on a gallon of gas and he says that I ought to get from sixteen to eighteen miles. I have not had an opportunity to test out the mileage since the carburetor was adjusted but even with the adjustment of the carburetor, the sound above mentioned is still apparent.

Reply.—Apparently, this is another of those peculiarities that appear in many cars of like models. Other owners of this same model Buick car have complained of this sound and the service men have been unable to overcome it. We venture the opinion that the sound is due to the peculiar crank shaft, crank case and fly wheel construction. We cannot suggest a remedy, but perhaps the assurance that the same sound in other machines has not caused any mechanical trouble, will make it less objectionable to you.

2136 Second Gear Slips Out.

From E. P. Haskins, New York.—I have a Maxwell, 1916, model 25. I am bothered with second gear slipping out. Will you kindly tell me the cause and the remedy?

Reply.—This may be caused by a worn bushing

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on the forward end of the sliding gear shaft. The trouble, however, is more likely due to a worn plunger or a weak or broken spring on the gear shift lock. These springs and plungers may be removed and examined by taking out the screws on the side of the shifter lever housing just ahead of the shifting lever. With careful testing, it may soon be determined whether or not this lock is all right. It is intended that the spring should push the plunger into a notch in the gear shifter shaft and hold it sufficiently tight to keep the gears from working out of mesh, but not to make shifting with the lever difficult. If this does not prove to be the trouble, examine the fork at the gear itself for wear.

2137 **Fails on Second Speed.**

From a Reader, Ohio.—What makes a motor fail on medium speed? It pulls good on first and third speed. The batteries are tested full. My car is a Buick model B-25, 1914, and is equipped with Delco system.

Reply.—This can hardly be caused by anything but poor carburetor adjustment. It is likely that the adjustment is such that good power is not obtained at high engine speed, even though the engine pulls strongly at lower speeds with the throttle wide open. When the gear is changed from high to intermediate, the engine speed is immediately increased but it lacks power. This would be the same on the first speed gear, but because of the greater leverage would not be so noticeable.

2138 **Why It Loads Up.**

From C. W. Burnham, Mississippi.—I am in trouble with a model 69, Overland car, equipped with Schebler carburetor. The car is in good shape, except the carburetor seems to load up at times too much. The engine runs fine except when it loads up. We got a new carburetor of the same make and it did the same way. The float and needle valve are in good shape. When the engine is running you can stop it and the gasoline will be dripping from the carburetor. The ignition is good. I have been working on gasoline engines long enough, I thought, to know a little about them, but this trouble gets ahead of me. Please let me know through your valuable magazine what is the trouble.

Reply.—It is very difficult to vaporize the present grade of gasoline, and where conditions are unfavorable, such as a long or poorly shaped manifold or one with a very rough interior, the gasoline, though vaporized at the carburetor, will recondense in the manifold. The easiest way to overcome this trouble is to heat the ingoing air or use a water-jacketed carburetor or supply heat to the inlet manifold. In some cases all three have been found necessary.

2139 **Poor Ignition.**

From Dr. M. W. Kurniken, Pennsylvania.—What is the matter with my car? It is an Overland 80 Roadster with a Schebler 1" carburetor and the trouble seems to be with this instrument. When the air valve is adjusted for a lean mixture, I seem to have enough power, but there are terrifying muffler explosions and when it gets more gas and less air, I cannot get up Boulevard Hill and have to crawl along in the most humiliating manner. The valves were ground and the carbon has been burned out and the oil renewed, but this does not seem to hit the trouble. The car gets kind treatment, is fed gas and oil, such as it likes, regularly and ought to behave better; the garage men evidently do not know what to do and I appeal to you as a court of last resort to help me out in my need. I thank you in advance for any courtesy you may extend to me.

Reply.—A lean mixture is harder to ignite than a rich one, therefore, your trouble is probable due to poor ignition. Make sure that the interrupter points are perfectly clean and properly adjusted. Also, try widening or narrowing the spark plug gaps.

2140 **Engine Stalls.**

From J. L. Eagleson, California.—I had a 1917 Ford touring car in the shop the other day that I could not figure out what was the trouble with it or where it was located. I tried adjusting the carburetor without any improvement; also looked to see if the high and low transmission band was too tight, but that was O. K. Well, this is how the engine acted. It ran all right when running idle, but when it dropped back to high gear it chocked right and stopped. I have thought since that maybe the clutch finger pins were too tight and when it dropped back in high they pressed too hard on the clutch disks and that was what stopped it. Any information as to what the trouble with this car is will be appreciated.

Reply.—Adjusting the clutch finger pins too tight would not cause the engine to stall when high speed was engaged. Although you do not mention it, we presume that the engine pulled all right on low speed. Anything that would cause loss of power in the engine might not give trouble when the engine was running idle or pulling in first gear, but would so impair the power that the engine would not pull the car on high speed. We would suggest as possible causes for the trouble—emergency bands badly worn and locked on, or a weak magneto that does not deliver a good spark at low engine speed.

2141 **Battery Charging.**

From a Reader, New York.—I have a battery, 6 volts 40 ampere hours, which I use for lighting tail and side lamps. I charge separately from a house-lighting circuit and not from a dynamo on the car. The point about which I am not sure is how much charge remains in the battery; sometimes I have obtained a shorter lighting mileage than at other times. I have a voltmeter for testing, but even when the battery has been nearly exhausted the indication has always been two volts per cell. I, therefore, conclude that a voltmeter is not reliable as an indication of the amount of charge remaining in the accumulator. Can you give any information on the subject?

Reply.—The ordinary voltmeter is not intended to give more than a rough idea as to when the battery is fully charged, partly discharged, and fully discharged. A more accurate and larger scale instrument, on which finer readings could be taken, would be more reliable as to various intermediate stages in the battery discharge. The measurement of the varying density of the acid electrolyte during discharge is the only reliable indication. There are

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special hydrometers made for this purpose. Some batteries are made with hydrometer attachments.

2142 **Carburetor "Chokes."**

From Irwin F. Kratzer, Pennsylvania.—I have a Hudson touring car, model 6-40, 1916. I have run it 3000 miles and in going up a hill it seems to choke and lose power. I have a Zenith carburetor which is self-adjusting. What can be the cause? It is a high speed motor. I do all my own repairing. There is no carbon in the cylinders as I cleaned it all out and ground all the valves.

Reply.—If by "choking" you mean that the mixture becomes too rich, it is possible that the float mechanism becomes jammed and allows too much gasoline to enter the float chamber. On the other hand, the gasoline might be choked off at the strainer underneath the float chamber by an accumulation of dirt, so that when more gasoline is required, as in going up a hill, a loss of power is noticed. As you say, this carburetor has no adjustment and about all you can do is to make sure that plenty of heat is supplied to the ingoing air, that gasoline reaches the float chamber in sufficient quanity and that the spray nozzle passages are not clogged. If, with these points all right, it does not operate properly, it is time to call in a Zenith expert or get a new carburetor.

2143 **Motor Misses and "Belches."**

From C. M. Kellogg, New York.—I trust you may be able to give me some suggestions on a motor in a model D, 35 Buick car, as I am unable to locate the trouble and the Buick people don't seem to know. This car is equipped with a Splitdorf mangeto which has been discharged and cleaned; also a new coil of the same make installed. The motor is in fine shape; the compression is good, push rod clearance O. K., good new plugs, timed O. K., breaker points new and gap O. K. This motor runs fine on any speed around 10 miles or over, but as soon as slowed down for rough spots, or when you start from a standstill, the motor seems to get too much gas, misses and belches black smoke. I have had others try to overcome this trouble, but have been unable to find relief. I have tried three new carburetors and they all act the same. Have on now new R Schebler carburetor which has a fine pull to it, but it does not seem to make any difference how lean the mixture is, as soon as you give it gas to start this choking will occur, until the motor gets up to a high speed. The spark position does not seem to make any difference, neither does it work any better on 4 new dry cells, as I thought the magneto was lazy on slow speed. The compression seems to be equal on all cylinders, as well as the spark, but you cannot idle down the motor real slow unless it seems to have a limping motion on dry cells or magneto. The valve springs seem to be all in good tension. This Buick Company thinks it may be intake valve trouble, but they all seem to be all right. I trust you may have some enlightenment you may be able to give me on the matter, as it is very trying when you want to start to have it smoke and choke up. The motor always starts very nicely.

Reply.—This trouble may be due to worn intake valve stems which allow air to enter and thin down the mixture. In an attempt to overcome this, the carburetor has been adjusted to give a very rich mixture at low engine speed. However, a proper mixture cannot be procured until this leak is overcome by replacing the worn parts. A leaky inlet manifold gasket will give the same trouble, as it will be found necessary to supply too rich a mixture to four cylinders in order to get a rich enough mixture to explode in the other two. Insufficient heat to the mixture will also give the same symptoms.

2144 **Cleaning the Transmission.**

From F. Conklin, New Jersey.—Will you kindly tell me how to clean the transmission on a 1916 Hup touring car? It is separate from the crank case.

Reply.—Remove the top cover. Drain case by removing the plug in the bottom. Replace plug and fill case about half full of kerosene. Jack up one rear wheel and run the engine several minutes with the gears in mesh. This will wash the gears so that it will be an easy matter to finish the job with plenty of kerosene and a cloth, after the draining plug has again been removed from the bottom of the case. Carefully remove any metal sediment found in the bottom of the case. After the case has been thoroughly wiped out with the cloth, fill with a heavy oil or a light grease to a point where the lubricant just touches the lower side of the transmission shaft.

2145 **Raising the Carburetor.**

From F. S. Bullard, Maryland.—I would like to know the following: I have a 4-cylinder, 4-cycle, 4½ by 5-inch marine engine that has a very long connection between the intake and the carburetor. Will it consume more gasoline to raise the carburetor up close to the inlet manifold? I can raise it at least a foot.

Reply.—Probably not.

2146 **Fierce Clutch.**

From Edgar F. Stannard, Virginia.—The clutch on my car has a tendency to grip suddenly. It is of the leather to metal cone type, and it seems to release hard. The clutch has not had much use and all I have done to it is to apply a few drops of castor oil, as you advised me some time ago.

Reply.—Probably the leather is in bad condition or the rivet heads are level with the surface of the leather. If this be the case, they should be hammered down with a metal punch. Also in any case try giving a thorough cleaning with kerosene and then add a small amount of graphite.

2147 **Fixed Timing.**

From A. L. H., Indiana.—I have obtained a second-hand car, which has fixed ignition timing. Can you give me any information how to avoid backfiring, as with another car I experienced a backfire that left me with a sprained wrist for several weeks? This happened with a car that had coil and battery ignition by a plain make-and-break on the engine, and it occurred when the timing was fully retarded. Has the question of the mixture proportions anything to do with the degree of risk in starting up?

Reply.—If it is possible to have the alteration made it would be advisable to have variable timing fitted. The makers of the car, however, would not be likely to give more advance to the magneto than is safe, even with fixed timing. If the contact make-

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and-break is set so as to break when the piston is a short distance from the top dead center, the risk of backfire is negligible, providing the starting handle be held properly and the pull-up made as sharply as possible. The carburetion has some bearing on the question, insomuch that a properly proportion mixture fires easier than a weaker one, which means greater difficulty in starting up.

2148 **Timing Gear Noise.**

From S. W. E., Ohio.—I have a two-cylinder car, the cranks being set at 180 degrees. The engine runs with excessive noise, this apparently coming from the timing gear wheels. The inlet and exhaust cams, which are placed on opposite sides of the cylinders, rotate in the same direction, getting their motion from a loose intermediate steel gearwheel driven by the crank shaft gear. The noise is noticeable when the valves are closing, and especially when the inlet valve of one cylinder and the exhaust valve of the other close together. How can I stop or reduce this noise? Can you also explain why, although the spark is advanced, there is a constant firing back along the inlet pipe into the carburetor? I have a magneto fitted with variable spark timing.

Reply.—Noise from a timing gear is generally caused by a considerable amount of backlash, due to wear of the gear teeth, and the only permanent remedy is to have a set of new gear wheels fitted. The noise is certain to be worse when the valves operate, as this would be the time when the backlash would cause a sudden jerk on the timing gear system. The backfiring is probably due to weak mixture—the carburetor therefore requires some attention—or it may be the result of a slight leakage of air into the mixture.

2149 **Battery Charging.**

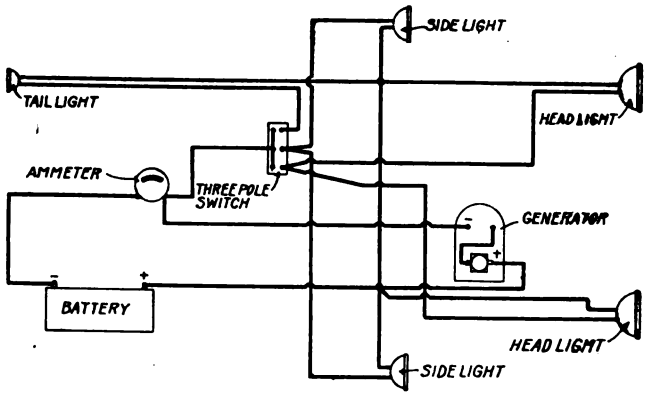
From Major C. J. Swaddling, Canada.—1—Can I charge a battery or a number of batteries from an already charged set of storage lighting batteries as used in lighting a building? 2—What amperage should I get out of a storage battery having a single positive plate 8½ x 5 x ¼ thick? I have 120 of these storage batteries and charge them during the day with a direct current 100-volt generator. I thought I could connect a customer's 6 or 12 volt battery with a certain lot of my own ready charged batteries which would give off the right number of amperes and by that means would be sure of a good, steady flow of current for a certain number of hours without the necessary attention which would be required if charged through a stack of lamps direct from a generator. I have been charging from a generator before the war, but now that I am back and my two sons are still at the front, I find it impossible to do everything myself and am on the lookout for the easiest and most certain way besides the most economical way, and charging one of a few batteries through a bank of lamps is far from economical, yet I have not heard of anyone having tried charging from other storage batteries. Of course, way back in 1896 I used the primary battery for charging what we British call a storage battery. If you can help me I shall be greatly obliged.

Reply.—1—We judge that you wish to charge your customer's batteries by connecting them direct to your storage battery. This could not be done without inserting a variable resistance in the circuit which would need the same attention as a bank of lamps. While greater efficiency would be obtained by charging with a low voltage, that is, four large cells in series against a three cell battery to be charged, to accomplish this it would be necessary to connect your large battery in series multiple, because the four cells would not have sufficient capacity to fully charge the three cell battery. 2—The ampere output of a given plate varies considerably with the condition of the plate and its construction. In a general way, this capacity may be figured at 40 to 60 amperes per square foot, the area of both sides of the plate being included. The thickness of the plate may be disregarded.

2150 **Wiring for a Vesta Generator.**

From Chas. E. Barbour, Massachusetts.—I wish to install a generator on my Cadillac, 1910 car. The car was equipped with Prest-O-Lite before. Would you please send me a diagram of wiring, which I would appreciate very much. I have a Vesta generator which I wish to use. I thank you in advance for any information.

Reply.—The wiring given below will answer your purpose.



Wiring for a Vesta Generator on a 1910 Cadillac Car.

2151 **The Fixed Spark.**

From W. S., New Jersey.—What advantage, if any, is obtained with variable ignition timing as compared with fixed timing of standard magneto ignition? I can have either system and fixed timing has been recommended, as it is stated to be the simpler of the two and gives practically the same results.

Reply.—There are advantages in having variable timing. A better all-round efficiency should be obtained with variable timing, though this depends on it being always handled so as to suit the varying conditions of driving. It is chiefly an advantage when climbing to be able to adjust the timing to suit the speed and load. It is an advantage, also, to be able to retard the ignition when starting up, and thus avoid risk of a backfire.

2152 **Coil and Magneto.**

From Abel Gordon, Iowa.—I have a four-cylinder car fitted with the high-tension magneto ignition system. It is in every way satisfactory in running, and my only difficulty is in starting. Can you inform me as to the method of connecting up a coil and battery to the magneto so as to intensify the spark at starting? I have a good vibrator coil and battery, and have been informed that there is a way of com-

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bining them with the magneto so that the spark is made much stronger.

Reply.—It is not impossible to get a stronger initial spark by sending a battery current through the primary winding of the armature; but it is likely to have a bad effect in the shape of weakening the magneto after a short time. It is an entirely self-contained machine, and must be used quite distinct from coil ignition. To use this latter system it must be adapted to a separate set of spark plugs and the usual make and break. Do not experiment with a magneto. Leave it alone to do the work intended.

2153 Wiring a Dash Ammeter.

From H. L. Angell, Iowa.—Would you please tell me how I could wire a dash ammeter to a 1915 Grant six car?

Reply.—The easiest way to install an ammeter is to remove the wire as shown in Fig. 1 from the

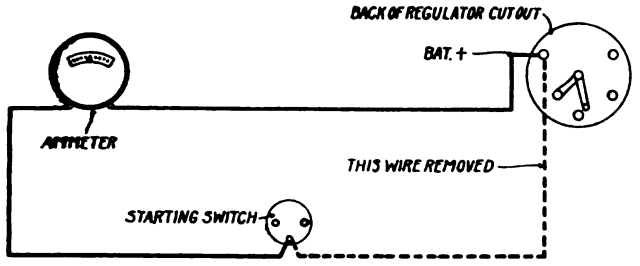


Fig. 1—Ammeter Shown Charging Current to Battery.

battery plus terminal on the back of the cut-out and connect it to the ammeter. Then connect a new

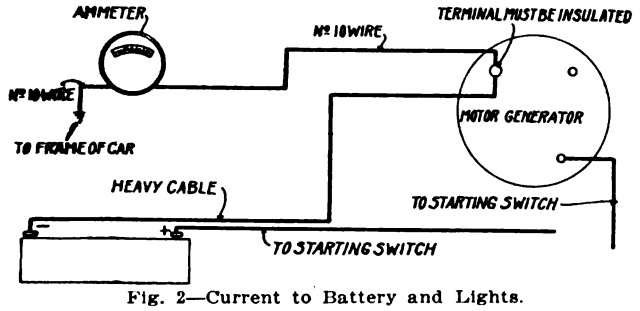


Fig. 2—Current to Battery and Lights.

wire from the other terminal of the ammeter to the battery plus terminal of the cut-out. With this connection, the ammeter will show only the amount of current going into the battery. If you desire to have the ammeter indicate the current used by the lamps it will be necessary to insulate the terminal at the motor generator to which the heavy wire from the battery is attached and then run a No. 10 wire from this terminal to the ammeter and another from the other terminal of the ammeter to the frame of the car, as shown in Fig. 2.

2154 Kerosene Is Not a Lubricant.

From J. F. Topliff, Maine.—I have been advised to add about a pint of ordinary kerosene to each gallon of lubricating oil. The advantages claimed are that this admixture prevents the pistons gumming up, and the starting can be effected more readily. Can you recommend this treatment, as my engine is usually stiff when starting, and I have to inject kerosene into each cylinder except when the engine is quite warm?

Reply.—Kerosene is not a lubricant, and trouble with the bearings would very likely result if such a mixture were used. There would be more carbon formed than there would be otherwise, owing to the kerosene burning up more readily than the oil. Nothing should be added to the engine oil. It is much safer to keep to the present method of injecting a little kerosene into the cylinders when necessary. It is possible that a lighter grade of oil would give better results. Most oil manufacturers supply different grades for winter and summer conditions.

2155 Initial Battery Charging.

From W. J. Dye, Pennsylvania.—I have a 40 ampere-hour battery which has not yet been charged. It is quite dry, and apparently has not had any acid in it. Can you tell me how to proceed to charge it? I have a 200-volt electric light supply in my house.

Reply.—Such a job should always be done by experienced hands if this can be arranged, as there are a number of special points to be observed and the proper charging rate has to be used, otherwise the battery may be spoiled. A first charge has to be of long duration, and the charging current be regulated to the specific amount for that size of battery. After the first charge it may be possible to give subsequent chargings from the house supply by following the instructions gven in books covering this subject, though it costs considerably more than it would at a garage with proper charging equipment. Home charging is wasteful of current, particularly from a high voltage supply.

2156 Maxwell Cut-Out and Regulator.

From A. W. Annis, New York.—1.—We have a Maxwell, 25-horsepower, 1915, model car, which has been driven about 4,000 miles. After this car had been run about 1,000 miles the combination cut-out and regulator began to give trouble. After adjusting it, it would work a short time and quit again. After a time it burned out entirely. A new one was purchased which was not exactly like the first, but the Maxwell Co. said it would work just the same, but we found it impossible to make it work at all. This was returned last fall. We now have another cut-out like the one we returned, but cannot make it work. The ammeter stands at zero all the time and the battery goes down very rigidly. Expert electricians have worked on this car and failed. The generator seems all right, but the current does not

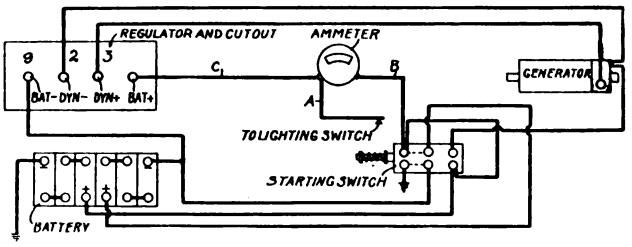


Fig. 1—Original Wiring of 1915 Maxwell Two-Coil Regulator.

get to the battery. It is a Sims-Huff generator. This car looks and runs like new, except this fault. We do not understand the wiring of the car and so far have been unable to find any one who does. This is a puzzle to us and we would like to get it in shape as soon as possible. 2—Would it do any harm to run ths car without the cut-out and regulator on. The regulator that came on the car was made by Briggs & Stratton. We sent the old one to them and requested them to send us one like it, and they

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referred us to the Maxwell people, and they will not send us one like the one that came on the car.

Reply.—1—Fig. 1 shows the original connections to the cut-out and regulator. These are numbered and lettered and named so that each wire may be identified in Figs. 2 and 3. Fig. 2 shows connections if a fuse block was supplied with the new cut-out, if not the connections will have to be made in accordance with the circuit diagram (Fig. 3).

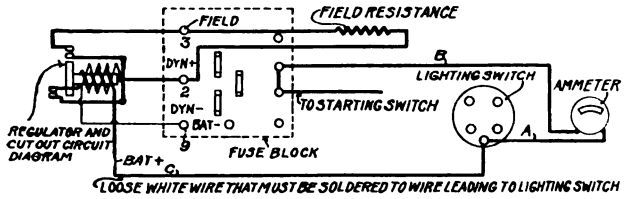


Fig. 2—Wiring for Single Coil Cut-Out and Regulator with Fuse Block.

Whether or not a fuse block is obtained, there will be one white wire on the regulator that is not attached to any terminal. This, in the first case (Fig. 2), must be soldered to the wire leading to the lighting switch, and in the second case (Fig. 3) to the wire connected to the ammeter. Wires (A) and (C) are connected differently in Figs. 2 and 3, but the result is the same. Regular connections 3, 2 and 9 on the fuse block, Fig. 2, are soldered to the ter-

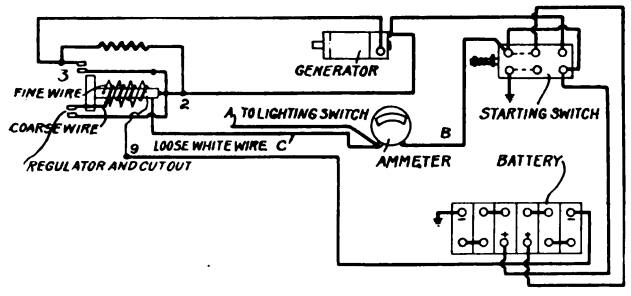


Fig. 3—Circuit Diagram of Single Coil Regulator Without Fuse Block.

minals, and it will be necessary to solder fast the wires leading from the generator and the battery to these terminals. Study carefully the circuits of Fig. 3 and there should be no difficulty experienced in making the proper connections. 2—If all the wires are disconnected from the regulator the engine may be run without damage to the generator. Do not, however, bridge wires around the regulator, as the generator field circuit will then remain closed and it will be burned out.

2157 The 1912 Ford Magneto.

From Reader, Kentucky.—I have a 1912 Ford car with the standard magneto which runs the engine alone quite well. I want to light two 6-volt headlamps, but I find that the current from the magneto is not nearly strong enough for the dual purpose. If I used a 40 ampere hour battery to run the ignition how many miles would one be able to travel if the battery were charged to just over four volts? Of course, the car would be driven in top gear nearly all the time. The coil is a Heinze. Also, do you consider that the magneto would be powerful enough to light the two headlamps if the ignition were run off the battery as I have described?

Reply.—The Ford magneto of that year's type of car does not give enough current for lamps and ignition. Only the 1916-17 types do this. Your best plan is not to interfere wth the ignition, but to use the battery for running the lamps. It is quite suitable (using 4-volt lamps, of course), whereas it would soon be exhausted by being used on the ignition, as the coil takes considerable current. The lighting being intermittent, a total of eight to ten hours lighting should be possible.

2158 Intermittent Power.

From S. E. Lincoln, Connecticut.—After an hour or so of satisfactory running, taking hills without difficulty, my car falls off in power to a very marked extent and will not take hills that it should do on high gear easily, and I have to come down to second. It may run like this for a few miles and then slowly work up to its proper power. I have failed to find anything at fault, though I notice that the engine has been distinctly hotter than when running normally. I use a fuel mixture of one-third kerosene and two-thirds gasoline, and it has occurred to me that the difficulty may arise from this.

Reply.—A temporary falling off in power as described may be attributable to a variety of causes, but in this particular case it is more likely to arise from some change in the carburetion, such as flooding, and, consequently, too rich a mixture. If there is very little response to the throttle, in addition to abnormally hot running, it is practically certain to be carburetion trouble. If this should not prove to be the explanation, the lubrication may be suspected, the cylinders not getting a proper supply of oil. It is not likely that the fuel mixture is at fault, as the proportion of kerosene is not excessive.

Reliners All Right.

From E. A. Driskill, Wyoming.—I see that Mr. H. M. Rush of Indiana would like to know if reliners are advisable to use in his tires, or in casings. He has asked for some little advice as to using reliners in tires. Will say that I never did use them in new ones, as I did not think it was of any use till the tire began to give out either on the sides or on the face. Will say here that I have not had a great deal of experience in the car line or with cars, not possessing a car until 1916. Since then I have learned enough to know that reliners are all right to put in your casings. I have had two in two of my casings and have gone from 300 to 500 miles with them in, and they are as good as new. Would advise you to put them in your tires that are beginning to wear out and you will find that it will save you a tire bill. The dealers say that money spent in putting in reliners is thrown away, but they are looking out for the dealers, and if they can sell a tire they can make more than if you get a reliner from them. If reliners were not any good why do the tire manufacturers put them out? I have had enough experience to know that a reliner in an old tire prevents blowouts, so you will do well in putting them in your tires.

That Strange Motor Noise.

From R. A. Schell, Florida.—In your April number M. E. E. Carpenter of New York (No. 2125) states that there is a strange noise in his motor, like a valve vibrating when the motor is running. I had a similar experience not long ago. A car came to the shop where I was working and the boss put me on the job. There was a vibrating sound in the

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motor that sounded like an automatic intake valve, and upon investigation I found the head broken off of one of the intake valves, and of course upon the suction stroke the valve would flutter. I hope this will be of some benefit to him.

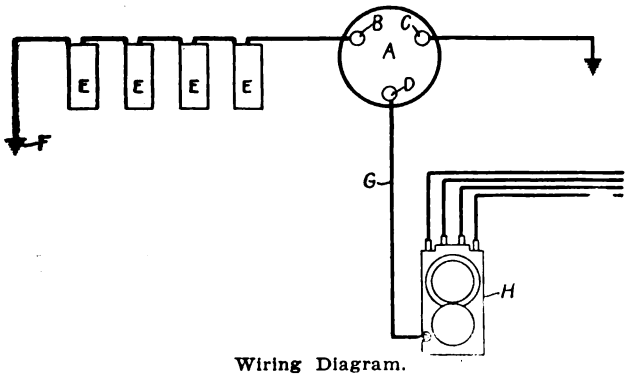
Can Any Ford Owner Answer?

From R. A. Schell, Florida.—I wish to ask you a question. This has puzzled every automobile mechanic in Arcadia. The garage where I work owns two Fords and they have a peculiar scraping sound when pulling very hard in the sand, and this is a very sandy country. These cars are 1917 models and are almost new, and there are other Fords here that have this same trouble. I took one of the motors out and overhauled it and that stopped it for a few days, but the same noise came back. The scraping is not noticeable only when the engine is pulling hard. I have tried adjusting the carburetor, and would retard the spark when pulling hard, but this did no good. The scraping is not continuous, it only scrapes every fourth revolution or every explosion of one of the cylinders. If you can enlighten me on this it will be highly appreciated.

Magnetos Used With Batteries.

From Edward C. Connell, Michigan.—Permit me to inform O. O. N., No. 2115, of your April issue, that the true high-tension magneto can be used with batteries by means of either a Bosch or Splitdorf Dixie coil. These coils are worth $15, and are wired as follows:

The face of the coil A has three terminals, battery B, ground C, and interrupter D. Four dry cells, E,



Wiring Diagram.

are used. Ground one side, F. of the battery to the frame. Attach the other side to the terminal on the coil marked C, and connect the ground wire G, of the magneto H, to the coil terminal marked interrupter D. This wiring is simple and it works fine. I have tried a Splitdorf with a Dixie, Bosch, and Mea magnetos—high tension.

For That Overheating Motor.

From F. S. Bullard, Maryland.—I always read with interest your trouble department and I may have the solution to Mr. H. G. French's, California (No. 2128) trouble. At least I hope so, as I had just such trouble several years ago with a well known car. In putting in a new water pump, no attention was paid to the proper direction of rotation, with the result that the pump simply churned up the water in the pump but did not circulate it. Reversing the direction of rotation fixed it O. K. Now it may be that it is a contrifugal pump, that the rotor may be put on the shaft wrong side around which will give the same result.

For the Model Car.

From William G. Reed, Massachusetts.—In your March issue you described "A Model Car." There are three features which it seems to me are desirable:

1—Slanting windshield (on a touring car) so as not to reflect either the sun or lights from another car into the driver's eyes.

2—Swaying headlights so connected with the steering connection that they will always point in the same direction as the front wheels.

3—A socket for a trouble lamp.

Try a New Plug for the Misfire.

From J. D. Hubbard, New York.—In reply to Oscar Barnes of Wisconsin, I have a 1914 Ford model T, have run about 3,500 miles last season. The front cylinder of my car acted as No. 2127 did. I tested all spark plugs and they seemed to be O. K., but in taking it to a Ford service station they found the front spark plug did not do its work completely and by putting in a new Champion plug I had no further trouble with the oil on the cylinder or spark plug. Try a new plug.

THE LEGAL ASPECT.

It Will Pay Every One Interested in the Automobile to Read This.

Equipment of Cars Sold by Catalogue.—A contract for the purchase of automobiles "fully equipped as per catalogue," and a cut purporting to be a cut of the type of car contracted for which was printed in the catalogue, showed a particular equipment of tires and rims. In an action to recover back money paid under the contract, it was held that the cars tendered in performance of the contract must be similarly equipped, although the printed specifications for the cars in the catalogue did not require such equipment, the cars being as much part of the catalogue as the specifications.—Hemwall Auto Co. v. Michigan Ave. Trust Co., 195 Ill. App. 407.

Ownership of Automobile.—Possession as Evidence.—An automobile was shipped by a manufacturing company to a dealer in San Francisco and the bill of lading, with draft attached, was sent to a bank, with instructions to deliver the bill of lading to the dealer on payment of the draft. The draft was not paid, but in some manner the consignee got possession of the car and shipped it in its own name to Reno, Nevada, to be sold. Before a sale was made, and while the car was in Reno, it was attached in an action by a third person against the dealer. Thereupon the bank paid the dealer the amount due on the bill of lading, and took from it a bill of sale for the car. Upon the third person's refusal to surrender possession of the car to the bank upon demand, the bank brought an action in replevin to recover its possession. In affirming a judgment for the defendants the Nevada Supreme Court held, Bank of Italy v. Burns, 159 Pac. 863, held that the presumptive of ownership which flows from possession merely can be overcome by showing that some person other than the possessor is the real owner; but the mere intro-

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duction in evidence of a bill of sale from the consignor of the car did not show that the purchaser had a stronger claim to the car than could have been asserted by the consignor as against the consignee in possession prior to the bill of sale. After possession of the car had passed from the consignor to the consignee and had been attached in the suit against the consignee, and judgment rendered for the plaintiff therein, and after the consignor, who had not been a party to the attachment suit, executed its bill of sale, the purchaser was privy to the judgment, which was admissible in his replevin action against the plaintiff in the attachment suit, to show title and right of possession in such plaintiff.

Liability of School Teaching Driving.—The California Supreme Court, Easton v. United Trade School Contracting Co., 159 Pac. 597, holds that a school which teaches automobile driving is liable when its employee allows a student to operate a machine during an instruction trip and his inexperience results in injury to a third person.

Liability for Conversion of Automobile.—Action was brought by the Tacoma Auto Livery Company against the Union Motor Car Company for the conversion of an automobile. The material facts, which were not in dispute, are as follows: The Motor Company conducted a garage in the city of Tacoma, where it carried on a general auto business, including the repairing and care and custody of cars for its patrons. The Livery Company was accustomed to send its cars to the garage to be washed, and on Sunday night, May 11, 1913, at about 1 o'clock, one of the drivers took the car in question to the garage for that purpose. The driver delivered the car to one Stowell, night man at the garage, saying that he would return about 4 a. m. to get it. Upon his return the garage was found locked, with no one on duty, and when the day shift came to work it was discovered that Stowell had disappeared with the car. The car was never recovered, and upon appellant's refusal to pay for it this action was begun to recover $2,500, alleged to be the value of the car. From a judgment for $2,400 for the Livery Company, the Motor Company has appealed.

The undisputed evidence showed that about 9:30 on Monday morning following the theft Mr. Jacobs, the manager of the Auto Livery Company, heard that a car answering the description of the stolen car had been seen early that morning near Lacey proceeding towards Olympia. Jacobs immediately communicated this information to the Motor Car Company's manager, Mr. Garfield, who suggested that the defendant send a car in pursuit and that Mr. Jacobs accompany the defendant's man. Jacobs assented to this plan. The proposed pursuit was not begun, however, until Wednesday morning, two days after the car had been stolen. The defendant contended that the delay was due to the lack of a suitable machine in which to make the trip and lack of a man to send along, while the plaintiff asserted that it was due to Garfield's unwillingness to proceed until the expense account for the trip was approved by the proper official. There was no showing that the delay resulted from any acts of the plaintiff. Mr. Jacobs and a Mr. McCord, who was sent by the defendant, then proceeded in pursuit of the stolen machine, picking up information that it had passed different towns along the route south of Olympia. They followed these clues until their arrival in Portland on Thursday, where they learned that the car had been left in the Oregon-Washington freight sheds from 7 p. m. on Tuesday until 1 p. m. on Wednesday, having been shipped to Portland from Ladue, Wash. Some one, evidently Stowell, had called for and removed the car at that time. From here all trace of it was lost, and it had not since been recovered.

The appellate court held that these facts seemed to sustain the finding of the trial court that the defendant failed to exercise reasonable diligence in the recovery and restoration of the automobile. When it was delivered to the garage company, its duty to exercise reasonable care in keeping and returning the machine to the owners immediately attached, and in case of theft of the machine would include reasonable diligence on the part of the garage company, from whom it was stolen, to recover it. This degree of diligence, it seemed to the court, was not exercised. The defendant's manager recognized that pursuit of the stolen car would be the best means of recovering its possession, and it was his suggestion that the trail be followed. A delay of two days in making the start did not seem to the court to be consistent with the exercise of reasonable diligence.

The defendant objected to the amount of the judgment, claiming that the trial court allowed a recovery for more than the value of the car when new. It was shown that the car had been run for only a short time, and that at the catalogue price, with freight and accessories, had cost $2,443. The judgment was for $2,400. This did not appear to the court to be excessive. The judgment was affirmed. —Tacoma Auto Livery Co. v. Union Motor Car Co., Washington Supreme Court, 151 Pac. 243.

Proof of Cost of Repairs of Injured Automobile.—Action was brought to recover damages for injuries to the plaintiff's automobile sustained in a collision with a street car of the defendant. The plaintiff claimed general damages in the sum of $218 and special damages in the sum of $106, a total of $324, and this was the amount of the verdict. The defendant appealed from an order denying its alternative motion for judgment or for a new trial.

The accident occurred at the intersection of Seventh and Cedar streets in the city of St. Paul. The street car was going westerly on the northerly track and made a turn to the north into Cedar. The plaintiff's automobile was following and the collision occurred at the corner of the two streets. The place was one of peculiar danger when a street car turned from Seventh into Cedar with an auto following. The defendant knew all about it. The auto driver knew something about it. Upon a consideration of the evidence the Supreme Court concluded that the question of the defendant's negligence and of the plaintiff's contributory negligence were questions for the jury; and the facts involved were not of a character to make worth while their detailed narration.

The parties adopted as the measure of damages the reasonable cost of repairing the auto plus the reasonable value of a substitute during the period necessary for repair.

A receipted duplicate bill showing the payment of $218 by the plaintiff for repairs was received in evidence. This, it was held, did not prove value nor amount. There was no competent proof of the reasonable cost of making the repairs, nor of their necessity, nor of the time reasonably consumed.

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Whether the time consumed was reasonable bore directly upon the amount recoverable for a substitute. The defendant was without opportunity to cross-examine upon any of these points. A correct result was not to be expected from such a trial and it did not come. The trial court's order was reversed. —W. S. Conrad Co. v. St. Paul City Ry. Co., Minnesota Supreme Court, 153 N. W. 256.

Agent's Authority to Warrant Cars.—Where the manufacturer of automobiles gives his warranty of the cars, and the order from the purchaser on the blank of the seller states that the seller does not warrant the cars, further than to assist the buyer in securing adjustments, it cannot be held as a matter of law that it was within the apparent scope of authority of the agent of the seller to warrant the car for the seller.—Crist v. Turner, New York Appellate Division, 161 N. Y. Supp. 856.

Implied Warranty of Cars.—A contract for the sale of automobiles expressly provided that no verbal or other agreement not specified in the order would be recognized, that the writing constituted the entire agreement, and that it could not be varied, changed, or modified by any verbal agreement, or in any way except in writing by the parties, attached or indorsed, and that no agent or salesman might alter the agreement. The Michigan Supreme Court, in an action for the price, Detroit Trust Co. v. Engel, 158 N. W. 123, held that parol evidence was not admissible to explain its terms. A provision in the contract that "the cars are 1912 models and are to stand sold as they are of this date in consideration of the special price" was held to negative an implied warranty that the cars were reasonably fit for the use intended.

Negligence of Owner's Infant Son.—In an action for the death of a person caused by the defendant's automobile while it was being driven by the defendant's infant son, the car having been taken out without the owner's knowledge and consent, the Michigan Supreme Court holds that the father was not guilty, although the car was bought and owned by him as a family car.—Johnston v. Cornelius, 159 N. W. 318.

Accident Caused by Intense Light of Automobile Lamps.—In an action for personal injuries caused by collision between the defendant's automobile and a buggy, in which the plaintiff was sitting, where it appeared that the defendant's car was lighted according to law, and he could not see the buggy because of the intense light of the lamps of an approaching automobile, the Michigan Supreme Court held, Johnson v. Albert, 158 N. W. 170, that the question whether the defendant was negligent was for the jury.

Evidence of Ownership of Car.—In an action to recover personal injuries caused by being struck by an auto-truck, where the defendant's pleadings put in issue the ownership and control of the truck and the control of the servant operating it at the time of the accident, it was held error to exclude evidence that the truck was in fact not owned and operated by the defendant at the time of the accident, and was owned and operated by another under contract with the defendant, and that the servant operating the truck at that time was the servant of such other person, as it was competent to sustain its pleadings and exonerate it from liability.—Bosco v. Boston Store of Chicago, 195 Ill. App. 133.

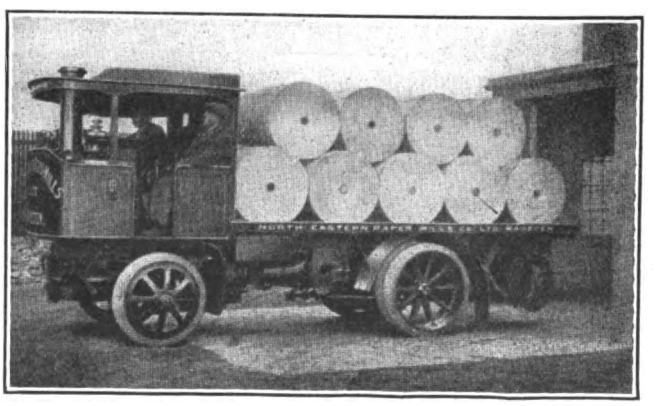
Negligence Must be Connected with Injury.—The New York Appellate Division, Linneball v. Levy Dairy Co., 160 N. Y. Supp. 114, holds that the driver of defendant's motor truck, which ran down plaintiff, left his cut-out open, so as to give a warning of the approach of the car, the horn having been removed for repairs, does not establish negligence because the municipal ordinance forbade the leaving of the cut-out open, for while violation of an ordinance is evidence of negligence, the negligence must be connected with the injury, and the cut-out was left open to avoid accidents.

Pedestrian's Negligence.—In an action for damages from automobile collision, the New York Appellate Division, Maddock v. Mulstein Co., 159 N. Y. Supp. 675, holds that evidence that plaintiff did not look before deflecting his course in a road, where he should have expected automobiles, or give warning signal to automobile following him, plaintiff's own testimony being weakened by the fact that he betrayed his oath by knowingly making a misstatement, did not warrant a verdict for him.

Owner Held Not Liable for Wife's Negligence.—The New York Appellate Division holds that where injury is caused by negligence of a wife operating her husband's automobile, no other person being in the car, and there being no evidence she was engaged in the business of her husband, who was a lawyer, and who had given her authority to use the car for her pleasure or any purpose whatever, there is no presumption that she was in his service.—Farthing v. Strouse, 158 N. Y. Supp. 840.

Warranty of Automobile Construed.—In a suit for damages for breach of warranty in the sale of an automobile, where the only warranty proved was that the car was guaranteed for life against any defect in manufacture and workmanship, it was held that evidence that the automobile was defective in design and plan of construction, and that the life of an ordinary automobile was at least two years, was incompetent. Where an automobile is warranted against any defect in "manufacture and workmanship," the word "manufacture" evidently refers to the process of converting the raw materials into finished parts for use in the automobile, and the word "workmanship" evidently refers to the character of the work done by workmen in the factory.—Warren v. Renault Freres Selling Branch, 195 Ill. App. 117.

Steam Engine Truck Much Used In England.



Sentinel Steam Wagon.

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TIRE WORK.

Practical Vulcanizing Hints, by D. R. Cain, Goodyear School of Tire Repairing.

For Small Tube Punctures—Many repairmen in repairing a "pinhole" puncture use a patch several times larger than the injury. This requires very heavy pressure to obtain a smooth surface. There is a much better way. Trim the hole just enough to remove all ragged edges, but enlarge it as little as possible. Clean thoroughly and cement. When the cement has dried, force a small thread of gum through the hole with an awl, trimming flush on the outside. In curing use just enough pressure to hold the tube firmly on the tube plate. A piece of holland or tracing cloth laid on the plate will ensure a smooth surface.

Making Air Bags Last—The life of an air bag can be greatly lengthened by observing the following rules, which have been found valuable in the Goodyear repair school. When the tire is placed in the mold the clamp screw should be tightened until the exact size of the tire is obtained, and then given about one-half turn. This slightly decreases the size of the cavity and relieves the strain on the air bag, in addition to giving perfect results in the cure. Never allow the bag to become flat as this will cause cracks in the lining. Inject a little water into the bag each week in order to keep the inside of the bag moist. Don't pull the bag out by the tube. Use the tape. By observing these precautions air bags have been used for as many as 145 cures.

Retreads in Sectional Molds.—Here is a method that will give very satisfactory results: Cure each section one-half the regular time. After completing this operation again place the tire in the mold, lapping just half-way between the points made on the first round, and cure for the remainder of the period. In this way no portion of the tread will be overcured.

Lap Plies in Sectional Work.—It is not advisable to butt the plies of fabric in building a section, for they will draw apart in curing, due to the expansion and the flow of the gum. To make allowance for this action, lap the new ply about ⅛ inch over the old fabric.

In the Winter Time.—Repair gums and fabrics received in cold weather sometimes appear lifeless, when as a matter of fact they are merely frozen: The freezing does no harm, but it is a good plan to thaw out the repair stocks in a warm room before using.

PRIVATE GARAGES.

What a Thousand Dollars or Less Will Do in Home Construction.

From Felix J. Koch, Ohio.—Latterly, the spread of the automobile has given impetus as perhaps never before to the building of attractive, inexpensive private garages, and if you be a brick-builder, and would erect a home of your own for your machine, you can hardly do much better than follow the concept pictured herewith, the work of a leading Cincinnati contractor in brick.

According to the kind and cost of brick employed, the price of such a garage will vary, of course, but all considered, a round $1,000 will put the house and runs into position; leave neat profit to the builder.

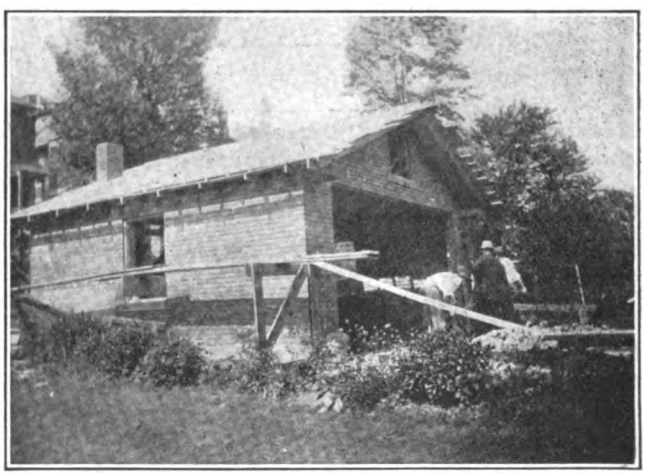
As we have the story from Mr. Masman, the contractor in question, work on such a garage should be begun, if possible, preferably in the summer months. This that the procedure may be kept away from frost. Where possible, June 1st is an ideal time to start, almost anywhere in the United States.

Obviously, the first step in the story is the leveling of the site. In most cases the yard or garden



The First Stages.

is so located that one need not excavate, except for the trenches. Where, however, excavation is required a team will be employed, especially where a cut is to be made into a bank. Three men to do the work itself and one on the wagon is the rule. Then it should take not to exceed two days for the men and team to accomplish this work and to cut the drive. The trenches and foundation walls are then laid. These for most localities should be three feet below ground in order to get away from frost. Trenches to such garage then should take the men



Nearing Completion.

a day and a half, this including the concrete. This done, one is ready to do the actual brick work.

The ideal size for the one-machine garage with plenty of room to move about and store things is, say, twenty by twenty feet, eight and a half feet in height. In the brick masonry three men are employed, with two laborers to assist where there may be a long carry from the street. From two to three days can be counted on here; this, however, includ-

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ing setting of stone work about the windows and other details.

Pressed brick for such garage should cost the garage owner today from $16 to $25 per 1,000, according to grade used, and three and a half thousand should fill the bill. Along with these about 2,000 common brick will be employed. The yellow brick, or in the case of the garage of the picture, the "iron-spot," will run from $22 to $23 the thousand. Slightly less of the common brick will be used with these—a difference of possibly three to four hundred in all.

The carpenters are summoned to put on the roof, three or four being set to work, and finish all work except the tiling of the roof in perhaps twelve days. Three men, working two days, can then put the tiles to the roof. In good weather often drying takes but two days, and the forms can come off on the third.

Thus complete, one has an attractive, neat and really inexpensive garage built to last. In plan, the garage is square, with ordinary gable roof above it, the terra cotta of such roof throwing in relief the tan of the bricks and the white of the stone work, making of the garage a neat and picturesque addition to the grounds.

A New Ford Car Converted Truck.

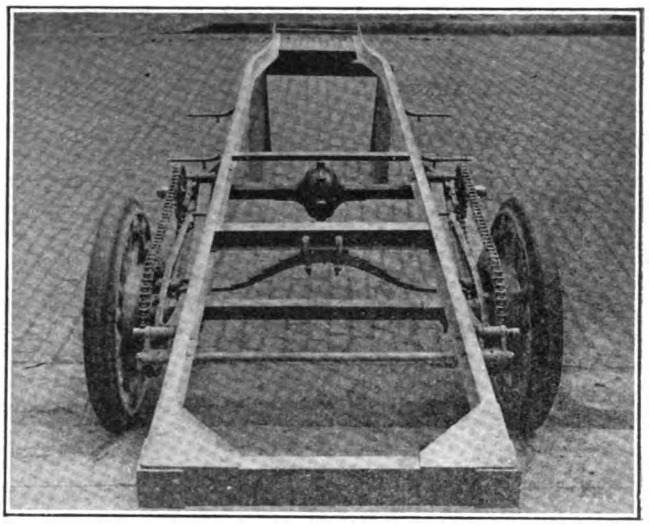
There are over a million Ford cars in the country and the only solution of the second hand question on these cars, when the bodies are worn out, is to convert them into sturdy one and one-half ton trucks, which can be done in great shape by the Dearborn Unit, which is built along real truck lines. The Ford power unit has conclusively proven its adaptability in these converted trucks and has thoroughly demonstrated its powerful strength in driving up high grades on high with loads of one and one-half tons. These converted trucks are no longer an experiment. There are thousands in every day use, giving thorough satisfaction to their owners, and operated at a low maintenance cost.



Dearborn Truck.

It is a well known fact that the Ford is the most economical light delivery car in use today; its high speed engine is the most efficient four-cylinder engine and develops more power than any motor of its size, and every driver will attest it is the most simple car to operate and take care of.

The Dearborn frame is 14 feet long and runs clear up to the radiator on the Ford chassis. It fits snugly and does not require any cutting of fenders or dashes. The rear spring shackles are supported on a 1-inch cross steel rod, while there is another cross member over the jack shaft. These three cross members make the frame as rigid and strong as frames designed to carry loads of two tons. The frame, made of 4-inch rolled channel steel, is securely bolted to the front of the Ford frame with three bolts on each side of the engine, then bolted to the Ford body flanges immediately back of dash, while the rear ends of the two side members of Ford frame are riveted to the cross member on Dearborn frame, just above the rear axle assembly of the Ford which is converted into a jack shaft and rigidly held in place by the specially designed hangers. Both these jack shaft hangers and cross rod hangers are hot riveted to the frame. Sprockets are attached to the Ford hubs and the drive is by double side Baldwin roller chains to sprockets on rear wheel brake drums.



Dearborn Frame.

The rear dead axle is rectangular 2¼ x 1¾ inches, drop forged and heat treated with a carrying capacity of 1½-ton loads. The side springs are 2 inches wide, 44 inches in length and have 9 leaves. They are made of high carbon steel, scientifically heat treated and oil tempered. The cross or relief spring over the rear axle has 6 leaves, 2 inches wide. This is designed to take care of overloading and relieve the tension on side springs when hitting bad spots in the road. The truck wheels have twelve 2-inch oval spokes and are equipped with Firestone solid rubber tires. Bock heavy roller truck bearings are used. The 12-inch emergency brake drums are rigidly bolted to hubs and have 2½-inch shoes, lined with 3-16-inch Brakebestos lining. The Ford brake rod is lengthened and connected to hand lever.

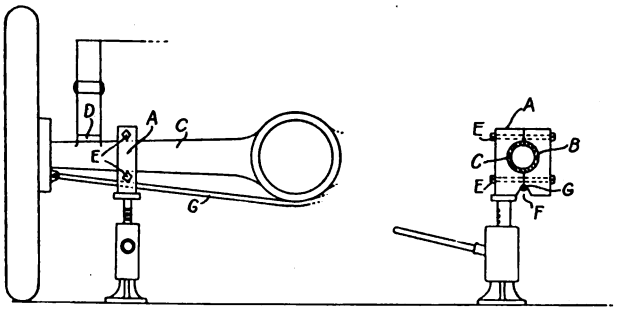
The Dearborn frame has its own heavy step brackets for running board. The oval spokes in rear wheels harmonize with round spokes in Ford front wheels. The pneumatic tires on the front wheels lessen vibration and insure long life to engine and working parts. The load on Ford front spring does not vary very materially whether the truck is loaded or empty. Every business man owning a Ford car is thus given the opportunity to convert his used car into a reliable one-ton truck at little cost. Thousands and thousands of business men who need a one-ton truck but cannot afford to invest $1500—the average price of a standard one-ton truck—can now secure a dependable one-ton truck at an additional outlay of only $350, which will give them a truck that can be operated far cheaper than a team of horses and wagon.

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Every piece of material used in building the Dearborn Truck Unit is of high grade used in motor truck construction, and the same careful attention to detail and workmanship is exercised as in the manufacture of high priced trucks. It is built to give thorough satisfaction and is guaranteed for one year. It is manufactured by the Dearborn Motor Truck Co., 1250-1264 South Campbell Avenue, Chicago, Ill.

Auto Jack Brace.

From The Autocar, England.—Having a car with a back axle presenting some considerable difficulty in finding a safe abutment for the jack head, owing to the presence of a tie rod from end to end, I have devised a simple means of overcoming this difficulty. As shown in the accompanying sketch, a block of hard wood, A, about 1 inch thick is used and a hole, B, cut near the top end to the diameter of the axle, C, near the spring pads, D. Immediately above and below this large hole, and at right angles to it, two $\frac{5}{16}$-in. holes, E, are drilled to accommodate two mushroom-headed coach bolts. The block is then sawn through, being divided across the center of



Jack Attachment.

the large hole so that the two portions can be put one on each side of the axle casing and bolted in position there.

It is first necessary, however, to cut at the bottom end of each half a groove or step, F, to accommodate the tie rod G. This groove—for that is what is formed when the halves of the block come together—should be an easy fit on the tie rod, so that when the bolts are tightened up, the axle itself is tightly clamped between the halves of the wood block. If necessary, these halves may be cut away slightly so as to allow plenty of clearance, say an eighth of an inch, between them, when the bolts are tightened.

When fitted into position, the jack head may be placed under the rearmost block. There is no need for it to abut against both, as, owing to the shaping of the blocks round the axle and the presence of the tie rod, there is no fear of the bolts bending or of the blocks turning round on the axle.

I have found this arrangement exceedingly convenient, and the time occupied and the effort required in jacking up one side of the axle have been very considerably reduced.

An Unusual Combination.

Motorists who travel the Lincoln Highway find at Bedford, Pa., what is probably the most original and unusual combination of garage, hotel, restaurant, barber shop, Goodyear service station and novelty store in the United States, if not in the entire world. A more refreshing place to stop on a tour of the famous Lincoln Highway would be hard to find. This place is known as "Hoffman's" and is conducted by Mr. Lee F. Hoffman, an experienced garage man and hotel man.

He keeps you busy reading about him long before you get to his Protean place of business. By a succession of well-placed signs reaching out fifty miles in both directions along the highway, Hoffman reminds you that every need of man or auto can be supplied at his combination hotel and garage. His great success in this most unusual venture is due to his complete understanding of the needs of touring automobilists. His chicken and waffle dinners are acquiring a most enviable reputation among motorists.

Last year more than 17,000 of these dinners were served to touring motorists, and hundreds of tourists were turned away during the season. But this condition is to be taken care of this season by a new four-story, 100-room hotel which is now under construction. Dining room facilities for 300 guests are assured with the completion of the new structure. In addition to serving motorists with dinners and Goodyear tires, Hoffman is constantly boosting the Lincoln Highway, of which he is Consul for the State of Pennsylvania.

At several dangerous curves he has built roadside mirrors, permitting motorists to "see around the corner." The handing out of warnings of speed traps, route cards and road maps and the placing of Lincoln Highway signs are other activities that have helped motorists materially.

Under the system of management employed the touring motorist is fed, sheltered and cared for over night, and in the meantime his car's gas and oil wants have been supplied. In the morning he is sent on his way with a route card carrying him west to Pittsburgh or east to Philadelphia, with a hearty invitation to "drive this way again."

What Hoffman is doing to better motoring conditions along the Lincoln Highway simply illustrates what one Goodyear service station dealer has done in the interest of touring motorists and represents the highest type of service that a merchant can render to his customer.

LOCK NUTS.

Another New Device That Should Commend Itself to Those Who Favor "Safety First."

In the article on lock or safety nuts which appeared in last month's issue, mention of one was omitted which is both simple and effective. The nut-lock, an illustration of which is shown herewith, consists simply of a steel plate punched with two holes and then bent to a U-shape so that the two holes are opposite but slightly eccentric. This is done in a die press with one operation. When the nut-lock is screwed upon the bolt, the holes are pulled into concentric positions, thus causing a direct pull upon the outer leg and a push upon the leg next the nut. This force is exerted at the root of the threads. There is also a lateral force due to the compression of the U-plate when it is screwed home against the nut. This device is of general application and has been tested with satisfactory results on machinery, automobiles, locomotives and track bolts.

For the automobile trade, in which only a small section of the bolt extends beyond the nut, and for

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which the bolts are all made with S. A. E. threads, a special type of spring nut lock is made. It varies from the other locks made only in the fact that it is constructed of thinner steel. This enables it to engage the finer threads of the automobile bolts and still have only a minimum section of the bolt project beyond the nut. The small size, simplicity, neatness and the ease with which it is applied will immediately commend the spring nut lock to every autoist.

While the demands of the automobile trade will run into tremendous figures every year, that is only a small part of the trade field awaiting the spring nut lock.

An automobile is, after analysis, simply a piece of machinery that moves instead of being stationary. It is made up of many different parts and sections united into a compact whole, and united largely by

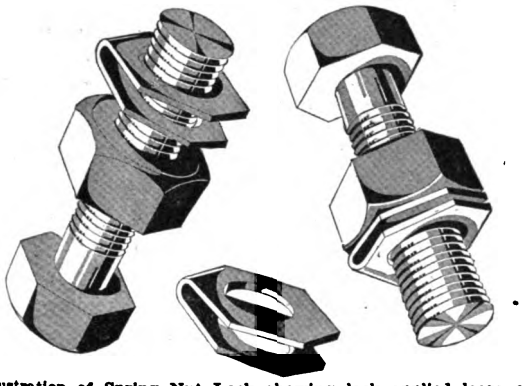


Illustration of Spring Nut Lock showing lock applied loose on bolt (left); Spring Nut Lock (center); lock tightened up against nut to hold until removed (right).

nuts and bolts. That these bolts and nuts shall hold and do their work is imperatively necessary to those who use the car. It is not that failure means delay and discomfort—it is a matter of life or death. A nut works off the steering column of a swiftly moving car, for instance. The driver loses control and then comes the crash or overturn with death or mutilation to the occupants. With the spring nut lock on the nut in the steering column such accidents cannot occur. And so it is with almost every part of the automobile. Wheels, transmission, differentials, axles, springs, engine, carburetor, the steering column—all are held together by bolts and nuts. Even the body of the car is held safely to the chassis by bolts and nuts. The working off of one insignificant nut from the carburetor, transmission, or any one of a score of other parts is sufficient to "kill" the car—to transmute it from a swift-moving piece of mechanism into an inert mass of metal.

This demand the Spring Nut Lock Company of 508 South Dearborn Street, Chicago, has prepared to meet. It has contracted with The Stowell Company of South Milwaukee, Wisconsin, which has one of the largest industrial plants of the Milwaukee district, and this company has installed a number of the necessary machines and is now turning out the locks in the sizes most generally used.

When Is An Inner Tube Useless?

"How am I to know when an inner tube is 'done'? is a question I am asked repeatedly," declares G. E. Grunner, manager service department, the Goodyear Tire & Rubber Company. "It is the natural inquiry of a tire user who has had several repairs made on his tubes and wishes to obtain the utmost mileage from them, yet wants to avoid the inconvenience of making a tire change on the road due to tube trouble. In these times when economy is the order of the day, a tire user holding an old tube in his hand, can well afford to ponder a minute before casting it aside as 'through.'

"It is difficult sometimes to determine just when a tube is unfit for further use. However, porosity in a tube usually indicates that it has attained its three score and ten. In this age of use, very small cracks can be observed in the rubber if it is stretched and examined carefully. The next development is splitting when the air pressure becomes too great for the tube to bear. If the rubber in a tube is 'live' it may successfully bear as many patches as a beggar's coat. But due care must be exercised in the vulcanization of the patch to the tube, that too large a portion of the tube around the patch is not cured. If portions of the tube have been over-cured in patching operations disaster is sure to follow.

"I believe that the lack of proper care of the tube is responsible for most of the trouble tire users experience. The observance of a few precautions would help wonderfully to eliminate these troubles. The absence of sufficient talc between casing and tube allows the generation of heat which vulcanizes the tube to the fabric of the casing. Then if you attempt to remove it it tears.

"Much tube splitting is occasioned by the slipping of the tube between the casing and the rim, which soon results in a 'pinch.' The remedy is careful applying. The protection of spare tubes is a matter that many tire users pass over too lightly. Usually spare tubes are folded and carried in the tool box, where they come in contact with grease, oil and tools.

"The grease and oil greatly reduce the quality of the rubber, while the tools many times cause the tubes to become chafed and worn and unfit for use. It seems to me that the whole problem of obtaining maximum tube mileage resolves itself into the simple matter of taking care of it properly."

TO PROSPECTIVE BUYERS.

Good Advice on Selecting a Car, and on Driving and Its Care.

(Copyright.)

From W. C. Sills, Sales Manager, Chevrolet Motor Company.—Choose a car with the same care as you employ a man. When you employ a person, you ask for recommendations, for a statement that will help to identify him, to be able to judge his worth, his dependability, to you.

You cautiously investigate his record, his reputation with former employers, his reliability in past performance of duty. You are particular about his appearance. If he gives you a bad impression at first, he may never have another chance. You are anxious to secure the best man available for your need.

Your car should be selected with the same care. In the beginning, however, keep in mind that no single car is the only good car. No car is the best in the world. There are many cars of acknowledged reliability in make and performance, and, hence, you should judge a car by the known reliability of the maker.

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Seek a car built by a company of acknowledged financial standing. Inquire of the extent of its equipment, of the number and size of its plants, of its reputation. It is safe to assume that only a successful car can create a large and sustained demand from the public.

Make up your mind to the fact that a motor car represents the ideals of the manufacturer—and its worth will be in proportion to that ideal. You should seek a car that has been sincerely built—in which there is incorporated a high mechanical standard.

There is wisdom in the public taste. Find out how the average owner regards the car you intend buying. You should buy a car that your wife and children will feel proud of—a car with a good name. You cannot be too scrupulous in your choice, for when you purchase an automobile, you make an important long-time investment.

Let us compare buying an automobile with that of buying a house. In buying a house, you would make certain of the strength of the foundation. You would inspect it inside and out. You would go over it from every view. You would weigh each item. You would consider the purchase from the angle of sturdiness, its method of construction and material used. It would be the same way from an artistic standpoint. You would consider the harmony, the finish, the detail, comfort, and beauty.

Cover these same points in buying an automobile. Be just as careful. Be thorough. It pays, for your thoroughness will help you to gain a good idea of automobile construction. And you need this knowledge. For once an automobile owner, always an owner. And with increased knowledge, you will better be able to judge values in the future. Buy a well balanced car—a car in which equal attention has been given to mechanical dependability, and good looks. But in judging, let mechanical dependability come first; for without it, you will be helpless.

A beautiful exterior is something to feel proud of. But it will not help you in case your car breaks down on the road. It is good, sound business judgment to buy a car that is absolutely right mechanically, as well as artistically.

Learning to Drive.

After you have made your purchase, be careful how you start. In the beginning, read minutely the instructions furnished with the car. They are given you for the purpose of acquainting you fully with the various mechanical operations. Know every rule, every definition, every instruction.

Have confidence in yourself and your ability to master the knowledge of driving. Learn in the beginning the functions of the motor, clutch and transmission. Know how the power is actually delivered to the rear wheels. Know what each lever will do. Study the use of each instrument on the dashboard. Learn thoroughly the principles of motoring. These will be found simple. Take your first lessons when there is little traffic, and as you increase in knowledge and practice, venture in busy, congested city streets.

Keep your eyes in front of you. Do not endeavor to speed. Go slowly. Forget everything but the car. In learning to drive, exercise care. Do not get nervous. This leads to confusion. It is comparatively easy to go through the motions of starting, steering, and stopping, before you drive your first mile—if you concentrate! Hold your feet ready on the clutch and brake pedals. This adds confidence. Hold the steering wheel lightly. Steer easily. Start and stop gradually.

Practice makes perfect. Use good common sense all the time and do not lose your head.

Care of Machine.

Your car is a piece of machinery, and, as such, is entitled to care and attention. For the moment, regard it as a horse. As a horse needs care and attention regularly, so does an automobile need proper care and attention.

The fair man treats his car with consideration. You would not expect a horse to go forty-eight hours without food and expect him to do good work, and you should not demand proper performance of your automobile without due attention to its care.

Change of Spirit.

"A change came over the spirit of their dreams." A few years ago the banking interests were dead opposed to their customers purchasing automobiles. They considered it a sinful extravagance, and they were wont to attribute hard times and divers potential calamities to the tendency, especially as it applied to the "common" people. But the automobile buying continued and what a wave of general prosperity it carried in its wake!

Now the banking interests seem to favor automobile buying. Possibly the object lesson of results may have converted them. The Wisconsin Bankers' Association has recently issued a circular which has had wide publicity. This is the way they endorse the automobile, and the sentiment seems a good deal like that which was expressed in this magazine "aforetime":

"There will come a time, if it is not already here, when every man who earns $1,200 a year in small places, and $1,800 a year in larger towns, can afford and should have a car. It brings more lasting and beneficial pleasures than any other medium yet devised as pastime. It takes you out-of-doors. It gives you a chance to picnic with the family, see the country, save time, entertain as no other device can do, and has its proper place in the scheme of life. But a little study of cars and their care and operation, thought for the little savings that are possible, will make what would seem to be a burdensome tax a real and lasting benefit."

Automobile Draftsmen.

The Technical School for Automobile Draftsmen and Mechanics closed its day and evening classes for the winter term on April 11th, after a very successful season. The annual exhibition of drawings took place on April 17th and the rooms were crowded with interested visitors. The correspondence department is kept open the year round. The school is to be enlarged to meet the demand for men with the training received there. All inquiries regarding the school should be addressed to Andrew F. Johnson, instructor at the School, 20 West 44th St., New York City.

Gasoline for Starting.

From George Peeling, Illinois—In answer to No. 2076 in the Trouble Department, I sell a fifty-gallon tank of gasoline every winter to tractor and truck owners in one-half and one-gallon lots for starting. It positively will fire at any temperature. I buy it of the Standard Oil Company at 34 cents a gallon.

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Stopping a Car.

In the New York Tribune of April 29 there appeared an article criticising the Dort Motor Company for its claims as to tests to show the promptness with which the Dort car could be stopped at grade crossings. It appears that the Dort publicity article made the statement that the car was stopped as follows:

Forty miles an hour, 22 feet.
Twenty-five miles an hour, 12 feet.
Fifteen miles an hour, 4 feet.

The Tribune adds: "The only way a car going 40 miles an hour can be stopped in 22 feet is to run it into a wall that far off. It will stop then, but perhaps the passengers won't. And that would be about the effect of suddenly locking the brakes when going at 40 miles an hour. The passengers would be thrown far from the car. If they were lucky enough to be tossed clear beyond the oncoming train to the other side of the railroad tracks they would at least escape being hurt by the train, even if landing head-on in the road beyond killed them."

We are unable to substantiate this claim, never having made the test, but the Tribune critic says:

"I will bet an amount equal to the insurance his estate collects on the train's end of it, if he will come up to a grade crossing at 40 miles an hour with a train headed for the same spot and will agree not to put on his brakes until 22 feet away. The car would inevitably slide much further than that distance. An automobile can be much more readily halted with the wheels rolling than with them locked. Remembering only that at 40 miles an hour a car is traveling nearly 59 feet in a second, to state that it can be brought safely to a stop in the next 22 feet is clearly absurd."

As to the foregoing, several elements enter into the distance a car may be stopped at a certain speed. In the first place, it depends upon the weight of the car. A baseball traveling at the rate of "nearly 59 feet in a second" can be stopped in the space of one foot. In the case of a heavier body it will take more space, depending upon its brake power, the friction of its weight upon the surface on which it rests, and whether that surface is either slightly up-grade or down-grade, this last being an important consideration, when it is considered that an exactly level approach to a grade crossing is hard to find. It is true, likewise, that a car would have a tendency to overturn when stopped so suddenly, and if it did not overturn the passengers would pitch out if not firmly seated, but they probably could easily brace themselves so as not to pitch out if they knew the shock were coming. Much depends upon how the brakes are applied as to whether a car will overturn when so stopped, and this requires both the highest judgment and utmost skill.

In reply to an inquiry from this office the Dort Company frankly states with reference to the statement: "It originated at the Pacific Coast with one of our distributors and was given considerable publicity, unauthorized by us, throughout their territory. Copy of this came to our office and for some reason unknown to the management was circulated through our advertising department, which has been very badly disorganized for some months past.

"As to whether or not the statement is correct, we really are not in position to say, as we have made no attempt to verify the truth of same. In the first place, we do not believe in publicity of this kind—it is not at all in accordance with our ideas and ideals of motor car advertising or publicity as we thoroughly believe in dealing absolutely in facts. If we knew this statement to be true, it would not meet the writer's approval for publication because it would hardly be accepted as a fact by the buying public."

NEW AND INTERESTING THINGS IN MOTORDOM

The Pennock Headlight Tilter.

This enables the driver of a car to direct the light from the headlights wherever it may be needed. It can be instantly operated from the seat and covers all the conditions of city and country driving, so that legal requirements in regard to dimming, etc., can be readily met by the driver. These tilters will absolutely eliminate the glare and they are legal everywhere. They fit your electrically lighted car, your gas lighted car, or your Ford car, and the retail price is only $5 per set. For circular or sample sets, write direct to the manufacturers, the Specialty Mfg. Co., Minerva, Ohio.

New Cooling System.

The Thermomat Auxiliary Cooling System which absolutely prevents boiling and overheating of Ford motors is being manufactured and marketed by The Cawle Company, 506 City Trust Bldg., Indianapolis, Ind. Although the stock models of the Thermomat are designed to fit Ford cars the instrument is equally adaptable for any and all automobiles and can be made special to fit any car. This device eliminates Ford overheating troubles by preventing steam pressure in the engine and radiator. It is essentially a simple condenser such as steam plants have used for years. It is easily installed in two hours' time by any garageman or car owner. It is permanently automatic in action and will last the life of the car. It eliminates constant refilling of the radiator. It enables Fords to run in high gear at a comparatively low speed, or in low gear in mud or sand and on hills during the hottest weather without overheating the motor. It reduces the consumption of lubricating oil and gasoline and in winter it condenses and saves anti-freezing solutions.

Lawrence & Co. Opens New York Branch.

L. Lawrence & Company, of Newark, N. J., with branch offices in Chicago and Detroit have opened a New York branch at 546 West 45th Street. This branch will handle the increased business of repairing scored cylinders which are fused electrically by the patented process controlled by this company.

Do You Advertise in a Medical Journal?

We wonder if any of our readers have stopped to think that almost every physician owns an automobile. This being the case, it would seem to be a logical conclusion that a medical journal would be an excellent advertising medium for automobiles and almost every kind of automobile accessory. The Journal of the American Medical Association, published at 535 N. Dearborn Street, Chicago, Ill., is undoubtedly one of the strongest medical publications in the country. This medium reaches 64,000 physicians, over 45,000 of whom are actually using automobiles in their practice. Rates of advertising and full particulars will be glady sent on request.

New Manager for Bailey Differential.

J. E. Duffield has been elected to the position of general manager and treasurer of the Bailey Non-Stall Differential Co., 1124 Michigan Avenue, Chicago. We understand that the business of this company is to be pushed on a very large scale including an advertising campaign of national scope.

Oxy-Acetylene Welding and Cutting.

By P. F. Willis, of Henderson-Willis Welding & Cutting Co., 1805 N. 11th Street, St. Louis, Mo.

This little book on oxy-acetylene welding is neatly and attractively bound and of a size that can be easily carried in the pocket. It contains 180 pages of useful information regarding the new methods of welding different metals, together with numerous illustrations and tables.

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Truck Moves House Seven and a Half Miles.

A remarkable and unusual feat was recently performed by F-W-D Motor Trucks at Camp Stewart on the Mexican border. When the last of the National Guard were ordered home, it was necessary to move one of the company houses which had been erected by the Army and the problem was a big one, as to how to move it the seven and a half miles without knocking it down and re-erecting it.

It was finally decided to load it on four F-W-D Motor Trucks, one at each corner. To do this, of course, it was necessary that the trucks at the rear corners should drive backwards and on reverse gear. In addition to this difficulty, the building being twenty feet wide by forty-six feet long, it was impossible to travel on the roads, because of telegraph poles, trees, and other obstructions. Therefore, it was necessary to make the trip across the fields and through the open country, up hill and down, through gullies and ditches. In spite of these difficulties, in spite of the fact that it was also necessary to maintain all four trucks at an absolutely even speed all the way, the four wheel drive traction, exerting a pulling force on front as well as rear wheels, made it possible for the F-W-D to accomplish this unique task in a little less than an hour and three quarters. The F-W-D Motor Truck is made by the Four Wheel Drive Auto Co., Clintonville, Wis.



A remarkable feat.

New Tool Book From Goodell-Pratt.

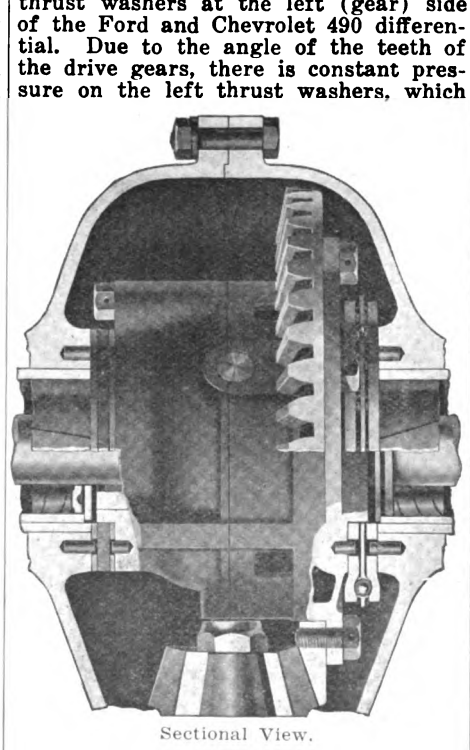
We wish to acknowledge the receipt from Goodell-Pratt Company, Greenfield, Mass., of their tool book No. 13, which shows more than 1,500 good tools made by this company. In the 432 pages of this book, there are sure to be a great many tools of interest to our readers, and as a reference book, this volume is exceedingly useful in any public or private garage, or in the warerooms of dealers. We understand that this book will be sent free, to any dealer or repairman who will write for it, using their regular business letterhead.

Climax Shock Absorber Company Helps Red Cross.

The Climax Shock Absorber Company, Benton Harbor, Mich., have announced that they will contribute to the Red Cross or other approved fund, the sum of $5 on every set of Climax Shock Absorbers sold by them to car owners on or before June 30, 1917. Contributions received in this way will be sent direct to the Treasurer of the Red Cross Fund in the locality in which the shock absorbers are sold. This device is a thoroughly practical one and its appearance and method of application may be understood by inspecting the accompanying engraving. These shock absorbers are sold on a trial and money back basis, and the manufacturers, in making this special offer, feel that they are giving the car owners an opportunity to do their bit in connection with war expenses.

Bailey Thrust Bearings.

The Ahlberg Bearing Company, of Chicago, with branches in ten principal cities, has been made sole distributor for the United States of the Bailey Ball Thrust Bearing, a replacement for the thrust washers at the left (gear) side of the Ford and Chevrolet 490 differential. Due to the angle of the teeth of the drive gears, there is constant pressure on the left thrust washers, which support the drive gear and keep it in mesh with the drive pinion. These washers having a sliding instead of a rolling contact, wear down from this gear thrust and allow the drive gear to shift away from the pinion. The gears then being partially out of mesh, the drive is taken on one tooth instead two and on the weak part of the too This causes gears to strip or break a other axle troubles often result. The being no wear to this ball thrust, gea are kept in proper mesh and will la almost indefinitely, thus eliminating t greatest source of rear axle breakdow This bearing is the invention of and manufactured by George D. Bailey Chicago.



Sectional View.

Patriotic Emblems.

Since President Wilson's speech si nalizing our entry into the war, it most unusual to see any car without least one American flag displayed. kinds of carriers are improvised. So drivers fasten the flag staff to the diator cap with a rubber band, oth have wires strung from mud guard wind shield and fly the flag therefro Even the rear spare tire carrier ser as a flag mount in some cases. The A Metal Works of Newark, N. J., have p duced a special radiator ornament the form of an American Eagle, wh is finished in gold or nickel. On back, directly between the wings, is neat socket with a set screw into wh is set a gold-speared staff, carrying 4 x 7 American flag. Made compl with nut and bolt, this is readily tached to any radiator cap and the m ufacturers are doing a tremendous bu ness on it. The Art Metal Works ma a large line of Patriotic Radiator Or ments, including the well-known fig of Uncle Sam, the American Shield w the American Eagle above it, Crossed Flags, known as America Fi as well as Eagles in all sizes both w and without flags. They are now f nishing any of the patriotic emble with flag socket and flag at a small dition to the list price. In view of tremendous wave of patriotism wh is now sweeping the country, the de er's opportunity on emblems of class, and particularly on the flag-car ing numbers, is too excellent to be ov looked. The autoist is usually no man to hesitate in the expenditure $2 or $3 for something which expres his feelings and adorns his car. Deal will do well to give the lines close tention now while the opportunity is its best.

Petry Cut-Out.

This is a scientifically designed out device, which ought to be inter ing to a great many of our read whether they are car owners, jobb or dealers. This cut-out is a posi cut-off. The valve cannot flutter. spring is so located that it is remo from the heat. The cut-off makes exhaust absolutely noise-proof when device is closed. There is an adj able lock-nut on the spring. While device has excess strength, it is li in weight and the great leverage insu easy action on a strong spring. La megaphone-shaped vent intensifies so of the exhaust and furnishes an excell warning signal. The adjustable le makes attaching of this cut-out easy

$150 for Your Judgment.

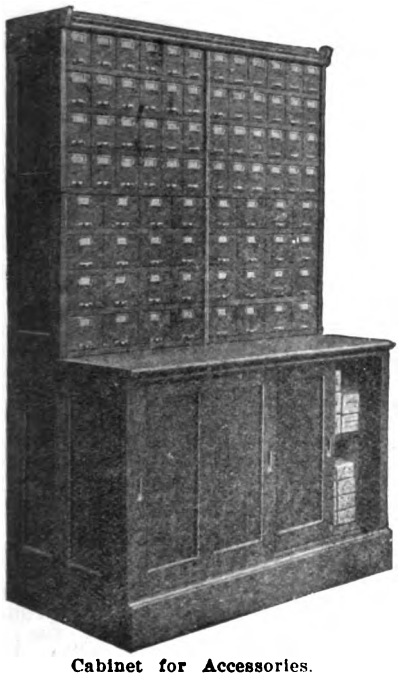
The Bailey Non-Stall Differential poration, 1124 Michigan Avenue, cago, recently offered $1,000 for most sensible letters concerning t product. The judges in this con have now selected the seven best lett This contest was confined to a cer

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class of contestants, but the Bailey Non-Stall Differential Corporation have now concluded to give everybody an opportunity to see how nearly they can come to the decision made by the judges. The thirty-six best letters have been compiled in a book, and it is proposed to offer $150 as a reward for good judgment shown in selecting the seven best of these thirty-six letters. The persons who come the nearest to making the same decision as the judges and also gives the best reasons for such decision, will be awarded $50 and the next four best will receive $25 each. Those who are interested should fill out the coupon attached to the advertisement of this company and send it in for the book of 36 letters and complete information in regard to the special offer referred to.

Stevens Service Cabinets.

Many repairmen lose time and money by lack of system in the care of repair parts. Stevens & Company, 375 Broadway, New York City, have made a thorough study of this subject and they are in a position to furnish auto repairmen with service cabinets which enable the shop-proprietor to keep track of all repair parts for all makes of cars. They also make a special cabinet for Ford agents, garage and accessory dealers, and this cabinet is illustrated herewith. It is called Cabinet Assembly No. 280, and it is built with special reference to the Ford agent. This cabinet contains 80 large drawers which may be subdivided into smaller compartments if desired. The base section is provided



Cabinet for Accessories.

with a sliding door and inside shelf, and it is roomy enough to carry a good stock of larger and heavier parts such as cylinders, crank shafts, transmission parts, etc., while the small parts are kept in the numbered drawers in the upper portion of the cabinet. The cabinet has a frame of heavy oak with rich antique finish. The drawers have finished oak fronts, with combination pull and card holder. The drawers cannot warp or stick, as the sides and bottom are made of heavy galvanized steel. Cross divisions may also be obtained for a further subdivision if required. All cabinets shown are designed for dealers' use, and prices quoted by the manufacturers are strictly net, f. o. b. factory. Dealers, repairmen and public garage owners should get in touch with this company immediately in regard to these very useful cabinets.

Magneto Parts.

A full line of magneto parts, for all makes of magnetos and coils, is carried in stock by the Guaranteed Magneto Parts Corporation, 1765 Broadway, New York City, N. Y. This company is also prepared to furnish spark coil parts, tungsten contracts, starter and generator brushes. All parts are guaranteed against defective material and readers who are interested should write without fail for the free catalogue of this company and their special agency proposition.

The Ambu Electric Trouble Shooter.

We suppose that nearly everyone who has troubles would be glad to shoot them if they could get them out of the way by doing so. The motorist has troubles of his own, and to remedy some of these, the Ambu Electric Trouble Shooter has been invented. This is an instrument which automatically detects and locates accurately and quickly trouble in any American made starting and lighting system used as standard on any American made cars, including the Delco, Westinghouse, Gray and Davis, and all other electrical systems. This trouble shooter, so called, is worthy of investigation by every car owner, dealer, or garage owner in the land. It is manufactured by the American Bureau of Engineering, 1018 S. Wabash Ave., Chicago, Ill. The same company also gets out what they call their Ambu Service which consists of wiring diagrams, showing the exact layout of every electrical system as applied to automobiles, covering 400 or more cars, also auto repair charts giving concise and practical working information and complete instructions on how to make repairs quickly and positively. Ambu Service bulletins will keep you posted on all changes, additions and improvements which may be made in the various lighting and starting systems, also engineering advice to help you out of any unusual difficulties. After the above review covered by the American Bureau of Engineering, we think our readers will agree that it ought to pay everyone interested in cars to get in touch immediately with this enterprising company.

Double R Rectifiers.

These rectifiers are described by the manufacturers as simple, durable and efficient. It is also stated that they make healthy batteries, satisfied customers, and a full pocket. They are designed either for garage or private use. Readers who are interested should write for prices and full particulars direct to the R. & R. Rectifier Company, Midway, Fla.

The Shaler Five-Minute Vulcanizer.

The C. A. Shaler Company of Waupun, Wis., well-known manufacturers of tire vulcanizers, have recently put on the market the Shaler Five-Minute Vulcanizer which sells, complete with 12 patch and heat units for $1.50. The illustration will give an excellent idea of the appearance of this outfit, which in its display carton, carries out the Shaler policy of demonstrating an article as well as attracting attention by an unusual method of display. The cover of the stand provides for a real vulcanizer to be fastened on a section of the inner tube, showing both the method of opera-



tion and a completed repair. Opposite the vulcanizer is a real match slipped in a little holder. The striking color scheme, and simple method of telling the whole story have brought much favorable comment from dealers who have observed its results in actual sales to motorists, and this outfit could be used to advantage on the counter of every dealer in the country.

A Novel Advertisement.

We illustrate one of the most curious and interesting advertising devices which has ever been brought to our attention. Here is a trained goose which appeared on the streets of Los Angeles, California, garbed as shown in the picture, and used as a walking advertise-



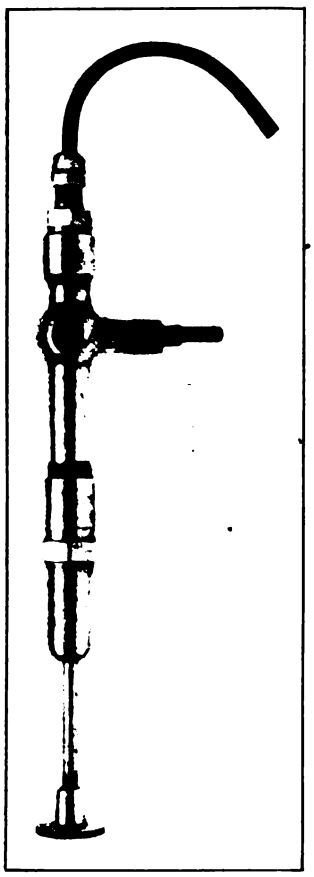
A trained goose.

ment of the Norwalk Tires, made by The Norwalk Tire and Rubber Company of Norwalk, Conn. It is estimated that 50,000 people see this goose every day, and the clever advertising idea is therefore proving very profitable to Lichtenberger-Ferguson Company, who are the Norwalk Tire Distributors in the cities of Los Angeles and San Francisco.

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The Maltby Spray Primer.

The latest invention of a Michigan Inventor, Mr. Frank D. Maltby, Battle Creek, Mich., is this spray primer—a compact little device of brass which is guaranteed to start gasoline engines even in "zero" weather. The primer may be attached to the manifold of any car and installed either through the radiator in hand cranked cars or through the dash in cars equipped with electric starters. The new primer acts by taking



A New Primer.

a charge of gasoline from the main gasoline line and injecting it into the intake manifold. The gasoline is atomized as it is injected into the manifold and instead of the usual dead gasoline a live fireable gasoline vapor is produced.

The Oxygenerator.

This is an appliance which the manufacturers state, will actually eliminate carbon, thus promoting 100 per cent. engine efficiency. The Oxygenerator is simplicity itself in construction. It consists of a water container and a copper coil. The container attaches to the exhaust manifold. This device may be said to digest the water and it carries superheated steam, through the copper coil wrapped around the exhaust manifold into the cylinders. The vapor quickly permeates every atom of power mixture, thus blasting into the most digestible shape, all usable fuel. It is also claimed that the carbon is absolutely burned away. The device is guaranteed to be fool-proof and wear-proof, indeed it will outlive the car and costs nothing to operate. The retail price of the Oxygenerator is only $10 and the manufacturers guarantee satisfaction or money back. Car owners who are interested should write direct to the Oxygenerator Company, Department 110, 1919 Michigan Avenue, Chicago, Ill., and in writing be sure to give the name of your car, also the model and year. Dealers are also requested to write for wholesale prices, descriptive matter and proof of the superiority of this invention.

Change in Firm Name.

The Vital Manufacturing Company is the new name of The Bigsby Rotary Manufacturing Company, of Cleveland, Ohio. Their products are widely known at this time, and much has been planned for enlargement of their present merchandizing system. They have made and will continue to make a complete line of standard spark plugs. About 75 per cent. of all the breakage in porcelains is due to the wrench slipping when the plug is being screwed into the cylinder, or to the undue strain put on the porcelain when the cable is being attached. In the "Protecto" the shell extends above the top of the porcelain protecting same from an outward bump or jar. Into the shell is screwed a heavy special fibre cap which carries the terminal post, allowing the cable to be fastened independent of the central core. The slight gap between the central electrode and terminal post intensifies the spark and eliminates the danger of breaking porcelains when tightening terminal with pliers.

Important Business Change.

At a directors meeting of the Universal Rim Company, held in Chicago, April 26th, it was decided, for the purpose of greater specialization, to separate the two departments of the business. The Royalty and Patent Department will continue under the name of the Universal Rim Company, and will have in charge all matters pertaining to patents, royalties, and the licensing of factories to manufacture Baker Rims. The Wholesale and Manufacturing Department will be continued under the firm name of Stone-Thompson Mfg. Company, which takes over the entire distribution of Baker Demountable Rims, and the manufacture of Stone Shock Absorbers, as well as other automobile specialties which are now in the course of development. The management of the Stone-Thompson Mfg. Company remains the same as the former wholesale department of the Universal Rim Company. Mr. S. M. Stone is the inventor of the Stone Shock Absorber, and has been associated with the Rim Company for several years. Mr. P. C. Thompson was formerly Treasurer and Sales Manager of the Rim Company, and has been connected with the same almost since its inception.

The Liberty Bell.

There are some who prefer a bell for use as a warning signal, rather than a horn or whistle. To such car owners, the Liberty Bell will strongly appeal. The manufacturers, in advertising this bell, call attention to the fact that this in a polite signal, although every effective. The clear bell tone will carry through all sounds of traffic, and the fact that the bell is used to such a great extent by fire departments is in itself sufficient testimony as to the value of this form of signal. We understand that this signal can be attached to any car, and it is manufactured by the Liberty Bell Company, 411 Superior Arcade, Cleveland, Ohio, to whom all inquiries should be addressed.

Assures a Smooth Running Motor.

Simple in its design and principle of operation, the Friestedt Hydronizer is a new, practical, 100 per cent. efficient device for overcoming faulty carburetion and engine power waste. To "hydronize your engine" by use of the apparatus here illustrated, is an assurance, according to the inventor, Arthur A. Friestedt, president of the Friestedt Manufacturing Co., Chicago, of more miles from every gallon of gasoline; carbon not only prevented but removed; clean spark plugs at all times, and a smooth running motor. The Hydronizer is now being supplied solely for use on Ford cars, but within 30 days a universal type will be adapted for attachment to the power plant of all leading makes of cars. The name "hydronizer" has been registered in the U. S. Patent Office, and is made to apply solely to the Friestedt device. It is not necessary to develop steam or vapor before the device will operate. It automatically goes into service from the first throb of the engine. Clean water and air are used, although the hydronizer will admit of the use of kerosene, alcohol or any fluid not detrimental to the engine or gas mixture. The Friestedt Hydronizer is a combination economizer and decarbonizer in that its prin-



ciple insures the saturation of the air that is drawn through the central tube and water by the vacuum created by the engine. One pint of water is sufficient for from 150 to 175 miles and should the water be exhausted, only the decarbonizing feature would be absent as the air admitted to the engine will continue the gasoline economy. The saturated air generated by the device, when combined in combustion with gasoline vapor creates a carbon monoxide gas which consumes the carbon. Further, by consuming excessive cylinder lubrication, the hydronizer saves the replacement of piston rings, and insures absolute freedom from sooty plugs. The Friestedt Manufacturing Co. is offering a most attractive proposition to dealers. In localities where dealer representation has not yet been established, the demands of motorists for the Hydronizer are being supplied from the factory, located at 2934-38 W. Lake St., Chicago.

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The Perfection Rim Tool.

This tool, as shown in the illustration, is reliable, simple and rapid in operation. It is easy to adjust, simple to work and understand; in fact, there is nothing complicated about it. Two or three movements and the tire is removed, and



when repaired, placed back in position again. With this tool, there is no possibility of injuring the casing or inner tube. The tool is easily adjusted to fit any one-piece split demountable rim. The retail price is only $2.50. This tool is manufactured by the A & A Company, Pillsbury Bldg., Minneapolis, Minn., and it is marketed by J. A. Smale, Inc., Special Factory Sales Representative, Fisher Bldg., Chicago, Ill.

A New Catalog.

The Akron Rubber Mold & Machine Co., Akron, Ohio, have just issued a new catalog; a very comprehensive book illustrating and describing their complete line of tire repair equipment, as well as a large line of standard equipment they manufacture and sell for tire builders' use.

The Tire Repair Section shows the line of Tip-Top Ti-Re-Pair Equipment manufactured by this company, including their new Type F, big capacity, self-contained outfit, which they are bringing out this year for the first time, and which rounds out their line, giving a most complete line of equipment for the tire repair shop.

The Tire Builders' Section lists some of the standard equipment manufactured for tire builders. This firm is one of the largest builders of tire equipment in the United States, and does an extensive business in the manufacture of standard tire equipment as well as special machine work for tire factories.

A copy of catalog may be obtained upon application to The Akron Rubber Mold & Machine Co., 917 Sweitzer Ave., Akron, O.

AUTOMOBILE BUSINESS. A guide, helpful, inspirational and Suggestive. By Jacob H. Newmark. Automobile Publishing Co., Detroit, Mich. Price $2.

The author is a man who has followed the automobile industry from its inception and he has given his experiences and observations in a very practical and common-sense manner. The work comprises about 200 pages, and every dealer, garage owner or repairman will find in it information that will aid him in whatever line of the automobile business he may be engaged.

New Design Piston Ring.

Owners of motor cars are very much wrought up at the present time, over the refuse of poor gasoline which will not vaporize getting down into the oil pit and so injuring lubrication. One expert recently stated that when some of the oil taken from the oil pit (after about oue thousand miles run) had a match touched to it, it exploded the same as gasoline would, indicating that gasoline was mixed with the oil. Gasoline leakage is generally caused by a certain amount of mixture which is not burned and which finds its way to the crank case diluting the oil and destroying lubrication qualities. This action is due to the fact that there is not a perfect seal between the cylinder wall and

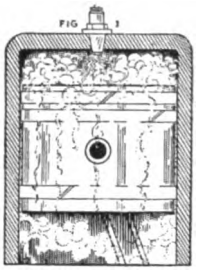


Fig. 1.

the piston rings. Of course it is perfectly obvious that gasoline is not a good lubricant. And it does not take much speculation to determine what will happen to a motor if no steps are taken to prevent the gasoline from leaking into the crank case and mixing with the lubricant. Motorists can avoid this trouble to some extent by using a good grade of oil and frequently draining off the oil from the crank case.

The Automobile Accessories Co., Baltimore, Md., have lately brought out a new design piston ring known as "No-Leak-O" "oil sealing." It is claimed that the deep groove cut around the face of the ring, with a scraping edge, in combination with the lap joint, forms a perfect seal of oil. That is to say, with a groove full of oil all around the ring, the gas cannot escape, the oil cannot get up and the refuse of poor gasoline cannot get down into the oil pit. See Fig. 2. The plain ring shown in Fig. 1 will hold compression and give normal

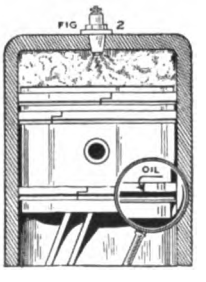


Fig. 2.

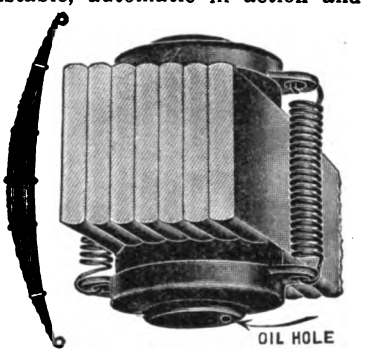
power when sufficient oil is used to form the seal, but when sufficient oil is used to form the seal, there is a waste of oil. This surplus or waste oil is burned into carbon and smoke at every stroke of the motor. If the quantity of oil is reduced, gas will escape past the rings on the compression stroke, when exploded, fire will follow the escaping gas, carrying the refuse of gasoline to the oil pit, all of which is very injurious. It will be seen that the groove full of oil acts as a dam or packing, the same as the improved water pump; where a groove full of water makes its own packing against water. By holding the gas, the motor will have maximum power, there being no waste there will be no carbon and the refuse will go out through the exhaust pipe. This is a very simple and well made ring and it is claimed by motor builders, mechanical engineers and owners who have used it extensively, that it is very effective.

The Hansen Automatic Air Valve.

This is a thoroughly practical valve which has recently been placed on the market. In this valve the rubber washers do not come in contact with the tire stem, which is an obvious advantage. The detachable stem is a separate, distinct and exclusive feature of this valve, which can be taken off or put on automatically. The valve is instantaneous in action and will not leak. Many of our readers will undoubtedly be interested in this and other Hansen accessories, which include air dusters, hose connections, hose clamps, etc. Write for prices and full particulars direct to the manufacturers, The Hansen Mfg. Co., Cleveland, Ohio.

New Sterling Spring Oiler.

This is a handy little device which insures perfect spring lubrication with a minimum of trouble. The cut will give an excellent idea of the appearance of this device which is easily attached, self-adjustable, automatic in action and re-



quires no tools to install or operate. All that you need to do is to soak the pads with oil and hook them over the auto spring; then introduce a little oil through the oil hole once or twice a month and spring troubles are over. There is no pressure on the pad where the oil is introduced. It can therefore absorb the oil and feed it to the spring leaves. The important feature of this device is that it retails for only 25 cents. This is a quick seller for dealers, and correspondence is invited by the manufacturers, The Sterling Mfg. Co., 321 Frankfort Avenue, Cleveland, O.

"Stik-Tite" Back Curtain Windows.

A very practical line of back curtain windows, under the trademark name "Stik-Tite" is manufactured by the Cincinnati Auto Specialty Co., Cincinnati, Ohio. These windows are made in almost every known size and shape, some especially made for the Ford car, and also for practically all standard makes. These windows are packed one dozen in a box, and one gross in a carton. Stik-Tite windows only average three ounces in weight each. There is a constant demand for these goods and they should be carried in stock by every live dealer. Write direct to the manufacturers for prices and terms.

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Keep Your

Johnson's Carbon Remover

Cures 80% of Engine Trouble

That knocking in your engine—the difficulty you have climbing hills—poor acceleration—lack of power—pre-ignition—noisy motor, are all caused by carbon.

Put New Life in Your Engine

with Johnson's Carbon Remover and it will run like it did the first 500 miles—quietly and full of "pep." No matter how choked up your motor may be, Johnson's Carbon Remover penetrates and softens the carbon. It then burns and powders and is blown out through the exhaust.

You Can Do It Yourself

Five minutes' time and no labor required. Simply lift the hood and pour an ounce of Johnson's Carbon Remover into each cylinder through the petcocks or spark plug openings. Go to bed—get up in the morning and drive a perfectly clean engine.

Use It Every 1000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will automatically eliminate most valve trouble and your engine will always be at its highest efficiency.

Pints $1.00
Half-pints ..... .65

Johnson's Stop-Squeak Oil

Has the Remarkable Property of Seeping Rapidly Between the Spring Leaves

and to the furthermost wearing points and it there becomes a heavy-bodied lubricant.

The irksome task of jacking up a car, prying apart the spring leaves and lubricating them is forever done away with. You, yourself, can now keep your springs thoroughly lubricated at all times. All you need is Johnson's Stop-Squeak Oil.

Make Your Car Ride Easily

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. Instead of bumping over the road, you fairly float along if your springs are lubricated so you have spring action. Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

For Squeaks of All Kinds

Johnson's Stop-Squeak Oil will remove squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil.

Quarts .....$ .85
Pints ..... .50

Write for our folder on Keeping Your Car Young—it's free.

Johnson's Cleaner

Removes Scum, Road-Oil, Grease, etc.

Johnson's Cleaner really cleans. It removes spots, stains, scum, grease, road-oil, tar, alkali, etc. Even those spots that are ground in—mud freckles—and surface scratches that you thought were permanent—will disappear like magic under Johnson's Cleaner.

Does Not Injure the Varnish

Johnson's Cleaner contains no grit or acid so it cannot scratch or injure the finest finish—it simply cleans and prepares it for a polish with Johnson's Prepared Wax ***Liquid***.

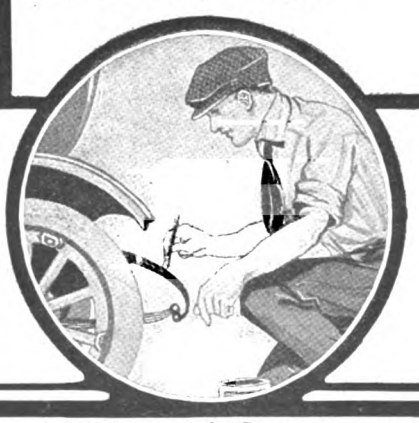
A Mirror-Like Polish

on your car adds to the pleasure and prestige of motoring, and increases the market value of your machine. It is just as important to keep your car looking well as running well. With but very little effort, you, yourself can keep body, hood and fenders just like new—use Johnson's Cleaner and Prepared Wax ***Liquid.***

Price, ½ lb. cans..35c each

If your dealer cannot supply you with Johnson's Automobile Products we will prepay the express to any point in the United States east of the Rockies.







S. C. JOHNSON & SON Dept. AD

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Car Young

Johnson's Prepared Wax

Now Made in Liquid Form

so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is the same as our Paste Wax except that it is a Liquid.

Johnson's Prepared Wax ***Liquid*** will prove a joy to the thousands of automobile owners who prefer a wax polish on their cars but are not inclined to spend the time or effort which Paste Wax requires.

Apply with Cloth, Brush or Spray

Johnson's Prepared Wax ***Liquid*** is very easy to apply and polish —but little rubbing is necessary. You can go over a good-sized car in half an hour. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches —prevents checking and cracking—sheds water and is absolutely dust-proof.

Quarts $1.20
Pints ..... .60

Tell your Dealer that Johnson's Prepared Wax is now made in ***Liquid*** form and insist upon him securing it for you. Write for our folder on Keeping Your Car Young—it is free.

Johnson's Black-Lak

Renews Tops, Side Curtains, Cushions, Etc.

Are your top and side curtains gray, dusty and leaky? If you knew of a preparation with which you, yourself, could easily and quickly make them look like new, would you buy it?

For Mohair and Leather Tops

Johnson's Black-Lak gives perfect satisfaction on any kind of a top. One coat gives a rich, black surface—just like new. It is easy to apply—dries in fifteen minutes—does not rub off on the hands or clothing — is permanent, water-proof and inexpensive. Do not hesitate to use Johnson's Black-Lak on the finest leather. It acts as a preservative and renders the leather soft and flexible.

For Worn Metal Parts

Johnson's Black-Lak is unequaled for blackening fenders—tire rims—running boards—hoods—radiators—guards—lamps—and in fact all worn metal parts. Prevents rust and keeps your car in a high state of repair.

Quarts $1.10
Pints ..... .65

Write for our folder on Keeping Your Car Young—it's free.

Johnson's Auto-Lak

An Automobile Body Varnish That Amateurs Can Use Successfully. Dries in 24 Hours.

Johnson's Auto-Lak is a splendid varnish for bodies, hoods, fenders and all parts of the car. It can be used by the amateur with perfect results. Dries ready for use in 24 hours. Johnson's Auto-Lak is now made in Clear and Black.

Does Your Car Need Re-Varnishing?

With Johnson's products you can easily do the work yourself. Johnson's Auto-Lak goes on easily and quickly—you can finish your car one day and drive it the next. If you are interested drop us a line and we will give you directions for re-finishing your car yourself in 24 hours. This includes the entire car, from wheels to top.

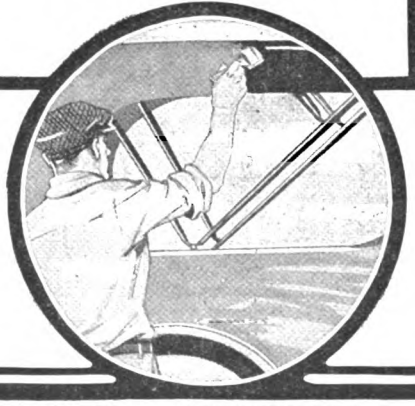
Johnson's Auto-Lak is a new product and not yet generally handled by dealers. If you are unable to buy it locally—send your order direct to us.

Pints....$1.50 **Quarts....$2.50**

One pint is sufficient for varnishing a roadster.

If your dealer cannot supply you with Johnson's Automobile Products we will prepay the express to any point in the United States east of the Rockies.







RACINE, WIS. U.S.A.

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Order Your Springs Now.

Prices of steel and steel products are increasing rapidly on account of the war and no one knows how high these prices are likely to go. Prudent dealers and service stations throughout the country are ordering springs in quantities, in anticipation that a further advance in prices is likely within the next thirty days, owing to the unprecedented advances in the steel market. The scarcity of raw material brought about by the demand created in the huge war orders of the United States Government will vitally affect every phase of the trade. These points were brought out very forcibly in a recent interview with O. G. Temme, president of the Triple Action Spring Company, of Chicago. "Advances in steel in the last month have surpassed all former records," said Mr. Temme, "and further advances are confidently expected by those in touch with the situation." Mr. Temme undoubtedly has the right view of probabilities in this market and a word to the wise should be sufficient.

Dreadnaught Tires.

In these days of naval and military activity, the Dreadnaught tires certainly have a significant name. The manufacturers state that these tires are "built to conquer." They are made of the toughest and highest priced materials obtainable which with the famous red rubber tread renders the greatest degree of durability with utmost resiliency. These tires are guaranteed for five thousand miles of service, but have a reserve of many hundreds more. The Dreadnaught tires are made with two attractive red rubber treads—the "vacuum" tread which is anti-skid, and the "ribbed" tread. There are excellent opportunities for the sale of these tires by reliable dealers. These tires are manufactured by The Dreadnaught Tire & Rubber Co., Baltimore, Md., but all correspondence should be addressed to Charles F. U. Kelly, Inc., Sales Department, 1834 Broadway, New York City. Many of our readers will be interested to send to this company for the beautifully illustrated booklet, "The Evolution of the Battleship," by Harry McDonald Spencer. This will be gladly sent free on request to car owners, dealers or any others who may be interested.

Water Stills.

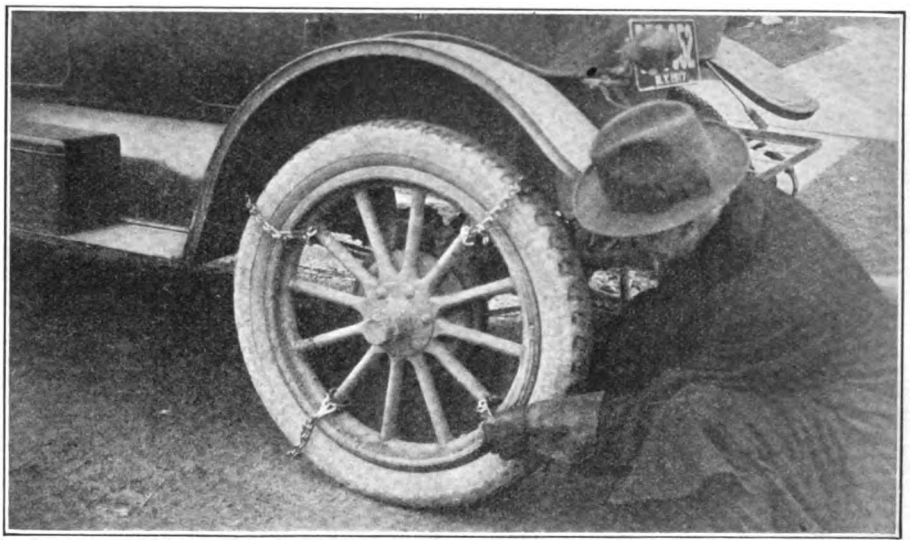
Pure water is an absolute necessity for garage use. None but the purest water should be used in the radiator, and in every up-to-date garage there should be a water still for distilling water. A full line of water stills is manufactured by The Sargent Steam Meter Company, 2835 Armitage Ave., Chicago, Ill. This company would be glad to send their catalog free to any of our readers who may be interested.

Vesta Lighting for Trucks.

Spillman Bros. Greater Shows is on the road. One hundred huge gasoline propelled covered motor vans are carrying the Spillman impediments this season, the Spillmans having "motorized" the entire show. As practically all circus travel is necessarily done at night the question of proper lighting equipment came up for consideration at the time these motor vans were purchased. After a careful survey of the various kinds of automobile lighting equipment on the market, the Spillmans decided that they could not do better than to follow Uncle Sam's example with the United States Government trucks on the Mexican border last summer—and Vesta Lighting Equipment was specified for the entire Spillman caravan. Vesta Truck Lighting Equipment is manufactured by the Vesta Accumulator Co., of 2100 Indiana Avenue, Chicago, which company also manufactures the well known Vesta Automobile Storage Batteries (a part of this equipment) and a large line of other automobile lighting specialties. The Vesta Accumulator Co. is one of the oldest manufacturers in its line, having been in business since 1897.

Easy-On Chains.

The Easy-On Chains made by the Woodworth Manufacturing Corporation, of Niagara Falls, N. Y., are of an entirely new type. The cross chain instead of being fastened to side chains are fastened individually to the spokes and thus can be easily put on without jacking up the wheel, even after one gets stuck on the road. The fasteners which attach to the spokes are covered with leather to prevent marring the paint and the cross chains are formed perfectly smooth and round next to the tire so as to not injure the rubber. The gripping member is comparatively thin on the middle of the tire and causes no bumping on pavements but is straight and long enough so that the ends take a deep hold in mud or snow. Easy-On Chains are packed a set of eight in a bag, four for each rear wheel, enough to give a good grip on any road surface. They are packed in a small bag and are intended to be carried in the car at all times so that the user can always feel he is ready for an emergency. They are made in three sizes, the small size which fits tires 3 inches or 3½ inches and sells at $3.00 per set; the medium size which fits tires 4 inches or 4½ inches and sells at $4.00 per set, and the large size which fits tires 5 inches or 5½ inches and sells at $5.00 per set. The manufacturers will send the chains at these prices parcel post or express prepaid to any part of the U. S. or Canada with the understanding that if the purchaser is not satisfied, on examining, he may return them express collect and they will refund the full amount sent them.



Enlarged Their Capital.

At a meeting of the Stockholders of The Mason Tire & Rubber Company, of Kent, Ohio, it was unanimously voted to increase the capitalization from $1,000,000 to $3,000,000, the new capital to consist of $2,000,000 Preferred Stock and $1,000,000 of Common Stock. The Mason Tire & Rubber Company at present is capitalized at $1,000,000. Its plant now has a capacity of over 500 tires a day and the increase in capital is made to allow for the tripling of the plant's capacity to 1,500 tires per day within the next year, and provide additional working capital. The Company's net earnings for March were sufficient to pay its Preferred dividend requirements of 7 per cent. four times over. At the present time over 200 distributors and dealers are handling Mason tires and tubes throughout the United States.

Removal Announcement.

In order to facilitate their service to the trade, Smith & Hemenway Co., Inc., of 99 Chambers Street, New York City, manufacturers of "Red Devil" Tools, are removing their executive offices to No. 130 Coit Street, Irvington, N. J., where their factory is located, thereby linking their office and factory facilities together. Only a small sales office devoted to New York City and export trade will be maintained in New York City, at 261 Broadway.

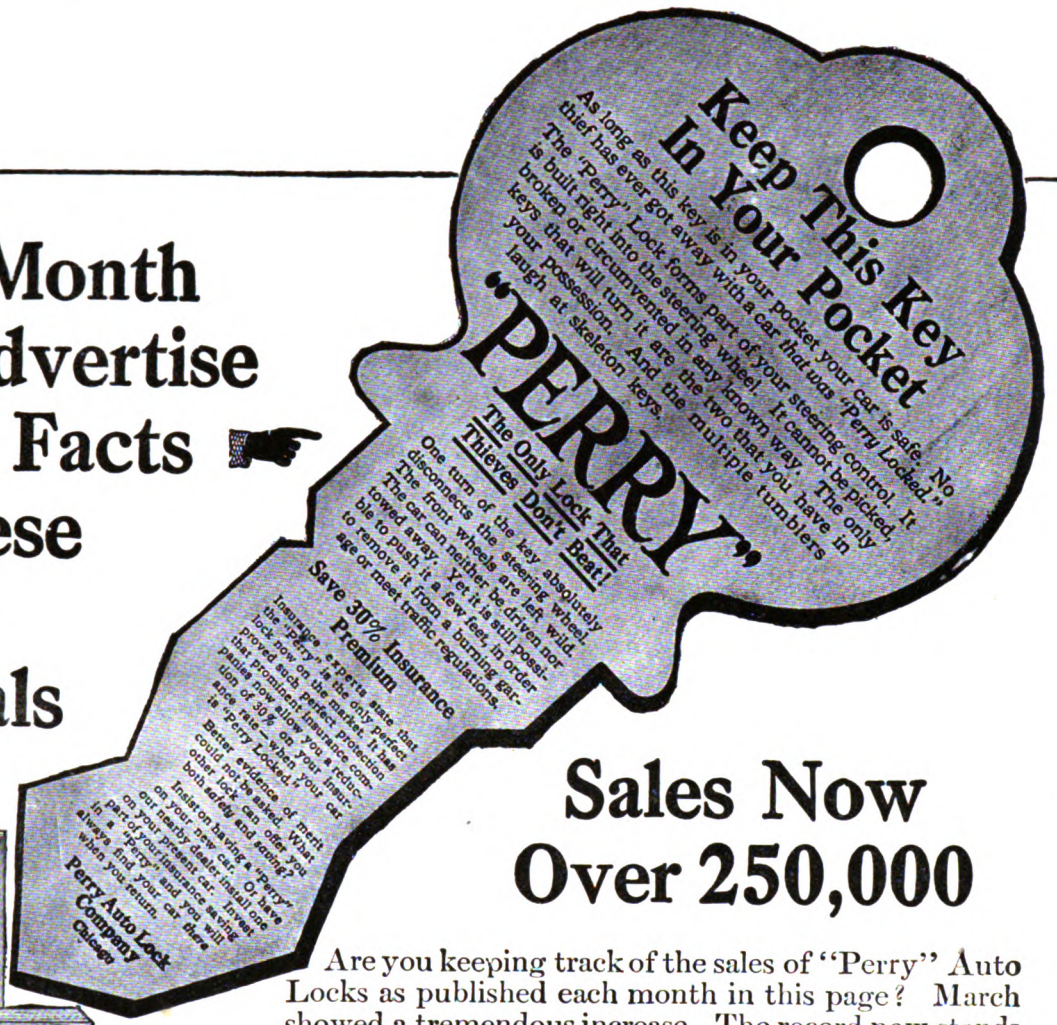
Maxfer Truck and Tractor Co.

The Maxfer Truck and Tractor Company have purchased a new plant for manufacture of their trucks at Harvey, Ill., one of the suburbs of Chicago. Their new plant is ten times as large as their old plant, and their production after the first of May will be 300 Maxfers per day. This will be a pleasant message to twelve hundred dealers scattered over the entire United States. Mr. Henry, the General Manager of the Company, stated in an interview to-day that their materials on hand would enable them to increase this output again in about sixty days. The Maxfer Company in nine months has grown to an organization of twelve hundred dealers, and a representative in almost every city in the United States and Canada, and in many foreign countries.

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Each Month We Advertise These Facts In These Great Journals





Sales Now Over 250,000

Are you keeping track of the sales of "Perry" Auto Locks as published each month in this page? March showed a tremendous increase. The record now stands at more than 250,000 *sold* since January First! If you are now a "Perry" dealer, you know all about this. You are already getting your share of the sales on the

"PERRY"

The Only Lock That Thieves Won't Touch

If you do not sell "Perry" it will pay you to get in touch with us at once. Mail the coupon or write a letter. The "Perry" is so much better than any other type of auto lock that it would sell *without* advertising. But we are on the job. We propose to put a "Perry" on every car in America. And our advertising is swamping our dealers with orders. Write today if you want to get in on this snap. Small stock—big demand—quick turnover—good profit. One type fits every car—with a special type for Fords at $5. Write.

Mail the Coupon!

"Send Your Dealer Proposition"

PERRY AUTO LOCK COMPANY
Dept. A-7, 1238 Michigan Blvd., Chicago, Ill.

Gentlemen: I have read your description of your "Perry" Auto Lock and would like to know about your special proposition to dealers.

*I sell*_____ *cars*

*Name*_____

*Address*_____ *Town*_____ *State*_____

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Davis Chemical in New Location.

The Davis Chemical Mfg. Co., Inc., makers of the Fracto cloth for windshield cleaning, also a general line of chemical and pharmaceutical products, have moved from 7 Water Street, Boston, Mass., to 306 Warren Avenue, Brockton, Mass., where their business will now be concentrated, the factory and office both being located at the new address.

The Howe Searchlight.

This is well called by the manufacturers "The Spotlight with the Wonderful Bracket." The product referred to is a spring controlled arrangement which enables the driver to utilize the light as easily as he could point his finger, and the strong rays will stay wherever you put them. The light hits the exact spot where you want light, with a direct one-way turn. The adjustment is so perfect that with a light touch, taking only a fraction of a second, you can direct the light wherever you want it, or you can leave it stationary and it will stay put at any desired angle. The spring controlled bracket is a feature not included with any other searchlight. The Howe Searchlight is entirely made from stampings, and therefore light in weight. It has a graceful streamline body and the finish is equal to that of a high class car. This light is reasonable in price and can readily be installed on any car. Dealers, garage owners and car owners will all be interested and they can readily obtain full information by writing direct to the manufacturers, the Howe Manufacturing Co., 1732 South Michigan Avenue, Chicago, Ill.

An Instant Light Control.

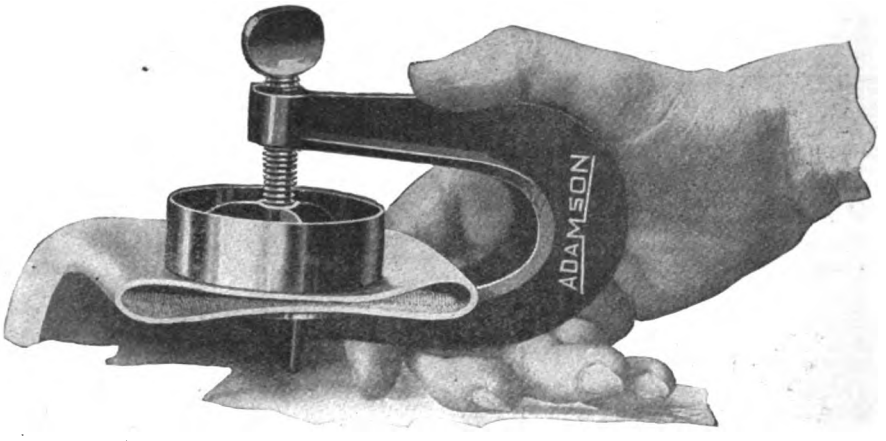
This is a device which gives the driver of any motor car complete and absolute control of the headlights, and they can be changed from 100 per cent. brilliancy to 100 per cent. legal dimness, enabling the driver to comply with no-glare ordinances in city driving. For parking, the headlights can be reduced to a mere pin point glow. A touch on the control button on the steering column gives the changes instantly. The Savidge Light Control, especially designed for Ford cars is made by the same company which makes Naturalite Control. This device for Fords gives a uniform white light all over the road at all engine speeds, from the lowest to the highest, the current being obtained from the regular Ford magneto, and the same adjustments are applied as that obtained from the Naturalite Control. Both of these devices are sure to command a great sale, and they offer a very important opportunity for dealers. The Naturalite Control retails for $5 with a guarantee which calls for the return of the money in thirty days if the car owner is not absolutely satisfied, while the Savidge Control for Ford cars retails for $7.50 and is sold on the same terms. Write at once for particulars to the Universal Motor Products Co., Indianapolis, Ind.

A Comprehensive Spring Catalogue.

We have just received from the Jenkins Vulcan Spring Company, 1402 Chestnut Street, St. Louis, Mo., their 1917 catalogue of Vulcan springs, and this catalogue contains stock numbers and sizes on springs for all the standard makes of automobiles; also complete code by which customers can telegraph their orders, which will be promptly filled from the extremely large stock of springs always carried by this company. It is a remarkable fact that the Jenkins Vulcan Spring Company at their main office and in four branches carry a total stock of 90,000 replacement springs, covering 588 separate and distinct types for all popular priced cars. This business was started in a very small way five years ago, with an initial stock of 100 springs and a small plant with a very limited capacity. The present big plant is working overtime to keep up with orders and sustain the reputation of this house for high class service. The capital stock of the company has just been increased from $60,000 to $200,000, this increase having been made necessary by the rapid development of the business. Our readers may always feel assured that all their orders will be promptly filled when sent to this manufacturer.

Adamson Five Minute Vulcanizer.

We illustrate the Adamson 5-Minute Vulcanizer, Model E, made by Adamson Manufacturing Co., East Palestine, O. This outfit is made especially for the quick repair of tube punctures and will vulcanize your tubes anywhere in five minutes. Like other "Adamson" outfits uses common gasoline—a dependable fuel. It differs from the other "Adamson" line only in size and it sells complete with box of a dozen 5-minute repair patches for $1.50. Extra box of twelve patches at 25 cents each.



Simple, Quick and Sure.

A Self Adjusting Belt.

The Self Adjusting Belt Company, 420 First Avenue S. E., Watertown S. Dak., has brought out a new device which will be much appreciated. This is a Self-Adjusting Belt, made for all automobiles, tractors and machinery. It is made of piano wire springs running lengthwise of the belt with leather blocks cut and laced on the springs, making the wear of the leather come on the edge of the grain. The belt can be shortened or lengthened by using another set of couplings, or be repaired in the same way with a coupling. The couplers are threaded and screwed in the end of the springs and will not pull out. With this belt there is no slipping, no noise, and the tension is uniform at all times. These belts are guaranteed for one year and they are made in sizes from 5/8 nches wide to 3 inches wide. Dealers and jobbers should write for discounts direct to the manufacturers, and all inquiries from car owners will also be promptly answered.

SKF Bearings for the Pacific Coast.

In order to more readily supply the SKF bearings on the Pacific Coast, the SKF Ball Bearing Co., of California, Inc., has been organized for the sale of these well known self-aligning radial and thrust ball bearings, and the main office of this new company, under the direction of Mr. A. F. McLaren, has been opened in San Francisco, at No. 341 Larkin Street, where a large assortment of these bearings will be carried in stock at all times. The engineering service of the company will also be available by addressing this office. The State of California has a larger number of car owners than any other State in the Union with the exception of New York, and live companies in every line of accessories are establishing agents and branch companies in this very important territory.

A New Association.

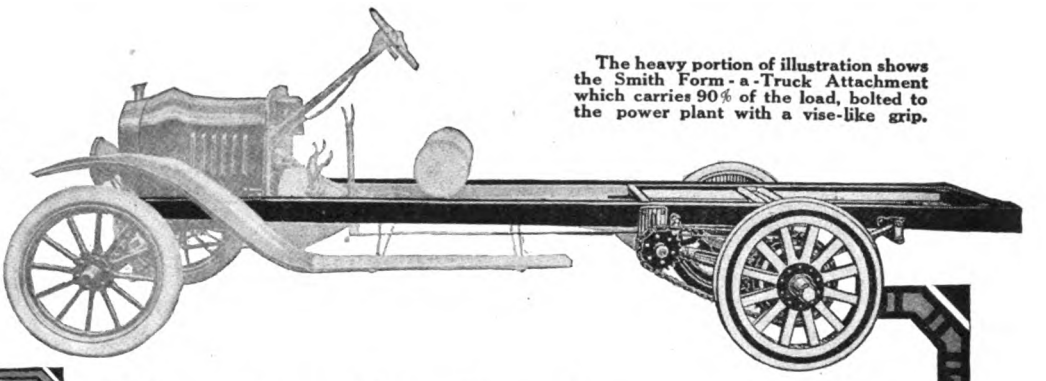
An organization of manufacturers of Automotive Electric Accessories was formed at Atlantic City, New Jersey, Monday, April 16th. This new organization will be known as the Automotive Electric Association. Among its members are the largest and best known manufacturers in this line. The purposes of the organization are to improve and develop this branch of Automotive Electric Accessories' business through standardization and by friendly interchange of experience with reference to design and manufacture. The following officers were elected at this meeting: G. Brewer Griffin, President, Pittsburgh, Pa.; C. O. Mininger, Vice-President, Toledo, Ohio; G. S. Cole, Secretary, Cleveland, Ohio; C. L. Amos, Treasurer, Syracuse, N. Y.

A Correction.

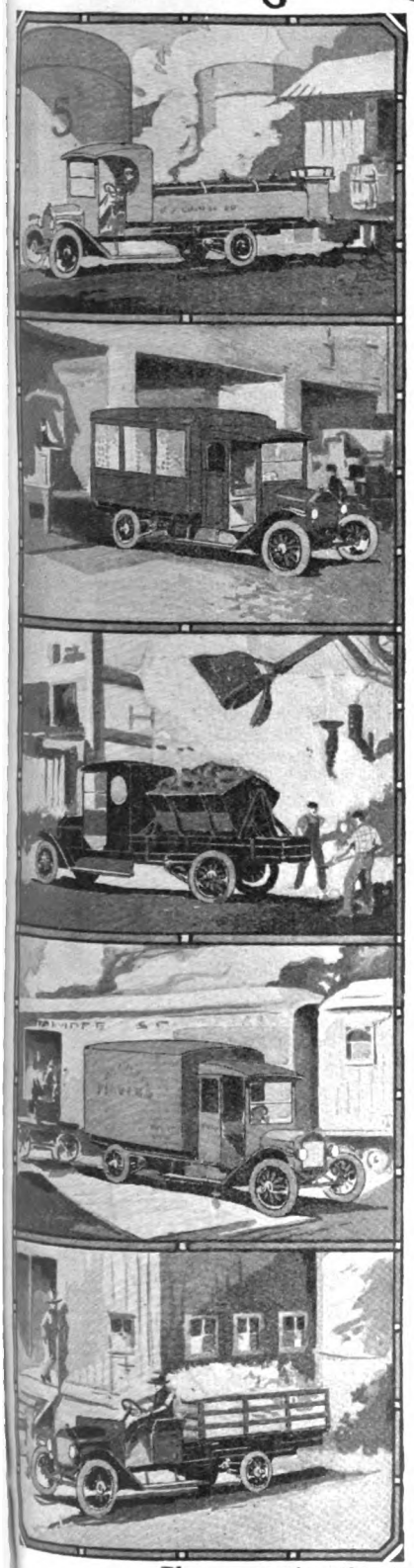
An error was made in the advertisement of the Poughkeepsie Utilities Corporation of Poughkeepsie, N. Y., which was printed in the April issue. One sentence was printed "every sale leaves you a net profit" when it should have read "every sale leaves you a neat profit." This error serves to illustrate how the omission of a single letter can sometimes change the meaning of a sentence.

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Smith Form-a-Truck $350 f.o.b. Chicago



The heavy portion of illustration shows the Smith Form-a-Truck Attachment which carries 90% of the load, bolted to the power plant with a vise-like grip.



There is a Big Premium on Smith Form-a-Truck Dealerships this Year

IF you can qualify as a Smith Form-a-Truck dealer—if your territory is still open, now is the time to act. Only the livest, dealers are being considered.

Many of the real business getters—men with the reputations for making big profits—who have built up enormous business—have moved to entirely new sections of the country where there were Smith Form-a-Truck dealerships available—

They know the money that is to be made.

And every established Smith Form-a-Truck dealer now can place a high cash value on his dealership.

Smith Form-a-Truck has exceeded every other achievement in the motor truck industry by a tremendous percentage—built up an industry of its own in less time than many manufacturers take to start their preliminary work.

Smith Form-a-Truck is the answer to the delivery and hauling question for every user of motor drawn or horse drawn transportation in the country.

Fleet orders from the big national buyers run up into several hundreds at a time.

Individual buyers total high into the thousands.

Production has already reached the amazing total of 350 a day to keep pace with orders for immediate shipment.

More Smith Form-a-Trucks are being built each month than all other makes of attachments combined, built for a year.

More in a month than any other manufacturer of motor trucks builds in a year.

Measured by any standard of earnings, dealer profits in Smith Form-a-Trucks are from 500% to 700% greater over a given time than any other make of motor truck.

Sales are faster—investment is less—and your money is turned with amazing rapidity. With the heavy premium already set on established Smith Form-a-Truck dealerships. There is always room for the right man—somewhere.

If you are a dealer who can qualify — who can maintain the high business standard maintained by the entire Smith Form-a-Truck dealer organization — there is a chance for you somewhere.

We are ready to receive your application — to show you just what we can do for you. But do not delay in getting it in. Wire today.

SMITH MOTOR TRUCK CORPORATION

Manufacturers of Smith Form-a-Trucks

Executive Offices and Salesroom, Smith Form-a-Truck Building

Michigan Boulevard at 16th St., Chicago

Eastern Branch, 1834 Broadway, New York
Southern Branch, 120 Mariette St., Atlanta
Kansas City Branch, 1808 Grand Avenue
Pacific Coast Branch, Pico and Hill Sts., Los Angeles

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The Beeman Garden Tractor.

In these days when thousands of people who never did so before are cultivating their land, many of our readers will doubtless be interested in a new tractor which has recently been placed upon the market by the Beeman Garden Tractor Company, Monroe at 15th Avenue N. E., Minneapolis, Minn. This is a simple yet effective device, and it is described as the only one horse power tractor on the market. It is especially



Simple and Effective.

adapted for use in comparatively small farms and gardens. It operates like the lawn mower, but without the hard work connected with that machine, because the self-contained power does the work. Even a boy or girl can operate this machine. All they have to do is to start it and steer it. It is especially useful in cultivating, and thousands of small truck gardeners are using this machine to great advantage all over the country. The machines may also be belted up for grinding, sawing, or for running an emery wheel, pump or cream separator. In fact this little machine has a thousand different uses, and will pay for itself on any farm, or garden, in a short time. The illustration will give an idea of the appearance of this machine, which in this case is being used for cultivating. Readers who may be interested should write direct to the manufacturers for free illustrated circular giving prices and full description.

The Demaco Gas Saver.

This is a simple but effective device which the manufacturers state will increase the mileage of any car from 20 to 40 per cent. They also offer to refund the money if this device will not do all that is claimed for it. This gas saver is regulated from the seat. It is easy to apply and offers good profits for dealers and agents. Any who may be interested should write immediately for prices and full particulars to the Decatur Mfg. Co., 717 East North Street, Decatur, Ill.

Electric Drills and Grinders.

The Standard high power portable electric drills and grinders are built for continuous service, and they are particularly adapted for use in any automobile repair shop. These tools are manufactured by The Standard Electric Tool Co., of Cincinnati, O., and they are absolutely guaranteed to give satisfactory results. Ball bearings are used throughout in the construction of these machines and every tool is guaranteed both electrically and mechanically. The modern method is to use motor driven tools, and these portable drills and grinders will soon pay for themselves in any shop. Readers who are interested should write to the manufacturers for full particulars and latest catalogue.

"S. & H" Gas Saver.

It is claimed by the manufacturers of the S. & H. Gas Saver that it will enable motorists to get from two to ten miles more distance out of every gallon of gasoline used, and it also prevents the formation of carbon in the cylinders, thus sustaining the power and speed of the car and prolonging its life. With every "S & H" Gas Saver, the manufacturers issue a strong guarantee which states that if the device has been properly adjusted on your car, you can return it any time within thirty days, if not satisfied, and the money will be refunded. The price of this device complete is $6.00, charges prepaid, with complete instructions for adjustment. Car owners should send direct to the manufacturers for free circular, and correspondence from dealers is also invited as this is a quick selling article. All correspondence should be addressed to the S. & H. Mfg. Co., Dept. 2, 406 Palace Bldg., Minneapolis, Minn.

Crowe Mechanical Fan Belts.

On long runs, the cooling system of a car is very important and in this connection, any motorist can testify to the value of a dependable fan belt. The Crowe Mechanical Fan Belt, when once installed, will always cling to the pulleys, turning the cooling fan at maximum speed. This belt is so constructed that there is no lost power or motion. Readers who are interested should write for free descriptive circular to the Mechanical Belt Company, 1202 Frederick Avenue., St. Joseph, Mo.

Universal Spring Oilers.

Nearly every motorist realizes the importance of having springs well lubricated. The Universal Spring Oilers made by the Improved Gauge Mfg. Co., 300 West Water Street, Syracuse, N. Y., are well adapted for efficient spring lubrication. By the use of one of these spring oilers, you can stop squeaks, work out the rust, and make the car run much smoother and better. These oilers are made in two sizes, 1½ inch and 2 inches. They are easily applied and retail for only 25 cents each. Jobbers and dealers are especially invited to write direct to the manufacturers for full information. Postal card inquiries will have prompt attention.

Starting and Lighting for Fords.

An excellent starting and lighting system for Ford cars has been placed on the market by the A. B. C. Starter Company, 33 E. Woodbridge St., Detroit, Mich. This is a two-unit system, being the same type which is used on all high-priced cars. It is described by the manufacturers as a light and compact system which puts no drag on the engine. The starter is idle while the engine is running. The generator consumes only one-eighth H. P. The starter connected with this system eases off the strain of back firing. There are no chains to break and restore. The weight of the device is equally divided on each side of the car. The accessibility of the Ford engine is not interfered with. The starting strain is at the exact point where the Ford designer intended it should go. No change is required in the construction to install this device, which is absolutely guaranteed against construction faults and material defects. The price is within the reach of any Ford owner, although the system is well made, efficient and durable. It is a quick seller for dealers, and correspondence is invited from them, as well as from owners of Ford cars. All correspondence should be addressed direct to the manufacturers.

A Real Carbon Remover.

The attention of dealers is particularly called to a new carbon remover called "Autopower" which is being extensively advertised. This carbon remover has been absolutely demonstrated and there is abundant proof that it is efficient. Many large concerns such as Marshall Field, Simmons Hardware Co. and others of nation-wide reputation are using this compound regularly. Poured into the gasoline tank, Autopower attacks the carbon right away and dissolves it. The cylinders and pistons are left clean and the full power is restored. There is no damage to the metal, upholstery or finish of the car. A quart of this compound which retails for only $1.50 is good for 1200 carbon-free miles. This is a quick seller and good agents are wanted throughout the country. For interesting free literature and full particulars, readers should write to the Crystal Oil and Paint Company, Autopower Division, Cleveland, Ohio.

A Warning Signal.

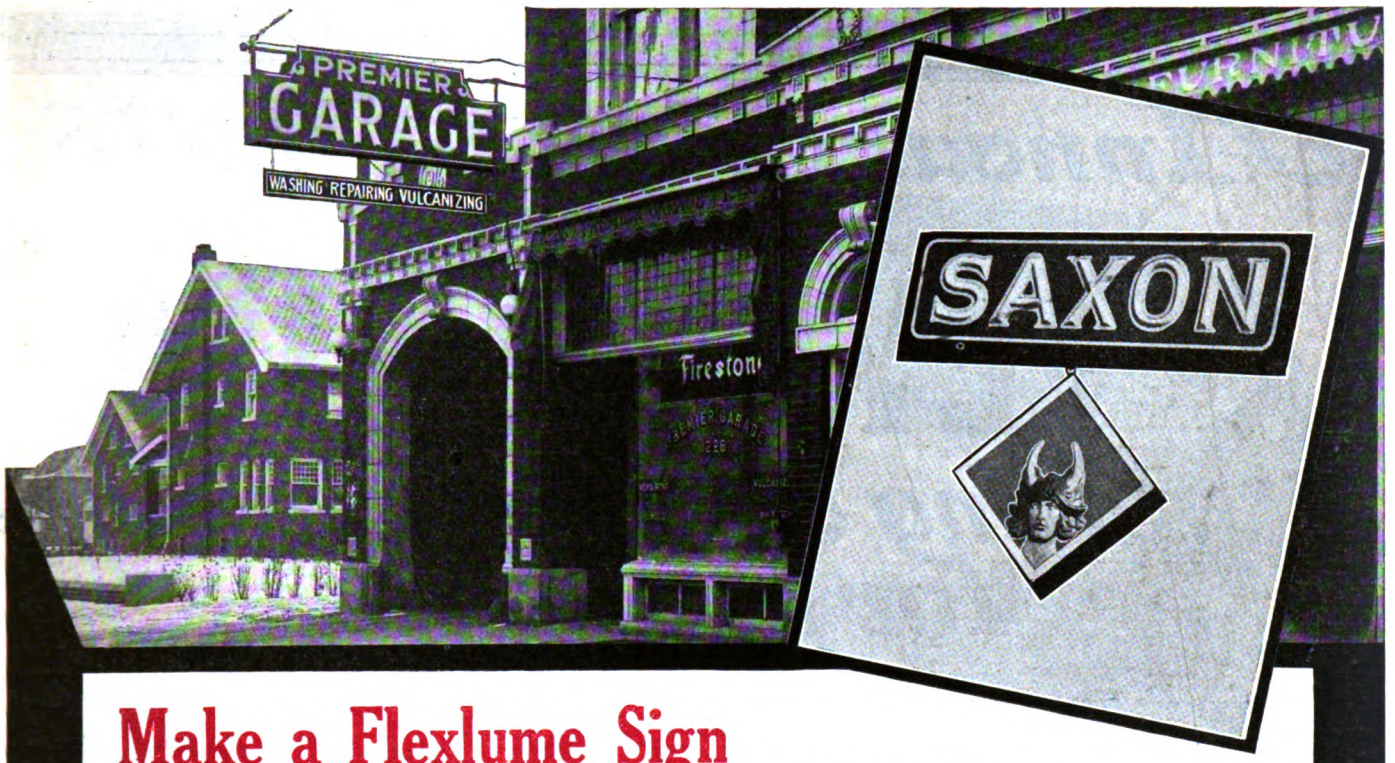
In a warning signal, the most important feature is to have the operating button or bulb easily accessible to the driver. The Handy Horn, for Ford cars, is equipped with a push button on the center of the driving wheel, where it can be reached instantly by the driver. A serious accident might happen in the short interval necessary for reaching



The Handy Horn.

through or around the wheel to blow the horn, but with the button situated on the center of the driving wheel, there is absolutely no delay. The price of this device complete is only 50 cents, and by many it is regarded not only as a luxury but as an absolute necessity. The Handy Horn is manufactured by the Francis-Rand Company, 400 Erie Building, Cleveland, to whom all correspondence should be addressed.

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Make a Flexlume Sign Pay Your Rent—

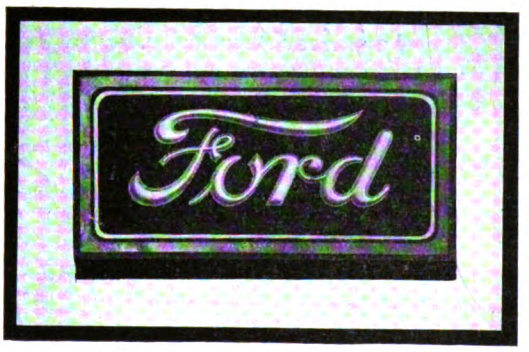
A *Flexlume* sign is not an expense but an investment. It is an unfailing money-getter for the garage man or the dealer.

Twenty-four hours in the day it blazes out its message of progress, for its raised white letters standing out from a dark background make it a day sign as well as a night sign.

The passing motorist will mark it as surely as the navigator marks the lighthouse.

Flexlumes give a maximum of electrical brilliancy, and they give it economically. The leading car builders and dealers are standardizing on *Flexlumes* not alone because they have the distinctiveness that is lacking in other signs, but because they give most electrical advertising for the dollar.

And *Flexlume* signs are not costly. They can be bought on easy payments where cash is not available.





Send in this coupon and get a sketch showing how YOUR sign will look.

The Flexlume Sign Co.

1445-1451 Niagara St. BUFFALO, N. Y.

Canadian Distributors:
THE FLEXLUME SIGN CO., ST. CATHARINES, ONT.
Pacific Coast Distributors:
ELECTRICAL PRODUCTS CORPORATION, 112 WEST 16TH ST., LOS ANGELES, CAL.

FLEXLUME SIGN CO., Buffalo, N. Y.

Please send me free sketch and information in regard to Flexlume Signs.

Signs should read.....

.....

To read one or two sides?.....

Vertical or horizontal?.....

NAME.....

ADDRESS.....

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Announcing The EVEREADY Starting & Lighting System for Ford Cars

To the Prospective Distributor

Yes, there are other Ford Starters on the market. It is on this fact that we base our claim for superiority.

Three years of work—planning, designing, building and testing, to overcome the limitations of present systems, have evolved the Eveready Starter.

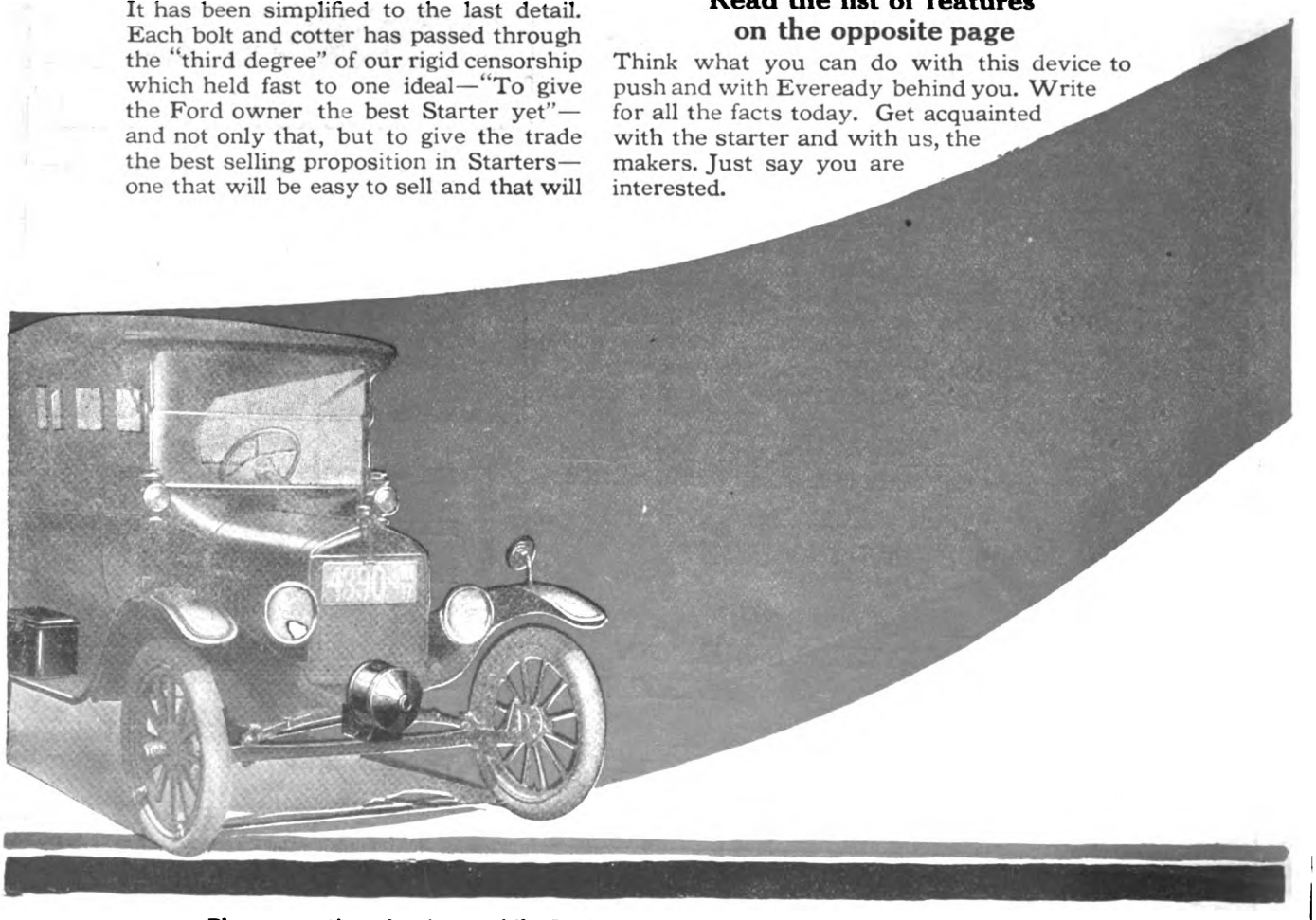
It has been simplified to the last detail. Each bolt and cotter has passed through the "third degree" of our rigid censorship which held fast to one ideal—"To give the Ford owner the best Starter yet"—and not only that, but to give the trade the best selling proposition in Starters—one that will be easy to sell and that will stay sold—an Eveready principle that has built up a leadership in all its lines.

Now it is ready for distribution

—we are now ready to carry out our distribution. There are many candidates for as many exclusive territories—good business for all of them—and that means you.

Read the list of features on the opposite page

Think what you can do with this device to push and with Eveready behind you. Write for all the facts today. Get acquainted with the starter and with us, the makers. Just say you are interested.



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500 Sold the first 5 days



The Eveready Starting and Lighting System for Ford Cars

Consists of a combined starting motor-generator unit, a 12-volt Eveready Non-Sulphating Storage Battery, and all the necessary switches and wiring.

The motor-generator is mounted on the front cross channel member of the Ford chassis, therefore there is no weight on the engine support.

Coupled direct to the Ford Motor-Shaft, **there are no gears, chains, belts or sprockets necessary to drive the generator, which drives at engine speed, eliminating the "drag" found in other types where the generator is geared to be driven at higher than engine speed.**

The 12-volt Eveready Non-Sulphating Storage Battery in this system is the only battery sold with a definite written guarantee against ruinous sulphation.

Ease of installation is another feature of the Eveready Starting and Lighting System. Single wire connection used throughout. The average layman may install the whole equipment in a few hours without altering car body or chassis. **Complete illustrated instructions are supplied with each system.**

Further information may be obtained by writing

AMERICAN EVER READY WORKS
of National Carbon Co. **Long Island City, New York**

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Great Oaks From Little Acorns Grow

50,000 SQ. FEET OF SPACE DEVOTED TO ACCESSORIES



OUR NEW HOME

For Dealers Only!

Service plus Bargains

"The Winning Team"

All the automobile Accessory trade is talking about the wonderful, rapid growth of the SERVICE MOTOR SUPPLY CO. of Chicago. They call us *"The fastest growing automobile accessory jobbing house in America"*—and they keep on sending us their orders.

We were the first to inaugurate, and practice, on a national scale, our system of selling to merchants from a complete monthly catalog. Our monthly catalog "SNAPS" is known by 100,000 accessory dealers from coast to coast as the ***"National Bargain Directory of Auto Supplies."*** Our system enables us to place before the accessory dealers of this country a new, fresh assortment of merchandise every 30 days.



Dealers—Send For "SNAPS"!

"SNAPS" is complete, containing over 1000 items, and keeps the dealer in touch with the ***latest*** and the ***best*** that the market affords. Within a few days from the time a new accessory appears on the market—our dealers see it listed and illustrated in "SNAPS"—and at ***surprisingly low prices!*** We do not have to anticipate a rise in prices when we quote you, and therefore, our dealers get the advantage of the ***lowest prices current*** at any time.

We ***buy*** for cash and we ***sell*** for cash—and ***we buy in enormous quantities!*** We are ***preferred*** buyers—we get the ***first*** chance at the ***best.*** Therefore we are able, and do give you, the benefit of the ***lowest prices*** at which ***our quality*** of goods can be bought. We are selling millions of dollars worth of Auto Supplies and Hardware per year—therefore we can afford to take a very small profit on each item—the big volume makes this possible and wins you this fine saving.

Our business was founded with a small capital but a big idea—the idea of ***SERVICE.*** We have taken the meaning of "SERVICE" in its broadest sense. And each day, each month, we have found a new and still broader meaning, so that now we understand that "SERVICE" means ***all things that go to make life easier and business more profitable for the dealers we serve!***

We guarantee to ship 90% of our orders within 6 hours from receipt. Only orders for unusual, special items are occasionally held longer. ***We guarantee to return your money*** to you any time you ask for it—and it makes no difference whether you want it back for a good reason—or for no reason at all—***you get it, quick.***



OUR OLD HOME

WE SELL WHOLESALE ONLY!!

Only ***qualified dealers and garage men*** who buy to resell can buy goods from us. No consumer can buy goods from us—our well organized "Turn Down" Department takes good care of that. We refuse to compete against our customers—this ***absolutely protects the dealer.*** Thousands of pleased dealers now call us their "Chicago Partner"—why don't ***you,*** too, send for a ***free*** copy of "SNAPS" the "National Bargain Directory of Auto Supplies?" Write on your letterhead so that we may know you are a dealer and entitled to get "SNAPS."

LET US BE *YOUR* CHICAGO PARTNER

SERVICE MOTOR SUPPLY Co. 1523 25 27 29 31 Michigan Blvd. CHICAGO, U.S.A.

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$150.00 ADDITIONAL MONEY Will Be Paid

Why Not YOU Earn This Money?

RECENTLY we offered $1,000 for the most sensible letters concerning the Bailey Non-Stall Differential. The judges have selected what they think are the seven best letters—the authors' names will be announced June 15th, and the money paid.

Before then, however, we are offering additional money of $150. Open to everybody.

Sign coupon below or use separate sheet, and we will send you book containing thirty-six letters. The seven best letters are included in this book.

We want you to read these letters and pick out the seven ***you*** think are the best according to the clearness with which they explain to you the merits of the Bailey Non-Stall Differential.

FOR the one who give us the best reasons for the seven letters which he selects, we will pay $50. For the next four best we will give $25 each. By best we mean the most sensible explanation for your selection.

Perhaps you will pick the same seven that the judges picked in the original offer—it will be interesting to see how near you come to it.

Complete information contained in the book of letters which we will send you free upon the receipt of the coupon below. If you submitted letters in our previous offer, it does not bar you from this one. It gives you a chance to earn additional money.

You will be interested in these letters anyway because they tell what others think about the

BAILEY

NON-STALL

DIFFERENTIAL

"BRAINS IN THE REAR AXLE"

—that intelligently direct the power to the wheel that has traction and can use it. That saves tires and insures safety. That prevents skidding, spinning, sidesway and stalling. That fits into the rear axles of any car and is quickly installed. That every car needs.

Fill out this coupon and mail at once

Bailey Non-Stall Differential Corp., 1124 Michigan Ave., Chicago, Ill.

Please send me book of thirty-six letters and complete information on how to earn your offer of $150.

NAME .....

CITY .....

STATE .....

STREET .....

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Perfect Driving Light

Under All Conditions
Safety — Convenience — Courtesy
Guaranteed or Money Back

100% Brilliancy

100% Legal Dim

100% Safety

50% Battery Saving



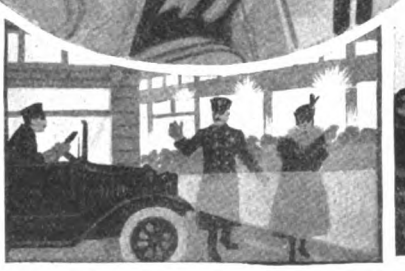
$5

Money Back in 30 Days

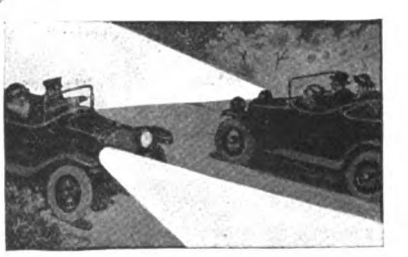
Our Guaranty



Full Brilliancy for Country Roads—Safety.



Legal Dim for City Driving—Law



Ditch Light for Passing Cars—Courtesy



Naturalite Control button for switching from legal dim to full brilliancy in city driving, or from full brilliancy to right ditch light — left light dim for courtesy in country driving.



Naturalite adjusting switch and coil of rheostatic metal permits legal dim, cuts current consumption.

Simplicity

Naturalite Control is easily installed on any make of car. One device fits all models.

It is amazingly simple to operate. Change from legal dim to full brilliancy for city driving obtained from simple button on steering column right under your thumb. Same button controls courtesy light or full brilliancy on country roads.

Calibrated switch to set for legal dim or for courtesy light conveniently mounted on dash board, easily reached.

Installation very simple. No complicated wiring or parts.

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Safety First-Courtesy Always in Night Driving

Controlled Light the Only Light

Naturalite Control gives you any degree of dim through the use of a simple calibrated switch on the dash of your car. This is for city driving or standing at the curb. Full brilliancy in case of emergency obtained through push button on the steering column—simple, convenient and meeting every legal requirement. Right side ditch light, left light dim for passing cars on the road—this is Safety and Courtesy in One.

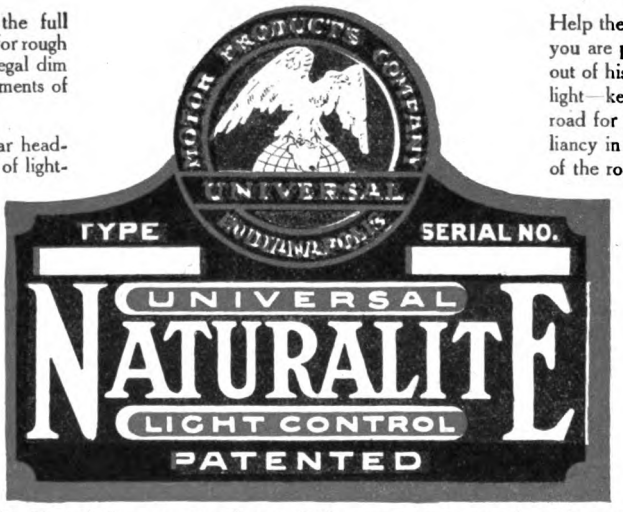
Safety First

You need driving-safety. Keep the full brilliancy of your lamps necessary for rough roads or country driving; get the legal dim you must have to meet the requirements of City Ordinances.

Naturalite Control used with clear headlight glasses is the only safe form of lighting under all conditions. Diffused or obstructed light will be eaten up by any good, strong pair of headlights on car approaching you at night.

Naturalite Control will give you full brilliancy of your lamps when you need it—will give you legal dim, full brilliancy, in right side ditch light with left light dim, instantly, from simply pushing control button on steering column. This is safe driving light.

For All Cars Using Storage Batteries



Courtesy Always

Help the other fellow on the road when you are passing at night. Keep the glare out of his eyes by dimming your left headlight—keep a safe driving light on the road for yourself by still having full brilliancy in your right lamp on the right side of the road for protection against culverts, soft roads and ditches.

Avoid the blinding effect of suddenly switching from full brilliancy to full dim. Keep a light on the road that your eyes are accustomed to.

This is courtesy and safety combined.

The only way you can get it for your car is by using Naturalite Control.

Convenience

Naturalite Control gives you any degree of dim necessary to comply with no-glare ordinances in city driving. For parking, the headlights can be reduced to a mere pin point glow—the current consumption is in direct proportion to the volume of light. In either case, the full unobstructed brilliancy of both headlights is instantly available for country driving, or for an emergency — a torn-up street — a bad crossing—driving into your own garage. A touch on the control button on steering column gives the changes instantly.

Right Side Ditch Light for Country Roads

The same calibrated switch that controls legal dim gives you courtesy adjustment—full brilliancy of right lamp, any degree of dim in left lamp.

Ditch light and full two-lamp brilliancy controlled from same button on steering column that controls legal dim for city driving.

Saves Money in Many Ways

Naturalite Control saves 50% battery current when lamps are set for legal dim. This doubles battery life in city driving or parking. Means increased motor starting efficiency.

It saves expense of special high candle power bulbs, resorted to by users of so-called "no glare" lenses. It saves destructive action from overloading wiring and battery, by reducing current consumption. It increases lighting satisfaction 100%.

Our Money-Back Guaranty Protects You

If you are not convinced within thirty days that Naturalite Control is absolutely necessary for your safety, send it back. If it does not give you the best lighting you have ever had, we will refund every penny of your purchase price. Send coupon today.

Special for Ford Cars

Savidge Light Control gives uniform white light all over the road at all engine speeds, from the lowest to the highest, from Ford magneto. Same adjustments of lamps as that obtained from Naturalite Control, for cars using storage battery, with extra provision for spot light for reading road signs or hunting house numbers. Covered by same money-back guaranty that we offer on Naturalite Control.

A Tremendous Opportunity for Dealers

Every motor car owner is an immediate prospect for Naturalite Control—the only safe control—the control that makes special lenses unnecessary—that gives the only kind of satisfactory lighting that can be obtained.

Every automobile owner knows the requirements of perfect lighting—full brilliancy for country roads—one light dim for passing approaching cars—a light that helps the approaching driver—legal dim light for city driving. The only way he can get it is from Naturalite Control.

Universal Motor Products Company, Indianapolis, Ind.

AUTO D. & REP. MAY, 1917

UNIVERSAL MOTOR PRODUCTS CO., Indianapolis, Indiana

Enclosed I am sending you $5.00 for which please send me Naturalite Control for my battery equipped car.

Make..... Model..... Year.....

FOR FORD CARS

Enclosed I am sending you $7.50 for which please send me Savidge Control for my Ford car.

Year..... Model.....

Name.....

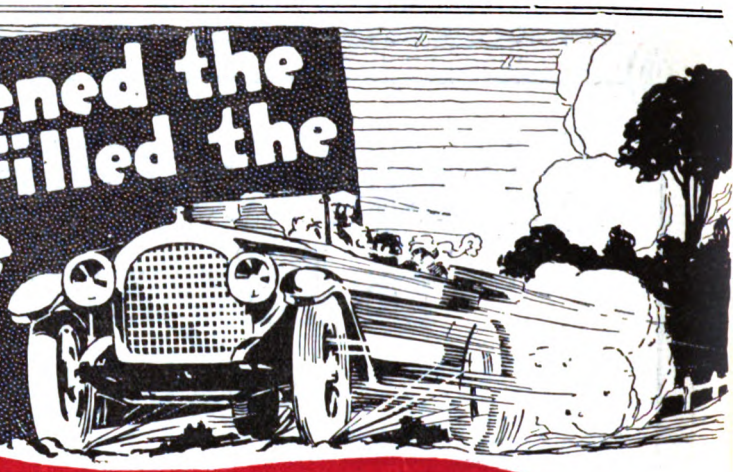
Street.....

Town..... State.....

We guarantee satisfaction from use of either Naturalite Control or Savidge Control or refunded purchase price within 30 days.

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We've Flattened the Hump and Filled the Hole in the SPRING Question



The question of center spring construction is no longer a "stumper." We have arrived at the correct answer—and like all problems there can be but *one* right solution. Other Types are errors.

The use of a bolt demands boring a hole. Metal is taken out. The spring is weakened where it should be strongest. A high average of breakage always results.

The "hump" model does strengthen the center—***stiffens it too***—depriving it of easy riding qualities. That's one objection. Here's another as serious—breakage occurs outside the malleable that holds leaves in place. Both styles are *plainly* faulty.

Higgins Quality Springs

FOR REPLACEMENT

are held together at center with a nib. The metal is *pressed* into a small groove. The back or nib of one groove fits into the hollow of the adjoining leaf—thus positively preventing "sliding." There are no holes. No bolts. No humps. *No breakage.* No stiff jolts from over-stubborn resistance. There's strength *a'plenty* to take ample care of heavy haulage over bumpiest roads—and *also* resiliency that relieves machine and motorist of all shock. You get endurance *combined* with the limit of riding comfort.

Ready for immediate installation. Made exclusively from highest grade motor car spring steel, of special anaylsis. Scientifically heat-treated. Tested for elasticity, tensile strength and anti-fatigue properties before shipping. No "weaklings" ever get by. Leaves thoroughly lubricated with water-proof, rust-proof, anti-friction lubricant. No squeaks. No mussy oiling.

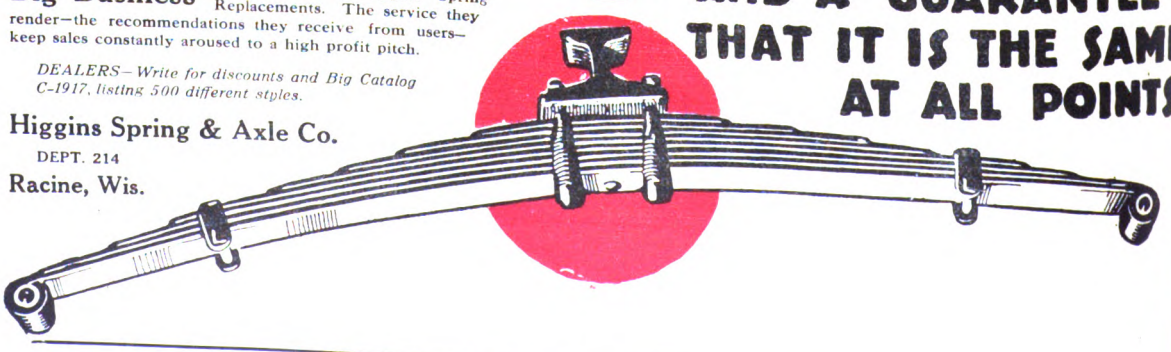
Ask your repair or garage man to supply you. Enjoy greatest riding ease. Protect your car from racking jolts—and yourself from possible accident.

Big Business always follows Higgins Spring Replacements. The service they render—the recommendations they receive from users—keep sales constantly aroused to a high profit pitch.

DEALERS—Write for discounts and Big Catalog C-1917, listing 500 different styles.

Higgins Spring & Axle Co.
DEPT. 214
Racine, Wis.

NO HOLES
NO HUMPS
SUPREME STRENGTH
FULL LENGTH
AND A GUARANTEE
THAT IT IS THE SAME
AT ALL POINTS



Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Prest-O-Lite SERVICE in NEW YORK



Views above show (top) front view of Prest O Lite Direct Factory Branch at 206-208 Amsterdam Avenue, New York City, (bottom) offices of New York Branch.

The illustrations above show two views of the storage battery testing, charging and repair departments of the New York Branch.

IN New York City and its nearby populous centers of industrial activity, the thousands upon thousands of automobiles in use create a large, steady demand for REAL BATTERY SERVICE.

The big Prest-O-Lite Direct Factory Branch in New York City, with its expert organization and ample facilities, is a sales depot and service headquarters for the Prest-O-Lite Battery—where manufacturers, distributors, dealers and car owners are assured direct factory service and co-operation.

With the adoption of battery ignition by a majority of car manufacturers, the storage battery may now be regarded as a *positive equipment necssity*. Consequently there is a large and growing demand for new storage batteries and expert battery service.

Garages and service stations everywhere are realizing large extra profits in battery replacements. Many have installed special equipment to provide complete repair and recharging facilities.

There may be a splendid opportunity going to waste right in your community. Get full details now on the Prest-O-Lite Battery proposition for dealers—also learn how special battery service stations may, with our co-operation, build up a profitable battery business of their own.

Interesting information sent on request.

The Prest-O-Lite Co., Inc., U. S. Main Office and Factory, 906 Speedway, Indianapolis, Indiana
Canadian General Office and Factory, Toronto, Ontario, Canada

The Prest-O-Lite battery is a better battery--backed by a better service

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CORK INSERT CORK INSERT CORK

for FORD transmissions

CORK INSERT CORK INSERT CORK

Pat. Jan. 15-'07, May 23-'16. Copyrighted Trademark, Advance Automobile Accessories Corp.

They Make the Ford Brake *Brake!*

When you step on the brake you *know* there is going to be action—you *know* your Ford is going to *stop* and stop with a positive smoothness and easiness. *Gone* will be the *jerking* and *rattling* and *lurching* and *chattering* when you stop—all due to

$3 Per Set of 3

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

TRANSMISSION LININGS FOR FORDS

$3 Per Set of 3

Cork Inserts *stop the vibration, stop the rattle and stop the car.* The trouble isn't with the Ford—nor with its brake—nor with its simple and positive transmission system. The whole trouble is in the transmission linings. Ordinary transmission linings become hard and glasssy—smooth from the constant pressure, friction, and soaking in oil. When the brake is applied they grip and then slip—it's that grip and slip—again and again—that causes the vibration, that ruins your car and makes it rattle.

ADVANCE CORK INSERTS can't get hard and glassy as does the ordinary transmission lining. They can't grip suddenly nor slip quickly. The cork won't allow them to. For cork can't char nor burn. Cork won't get oil logged and hard. The cork puts *permanent* and *positive grip* in transmission linings and the corks don't wear out.

Don't Have Your Ford Transmission Relined Three or Four Times This Year

Put on a set of ADVANCE CORK INSERT LININGS and do away with the expense and nuisance of having the transmission relined every two or three months. Not only will it *outwear three sets of any other kind on the market,* but it will give far better service, *while* it is lasting, too. They give an ease of action in the Ford transmission that is unparalleled by other lining even when new.

DEALERS' COUPON

Advance Automobile Accessories Corp.,
Dept. E5-1 56 E. Randolph St., Chicago

Please send one set of Advance Cork Insert Linings on regular dealer's terms.

Name .....

City ..... *State* .....

My Jobber's name is .....

Dealers: Order From Your Jobber

The demand for "Cork Inserts" is big right now. Your jobber has them. Order from him or us. Mention his name. He'll get full credit. Get ready for the big volume of sales which will follow this advertising. Send the coupon.

Advance Automobile Accessories Corp.

Dept. E5-1 56 East Randolph Street, Chicago, Ill.

CORK INSERT CORK INSERT CORK

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MyleMayker MyleMayker MyleMayker MyleMa

for FORD carburetors

MyleMayker MyleMayker MyleMayker MyleMa

Automatic Auxiliary Air Control

is added to the regular stock Ford Carburetor without interfering one bit with its simplicity It makes the Ford carbureter an instrument of $25.00 efficiency. Conquers instantly the biggest deficiencies of the Ford. Here's what happens when you put on the

MyleMayker

Copyright May, '16, Myle-Mayker Co.

5 Big Benefits To You

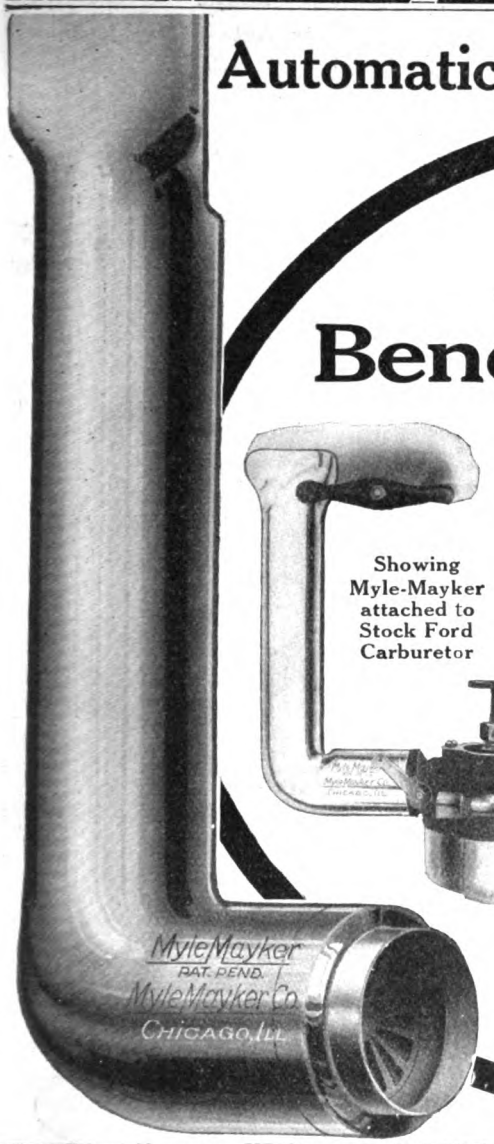
1. Easier Cranking.
2. Four Miles on "High."
3. Silent Motor.
4. Eliminates Carbon.
5. 3 to 10 Miles Increase per Gallon of Gas.



Showing Myle-Mayker attached to Stock Ford Carburetor

Any ONE Worth the Price

$5



Your car will start a lot easier—it will run quieter than you ever dreamed it would—it will practically be free from carbon deposits—it will throttle down to four miles per hour on high—it will run 3 to 10 miles more per gallon of gasoline.

What It Is and How It Works

Automatically the Myle-Mayker regulates the supply of air taken into the carburetor. For starting and low speed it gives a rich mixture. As the speed increases the mixture is automatically thinned. Without thought or attention it gives perfect carburetion at all speeds—reing not only in smoothness and quietness that that has never before been associated with the Ford, but also in greatest economy at all speeds.

Get the 5 Big Benefits Working for You

Get a Myle-Mayker today—Now. You can put it on or your dealer can, in just about a minute. That's all there is to it—No adjusting—No service—No oiling—No attention. Just put it on and it will do the work. Send the coupon if your dealer hasn't the Myle-Mayker and one will be sent prepaid. Be sure to mention your dealer's name.

MyleMayker MyleMayker MyleMayker MyleMayker MyleMa

Distributors—We Have a Proved Winner

The Myle-Mayker fills a genuine need. In a simple, fool-proof manner it enables the stock Ford carburetor to deliver perfect carburetion. We're pushing it by strong advertising in Saturday Evening Post, motoring journals and newspapers. Our direct-to-the-Ford-owner campaign is bringing first-class results for dealers. Get in on it. We have good, live sales-making circulars and display material. Here's an easy seller and a good money maker. It *stays sold.* Can be attached in a minute's time—no adjusting—once on, no more to it. Write today for terms and discounts. Get in the game *Now.*

MyleMayker Company

Dept. E5. 56 East Randolph Street, Chicago, Ill.

MYLE-MAYKER COMPANY, Dept. E5
56 E. Randolph Street, Chicago, Ill.

Gentlemen:—Please send one Myle-Mayker C. O. D. (or enclosed find $5.00). It is understood that the Myle-Mayker will cause my car to crank easier, run cooler, more silent, eliminate carbon and increase the mileage 3 to 10 miles per gallon.

Name.....

R. F. D. or Street No......

P. O......*State*.....

Dealer's Name.....

MyleMayker MyleMayker MyleMayker MyleMayker MyleMa

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The Red Road Book.

Not only our New England and Middle State readers but also readers in all parts of the country will be to some extent interested in the Red Road Book described on page 148 of this issue. This is one of the most reliable route books published. Great pains are taken in its compilation, not only to have the maps but the descriptive matter accurate. It has some advantages over any other route book with which we are acquainted. The price is $2.00, but we have made an arrangement with the publishers of such a character that we can offer the Red Road Book and the Automobile Dealer and Repairer for a year at the exact price of the book itself; namely, $2.00. This book contains 250 pages and should be in the hands of every reader who wishes to travel in the following states: All of the New England States, New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, West Virginia, District of Columbia. Those desiring one of these books who have already subscribed, can have it by sending $1.00 to the publishers of the Automobile Dealer and Repairer. These books will be ready for delivery the latter part of April or about the first of May, and all orders will be filled promptly as soon as the book is published.

The American Hotel Directory for 1917.

This is a most practical and useful hotel directory. It does not aim to give all the hotels, but it does aim to give the best in the towns and cities throughout the United States. By a system of signs, the standing of each hotel listed is indicated. It also shows whether the hotel is on the American plan or the European plan. The population of each place is given, its altitude and its railroad and trolley connections and some points about its principal business. A valuable map is attached. Numerous illustrations of the principal hotels in the large cities are given. It comprises 192 pages substantially bound in flexible cloth. The price of this excellent work is 50 cents and we have made arrangements with the publishers, the Independent Printing Companies of the United States, Washington, D. C., to supply our readers with it.

Send us 50 cents in postage stamps and we will have a copy of this directory sent to you. It contains a printed provision by which the purchaser can return the directory to the publishers at the expiration of the year 1917 and get a new directory for 1918 for 25 cents. That is, they allow 25 cents for the old directory when it is sent back. Motor Vehicle Publishing Company, 71-73 Murray Street, New York.

New Rust-Proofing Material.

The most generally used methods for covering iron and steel with non-rusting metals are based on dipping the articles into molten baths of the protective metals. The best known are leading, tinning and galvanizing, as either lead, tin or zinc are used. In all such processes there is a very considerable loss of the coating metals due to the oxidizing of the molten metal bath. This oxidation loss is entirely avoided by "epicassit," while the process of "epicassiting" affords many incidental advantages and conveniences; not only can it be carried out on the most extensive manufacturing scale, but it is equally applicable to the occasional job involving only a few square inches or the repair of a damaged coating. "Epicassit" is convenient and economical in the large plant and equally so in the field on structural materials, as in the repairman's kit. The invention is of German origin; it is broadly covered by U. S. Patents that have been acquired by Henry Hess.

Mr. Hess, Witherspoon Bldg., Philadelphia, will grant licenses to use the process; the material itself can be purchased through Hess & Son, 1033 Chestnut Street, Philadelphia.

Wants to Manufacture Accessories.

We have a communication from the Dow Wire & Iron Works, A. Lee Marcum, Sales Manager, of Louisville, Kentucky, in which they say, "If you know of any accessories that parties desire manufactured, we shall be pleased to have you refer them to us." Every little while somebody writes us that they want something manufactured and we have been unable to furnish the information desired. Inventors should make a note of the above address.

For Studebaker Owners.

Wm. Garrison Reed, Insurance Agent at 108 Water Street, Boston, has issued a very complete Oiling and Greasing List for Studebaker cars, which he gives away on call. It is indispensable for all Studebaker owners.

The A-B-C Starter for Ford Cars.

A license has been granted by the A-B-C Starter Company of Detroit on their 3-way generator drive under United States patent to the Brush Engineering Association of Detroit of which Mr. Al. P. Brush is president. Mr. Brush is the well-known automobile engineer and originator of a great many devices used by the leading automobile companies. This license covers the application of this drive to automobile motors and cars built by clients of the Brush Engineering Association. This drive is the invention of Alexander Churchward, and is used by them exclusively in the design of the A-B-C Starting and Lighting System for the Ford car.

What Push Has Done.

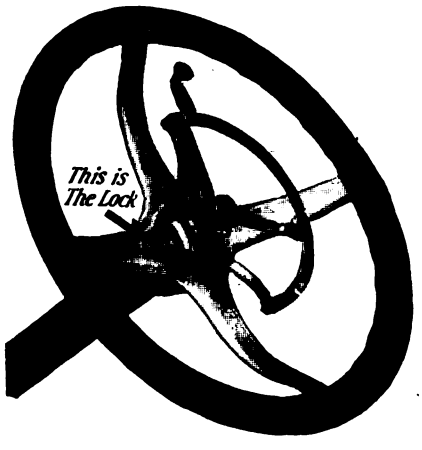
Experience and push have brought J. C. Gorey & Co. of 354 West 50th Street. New York, to the point where it is now one of the largest motor car repair parts companies in the United States. The company occupies a total floor space of 11.250 square feet. but its development has not come in a day. J. C. Gorev first became acquainted with automobiles as an errand boy with the Locomobile Co. of America in 1902, and in 1910 he formed the present company. The firm carries an unusually large variety of accessories and things that go to make a complete car.

Tu-Ford Valve Tool.

The Tu-Ford Valve Tool Company of Bay City, Michigan, have just commenced manufacturing on a large scale their latest Ford accessory known as the Tu-Ford Valve Tool. This useful device serves a double purpose, inasmuch as it first raises the spring, and second, automatically locks when the spring is in a raised position, making it an extremely simple matter to remove the valve and still insure the valve tool holding the spring in raised position. The valve tool also holds the spring in place when removing the valve for grinding. This is of special advantage to the Ford owner and repair men in general. The Tu-Ford Valve Tool is extremely simple and compact in mechanical construction and is made to be fitted on any model of Ford car. The retail selling price of this latest accessory is $1.00.

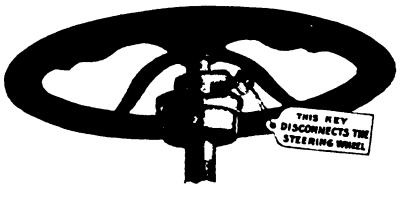
The Perry Auto Safety Lock.

The Perry Auto Safety Lock Company, 1239 Michigan Avenue, Chicago, have brought out a locking device for automobiles that not only prevents the driving away of a car but also the towing away of it by an unauthorized person. The towing of a car is the favorite method pursued by the professional auto thief for stealing a car, inasmuch as he does not have to stop to start a cranky



engine, but he comes along with a car with a rope attached to the rear axle, his partner jumps out and hooks the rope over the front axle of the car he wishes to get away with, jumps into the drivers' seat of the second car and away they go. But they can't do this with the Perry lock. Two styles are being made, one for Ford cars and one for others.

The effectiveness of these locking devices is attested by the fact that Insur-



ance companies will allow from 15 to 40 per cent. discount on the premium rate of a theft insurance policy where "Perry" locks are installed. These devices have been thoroughly tested by the Underwriters' Laboratories and carry their label service, which is recognized as authority by insurance companies all over the country. Most readers of the Automobile Dealer and Repairer are familiar with these locks and have joined the rapidly growing family of Perry dealers. A good margin of profit and a well advertised article of merit makes a combination that is hard to beat. Get busy!

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$1195 F. o. b. Racine
Mitchell Junior—a 40-h. p. Six
120-inch Wheelbase

Mitchell
SIXES

$1460 F. o. b. Racine
7-Passenger—48-Horsepower
127-inch Wheelbase

Yes—It Is True

Mitchells do offer at least 20 per cent extra value over other cars in this class.

The reason lies in John W. Bate, the famous efficiency expert. He built and equipped this mammoth plant to build this one type economically.

Now even our bodies are built under Bate methods. Nowhere else could cars like these be built at the Mitchell cost.

The Evidence

The evidence lies in the Mitchell extras, paid for by these savings. They include

31 extra features—
24 per cent added luxury—
100 per cent over-strength.

These extras will cost, on this year's output, about $4,000,000. They cost the buyer nothing, because of Mr. Bate's economies.

Another evidence is the Mitchell Junior—a 120-inch wheelbase Six. There was never a fine car, of this size, room and power, offered at near $1195.

Wanted Extras

The 31 extra features—like a power tire pump—are things every buyer wants. This year's added luxury—24 per cent—makes Mitchell the beauty-car in this class. Our new body-plant savings pay all that added cost.

The over-strength means that in three years our margins of safety have been doubled. The Mitchell is now a lifetime car—the sturdiest car ever sold at a modest price.

Over 440 parts are made of toughened steel. Safety parts are vastly oversize. We use a wealth of Chrome-Vanadium. Gears are tested for 50,000 pounds per tooth. In two years not a single Bate cantilever spring has broken.

Judge for yourself if buyers want such values. They will know them. Our advertising this year will cost $1,000,000. If you think that such cars mean a great dealer opportunity, we would like to hear from you.

MITCHELL MOTORS COMPANY, Inc.
Racine, Wis., U. S. A.

TWO SIZES

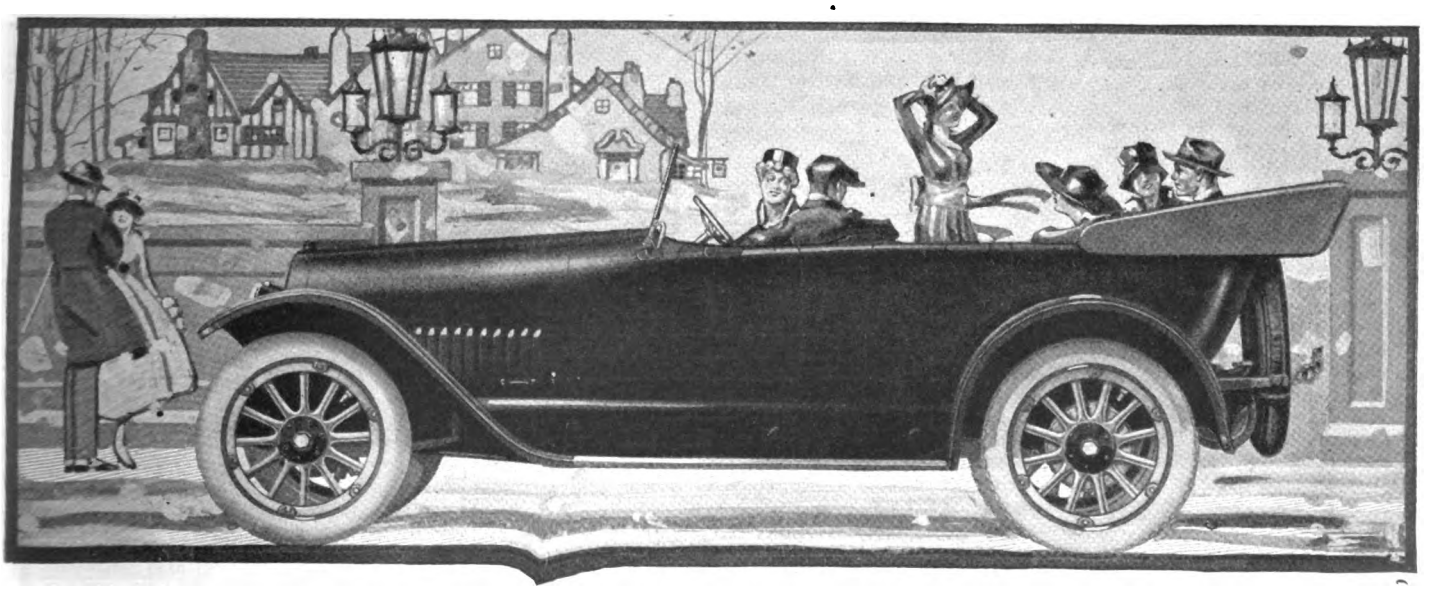
Mitchell—a roomy, 7-passenger Six, with 127-inch wheelbase and a highly-developed 48-horsepower motor.

Price $1460, f. o. b. Racine

Mitchell Junior—a 5-passenger Six on similar lines, with 120-inch wheelbase and a 40-horsepower motor—¼-inch smaller bore.

Price $1195, f. o. b. Racine

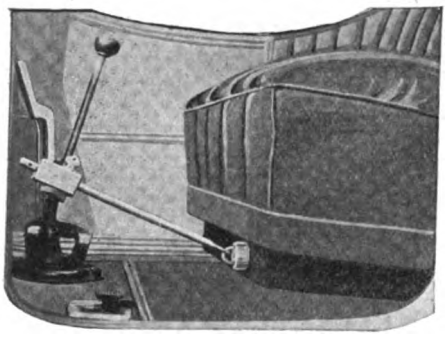
Also six styles of enclosed and convertible bodies. Also new Club Roadster.



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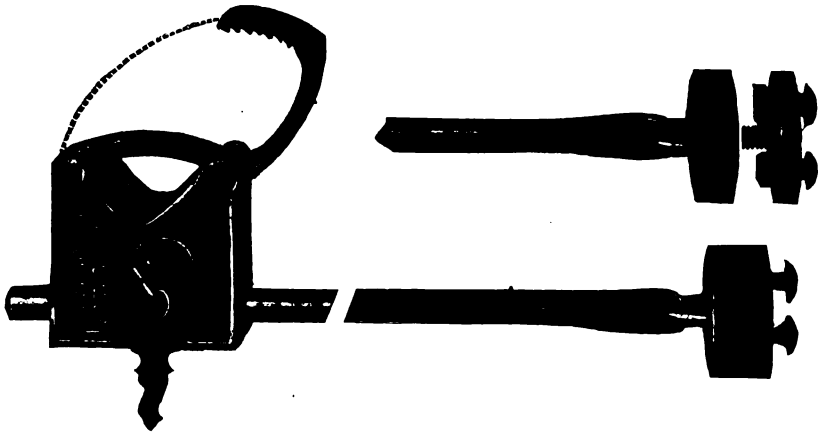
The "Protector" Lock for All Cars Except Fords.

The New York Coil Company of 338 Pearl St., N. Y. City, have just placed upon the market a novel transmission lock which is applicable to any make of car, Ford's excepted. As will be seen from the cut, one end of a half-inch steel rod has a swivel arrangement secured thereto, comprising two pieces. One of these pieces is secured to the heel board or panel, directly below front seat, by means of bolts, which are provided with round heads and a squared section. When these bolts are drawn into place and the rod containing the



The Lock Installed.

other member is screwed thereon, it will be evident that the nuts or bolts cannot possibly be removed when the other end of rod containing the lock is in position on Transformer lever. The lock proper or housing, contains a non-pickable barrel lock, in one side of which is formed a deep "V" section. A hasp swings into this section, through which the transmission lever projects. Due to this peculiar shape, the lock takes all sizes and shapes of levers whether round, oval or eye beam shape. When not in use the lock swings around against the heel board, where it is retained by a self-

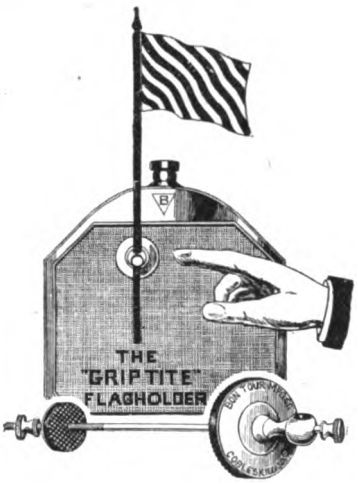


The Parts.

operating clamp entirely out of the way of the driver. To take care of the varying lengths of transmission lever from seat, a number of holes are provided in the half-inch rod, to allow the lock to be moved on rod. The screw retaining the lock in this position is covered by the hasp which together with the fact that parts are casehardened, renders the device absolutely thief-proof. No holes or marring of the transmission lever are necessary to install. There is nothing to interfere with the easy operation of same. The manufacturers lay stress on the fact that many cities do not allow any locking device upon the steering wheel or road wheels, and call attention to the feature of being able to lock the transmission in the neutral position, which does not prevent the car being moved in a garage or in the case of fire if left along the curb, but does prevent "joy-riding" and theft. The price is $6.50, with all fittings allowing any one to install in 15 minutes. An interesting circular sent free on request.

The Griptite Flag Holder.

This is a thoroughly practical flag holder which will hold the flag on the front of the radiator of any car, properly and rigidly. This flag holder is simple, besides being artistic in appearance and it fits any and every car. There



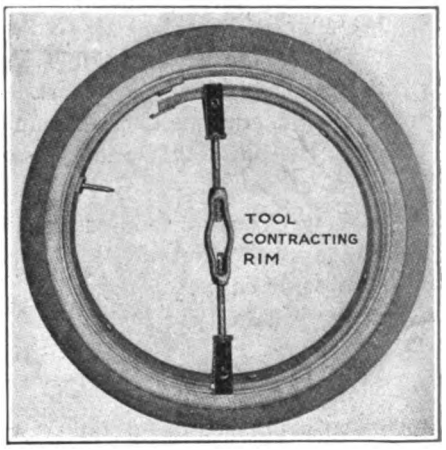
are corrugated heat-proof rubber cushions resting against the front and back of the radiator. They can be easily and quickly attached, no tools or clamps being required, and consequently no bother. A little thumb nut fastens this flag holder in position. The holder is made in polished brass, finished in nickel or black, as preferred by the car owner, and the retail price is only 50 cents. The illustration will give a better idea of the method of applying this flag holder than any amount of description. The Griptite is made by the Bon Tour Manufacturing Co., Cobleskill, N. Y., to whom all inquiries should be addressed.

Meco Engines.

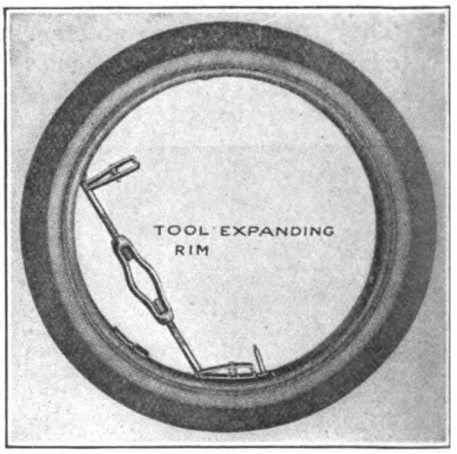
Every up-to-date repair shop or garage is equipped with power and perhaps the handiest form of power is a good gasoline engine. The Meco Engine may be operated by gasoline, kerosene or gas. They are big money-makers for jobbers and dealers, and many of our readers should not only install one of these engines for their own use, but could also act successfully as agents for these powerful and reliable machines. Meco engines are sold on 90 days' trial, with a five year guarantee. Readers should write for special agency offer and latest Meco prices direct to the Manufacturers' Engine Company, 1879 Crystal Ave., Kansas City, Mo.

The Burrill Tire Tool.

We illustrate herewith the Burrill Tire Tool, which is designed for pulling the rim from the tire. Removing a casing and tube from a demountable rim of the transversely split type is made easier by a number of devices especially designed to contract the rim. The Burrill tool here illustrated is for this purpose and it is positive in operation. Two pairs of jaws grip the rim at op-



posite points, one of which should be a few inches from the split end. These jaws are connected, and may be drawn toward each other by means of a turn buckle operating on threaded portions of rods attached to the jaws. As the distance between jaws is shortened, the rim is contracted. To replace and expand a rim on which a new tire has been placed,



one of the jaws, which has a notched portion, is placed against the valve stem reinforcement on the rim, and the end of the other rod is placed against a stud on the rim. Turning the buckle in the proper way will force the rods apart, which means expanding the rim, until it locks in place. This tire tool, which is liable to have a large sale, lists at $3.

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Quick Service

Distributors—Tuthill Titanic Springs

Albany	Albany Hardware & Iron Co.
Atlanta	Elyea-Austell Co., 35 N. Pryor Street
Baltimore	Baltimore Hub-Wheel & Mfg. Co.
Billings	Barry Motor Company
Birmingham	Moore-Handley Hardware Co.
Boston	Post & Lester Co., 223 Columbus Avenue
Buffalo	H. D. Taylor Co., 101 Oak Street
Charleston	The Cameron & Barkley Co.
Charlotte	Carolinas Auto Supply House, 221 N. College Street
Chicago	All jobbers
Cincinnati	The Ohio Rubber Co., 228 West Seventh Street
Cleveland	Cray Brothers, 1111 West 11th Street
Columbus	Griswold-Sohl Co., 79 N. Front Street
Dallas	Fisk Company of Texas
Davenport	Sieg Company, 500 Iowa Street
Dayton	S. T. & G. A. Gebhart Co., Third and St. Clair Streets
Denver	Auto Equipment Co., 14th Street at Lawrence
Detroit	Tuthill Spring Product Co., 1520 Jefferson Avenue East
Des Moines	Herring Motor Company
Duluth	Kelley-How-Thomson Co., South Fifth Ave. West
El Paso	Western Motor Supply Co., 318 San Francisco Street
Evansville	Orr Iron Company, 17 E. Pennsylvania Street
Fargo	J. D. Grant, 12 Roberts Street
Flint	Cumings Brothers
Florence	D. W. Alderman, Jr.
Fresno, Cal.	Chanslor & Lyon Co., K and Merced Streets
Grand Rapids	Sherwood Hall Co., 24 Ionia Street
Hartford	Post & Lester Co.
Indianapolis	W. J. Holliday & Co., 326 W. Georgia Street
Kansas City	Faeth Iron Co., 1125 W. Eighth Street
Kansas City	Motor and Machinists Supply Co., 1519 Grand Avenue
Lincoln	Nebraska-Buick Auto Co.
Los Angeles	Chanslor & Lyon Co., 1200 Grand Avenue
Louisville	Andrew Cowan & Co., 421 W. Main Street
Memphis	Ozburn Automobile Supply Co.
Milwaukee	Babcock Auto Spring Co., 192 Milwaukee Street
Minneapolis	Western Motor Supply Co., 12th Street and Harmon Place
Nashville	Auto Supply Co., 14th Avenue and Clinton Street
New Orleans	Interstate Electric Co., Baronne and Perdido Streets
New York	W. E. Pruden Hardware Co., 846 Eighth Avenue
Oakland	Chanslor & Lyon Co., 2537 Broadway
Omaha	Powell Supply Company
Peoria	The National Electric & Auto Supply Co., 117 S. Washington St.
Philadelphia	Manufacturers' Supplies Co., Cherry and Juniper Streets
Pocatello	Salt Lake Hardware Co.
Portland	Chanslor & Lyon Co., Broadway and Couch Streets
Quincy	Reid Motor Co.
Richmond	Chemi Company
Rochester	Sidney B. Roby Co., 208 South Avenue
Salt Lake City	Salt Lake Hardware Co.
St. Louis	Auto Devices Company, 3214 Locust Street
San Antonio	Fisk Co. of Texas
San Francisco	Chanslor & Lyon Co., 1236 Van Ness Avenue
Seattle	Chanslor & Lyon Co., 916 E. Pike Street
Sioux City	Sioux City Iron Co.
Sioux Falls	The H. F. Brownell Co., 314 W. 9th Street
Spokane	Chanslor & Lyon Co., 927 First Avenue
Tacoma	Chanslor & Lyon Company, 723 Broadway
Tampa	The American Supply Co., 610 Tampa Street
Toledo	Union Supply Co., 231 Superior Street
Washington, D. C.	Charles Rubel & Co.
Wichita	Shattuck-George Iron Co., 2nd and Rock Island Avenue

Nowhere in the United States, can a garageman or a motorist be more than one-half to three hours away from a stock of

TUTHILL *Lubricated* TITANIC SPRINGS

Better Springs

Tuthill Titanic Springs *cannot break* at the center—the point where seven out of ten spring breaks occur. Instead of a *weakening* center bolt or nib, there's the *re-inforcing* "ARCH"—the patented "wedge and yoke" plate that holds the spring leaves in a vise-like grip, and RE-INFORCES them. *Guaranteed forever* against center breakage. *Guaranteed at all points* and in every respect *for one year.*

Our Special Ford Front Spring carries same broad Titanic guarantee.

Better Service

In our new stock room is maintained constantly the largest, most complete stock of automobile springs in the world. Springs for every make of car sold in large quantities are ready for rush delivery by express. Even special orders go out within a couple of days. Distributors in nearly every city of importance carry complete stocks.

Write today for our valuable spring booklet, also 1917 price list—most complete price list ever published for spring replacements.

TUTHILL SPRING COMPANY

760 Polk Street, Chicago, Illinois

Foreign Distributors { Automobile Sundries Co., 18 Broadway, New York
Scott & Holliday, Ltd., - 74 Broadway, New York

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New Hudson Speedster.

The new Hudson Super-Six Speedster, four-passenger, has just been placed on the market. Because of the wide demand for other Super-Six types not a great many cars of the Speedster model will be turned out in 1917, and it is the aim of the company to give these an even distribution in the principal cities so that it may be seen generally in use throughout the country. A great deal of time was devoted to the design of this model, and it is the belief of the Hudson engineers that it will take the palm for appearance among all the high grade chum cars. It was created to meet a strong and growing demand for a fast, high-powered car of rakish appearance, and small seating capacity. Every line suggests speed and great power. One feature that will strongly commend the Speedster to motorists is the low, roomy arrangement of the seats. The capacity is four passengers. The seats allow the occupants to lounge easily and there is plenty of leg room both in the front and the tonneau. Instead of a rail foot rest in the tonneau the Speedster has a triangle form foot rest, which is removable. Equipped with the Super-Six motor it will be capable of high speed, pick up fast, handle superbly in heavy traffic, and range far and swiftly at the will of the driver. Hudson believes it has hit the taste of motorists who like the fast chum car. Altogether the Speedster is unexcelled for beauty, completeness, comfort and durability.

Here are some of the interesting body dimensions in the new Hudson Speedster: Distance dash to front seat cushion, 30½ inches; height of front seat cushion above floor, 10½ inches; height of steering wheel above seat cushion, 7 inches; distance between steering wheel and seatback, 15 7/16 inches; height of front seat back above cushion, 13½ inches; diameter of steering wheel, 17⅝ inches; distance from back of front seat to front of rear seat, 28½ inches; height of rear seat above floor, 14¼ inches; height of rear seat back above cushion, 12½ inches; width of front doors, 23 inches, width of rear doors, 18½ inches; height of body, 19¾ inches; sill length, 101 7/16 inches; length overall, 107⅞ inches; width of front and rear seat cushions, 41 inches; width overall of body at widest point, 49½ inches.

Handling Hazardous Liquids.

Early in January of this year the Shotwell Pump & Tank Company, Indianapolis, was incorporated to manufacture a complete line of pumps, tanks, etc., for the handling of hazardous liquids. The Shotwell Method does away entirely with the old style rack and pinion, substituting therefor an accurate method which delivers an exactly measured volume of liquid. This volume can neither be increased or decreased through negligence, design, or mechanical wear and tear. This improved design embodies a sliding block and crosshead, affording much larger wearing surfaces, insuring longer life and making it possible to operate the pump constantly in one direction without having it reverse the stroke. Besides, this design makes possible the complete enclosure of the working mechanism of all types, thereby keeping out dirt, which tends to rapidly cut and wear the working parts. Another feature which stands out as a distinct advantage in the Shotwell Method, is the accessible foot valve. This valve is situated directly above the tank instead of inside of it, and is easily accessible at all times through a cast iron manhole box, with a hinged top. This makes it easy to clean the valves and the intake screen. The Shotwell Company, though only a few months old, is fully equipped to turn out complete pumps in its own plant, having put in new machinery, going so far as to install its own toolroom and pattern shop. Catalogue will be sent to any one interested.

All Hess-Bright Stock Now American Owned.

In line with plans made last autumn when certain New York interests who were previously interested in the S K F Ball Bearing Co., also acquired an interest in the Hess-Bright Manufacturing Co. of Philadelphia, it is now announced that plans have been perfected for a closer co-operation between these two leading concerns in the ball bearing industry. The affairs of the two companies will be administered by a recently formed N. Y. Corporation, The S K F Administrative Co., No. 1 Wall Street. The Board of this Company consists of Mr. Frank A. Vanderlip, President of the National City Bank; Mr. Thatcher Brown, of Brown Bros.; Mr. F. B. Kirkbride, Mr. S. Wingquist, Mr. Axel Carlander, Mr. Marcus Wallenberg, a well known banker of Sweden, and Mr. B. G. Prytz, who as President of the S K F Ball Bearing Co. has been active in bringing about the fusion between his Company and the Hess-Bright Company. Mr. Prytz has been elected president of the Administrative Company. Simultaneously Mr. Budd D. Gray of the Hess-Bright Company has resigned as President of the Philadelphia Company and will become Technical Advisor to the new New York corporation, which will thus have the benefit of his experience in its various interests. At the board meeting of the Hess-Bright Company on May 8th, Mr. B. G. Prytz was elected to succeed Mr. Gray as President.

The S K F Administrative Company is extending the manufacturing facilities of both the Philadelphia and Hartford plants, and the demand for the Company's products continues to be so far in excess of the present supply that it has been considered advisable to immediately make additions both to the S K F and Hess-Bright factories, in spite of the present building costs. The closer co-operation between the two companies was greatly facilitated by the action of the American Hess-Bright stockholders in buying out the German minority interest in the Hess-Bright Co. shortly before the break with Germany, whereby all the stock came into American hands at what is reported to have been a very favorable price for the purchasers.

Mitchell "Six" Climbs San Bernardino Mountain.

Bucking snow-drifts and fighting its way through a veritable sea of slush and snow, a Mitchell "Six" owned and driven by E. V. Ballert, of Los Angeles, climbed to the crest of the high San Bernardino Mountains to the famous Pine Knot Lodge February 11, and brought in the first mail, as well as the first automobile of the year. At first, the proprietor, F. C. Skinner, could not believe his eyes when he saw a real automobile approaching. The only mail he had received so far this year had been brought in by men on snow shoes. Many tales have been related of how it was utterly impossible for an automobile to reach the summit of the San Bernardino Mountains, towering 11,600 feet above sea level and with its steep grades, this winter. Numerous stories of automobiles being snowed in, stalled or stranded on the road to Pine Knot Lodge have been told. So this is a record run for the Mitchell, attested and signed by a statement mailed by Proprietor Skinner and exhibited by the Mitchell representatives at Los Angeles. No extra equipment was used on the trip. A novel feature of the run was the fact that only one quart of water was consumed. Over two hours was consumed in getting through the last 200 yards of snow. Mr. Ballert will not get any cup for being the first automobile driver to reach Pine Knot in 1917, but he says that he had enough fun to repay him.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF AUTOMOBILE DEALER AND REPAIRER, published monthly at New York, N. Y., for April 1st, 1917.

STATE of New York } ss.
COUNTY of New York }

Before me, a notary public in and for the State and county aforesaid, personally appeared Frank R. Whitten, who having been duly sworn according to law, deposes and says that he is the business manager of the Automobile Dealer and Repairer, and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
NAME OF—
Publisher—Motor Vehicle Publishing Co., 71-73 Murray St., New York City, N. Y.
Editor—A. A. Hill, 559 West 183d St., New York City, N. Y.
Managing Editor—A. A. Hill, 559 West 183d St., New York City, N. Y.
Business Managers—F. R. Whitten, 41 Pinehurst Ave., New York City, N.Y.; M. T. Richardson, 71 Murray St., New York City, N. Y.

2. That the owners are.
Motor Vehicle Publishing Company, 71-73 Murray St., New York City, N. Y.
STOCKHOLDERS—M. T. Richardson, 71 Murray St., New York City, N. Y.
F. R. Whitten, 41 Pinehurst Ave., New York City, N. Y.
A. A Hill, 559 West 183d St., New York City, N. Y.
A. J. Richardson, Ridgewood, N. J.
Cornelius Doremus, 66 Broadway, New York City, N. Y.
Mrs. J. Howard Girardeau, Jr., Monticello, Fla.
Mrs. Guy Ulmer, Monticello, Fla.
Mrs. Harriet L. Johnston, New Rochelle, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are. None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear on the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

MOTOR VEHICLE PUBLISHING CO.,
Publishers.
Automobile Dealer and Repairer.
FRANK R. WHITTEN, Business Manager.

Sworn to and subscribed before me this 23rd day of March, 1917.

THOS. H. McGOLDRICK,
Notary Public.

(SEAL)

(My commission expires Mar. 30, 1918.)

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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

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Our new 1917 Catalog is just off the press. It has the finest line of up-to-date accessories for all cars that has ever been offered at money-saving prices. Every article is guaranteed to give satisfaction, or money returned.

Ask For Catalog D. R.

General Automobile Supply Company
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AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Ford Wheels, 30x3½, new $2.00
Ford Fan Belts, all } 1916 ..... 15c
leather, to dealers } 1917 ..... 20c
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By Parcel Post. We rebuild and install new parts. Largest and most fully equipped carburetor testing plant in the East. Factory appointed service station for all the leading companies. Also a stock of used rebuilt carburetors, $5.00 up. All work guaranteed.

JOHN WILLS, Carburetor Specialist,
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For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

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We Still Have a Few 100-lb. Box Assortments
Bolts, Nuts, Set Screws, Rivets, Filister Head Screws, Key Stock, Etc., Etc.
$5.00 per 100 lbs.
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INCORPORATED

Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.

Expert Repairing of All Makes.

Express your Magneto, Starter and Generator to us. Same will be repaired and returned same day as received.

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— Also —
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Expert repairing on all makes of Magnetos, Coils, Self-Starters and Generators. Armature winding a specialty. Parts for all makes carried in stock.

MAGNETO SALES COMPANY
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USED MAGNETOS
Bosch High Tension, $15 up
Save 50% to 75%
Herbert Aucock, 222 Columbus Ave., Boston, Mass.

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We have about 50 Bosch Magnetos to sell for cash. Every magneto is guaranteed to be in good condition. If in any way a magneto purchased from us proves not as advertised, magneto may be returned at our expense and money will be cheerfully refunded.

DU 4	Variable	spark	$20.00
DU 6	"	"	35.00
DR 4	"	"	15.00
DR 6	"	"	20.00
D 4	"	"	10.00
D 6	"	"	15.00
	Bosch A Coils		8.00

GENUINE PREST-O-LITE TANKS

Style B Empty, - $5.50

Portland Magneto Exchange
13 Forest Avenue PORTLAND, MAINE

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The Lowest Prices

Ever Quoted For High Grade Auto

BODIES

GREAT VARIETY
ALL BARGAINS

Full Detail—Photos on Request

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World's Largest Dealers
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This new welding compound for aluminum is **stronger than aluminum—perfect substitute for acetylene. One-half time and cost.**
Use Gasoline torch.
Trial Bar, 50 Cents $3.00 per pound
SEND FOR BOOKLET 7.
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WELDING PLANTS--$25 to $250

LIBERAL TERMS TO RESPONSIBLE PERSONS OR FIRMS.
Write at once to Manager Dept. B.
BERMO WELDING APPARATUS CO. OMAHA, NEBR.

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New Process—Brazing of Aluminum Crank and Gear Cases
GIVE US A TRIAL
DAVIS & SCHEGG CO., 2124 Broadway, New York

Tires

PRICE WRECKERS

All goods bought before the January increase in price sold at 1916 prices.

Blemished New Tires		Double Tread	
30x3	$6.50	39x3	$5.00
30x3½	8.00	30x3½	6.00
34x4	13.00	34x4	8.00
Guaranteed		$1.00 Less for Re-covering	

Give Us a Trial, We'll Both Benefit By It

ROYAL TIRE EXCHANGE
282 Halsey Street Newark, N. J.

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Tires

SANDOW TIRES

SPECIAL OFFER

NEW HAND MADE WRAPPED TREAD TIRES

31x3½	N. S.	$8.00
32x3½	N. S.	9.50
34x3½	Plain	10.00
34x3½	N. S.	10.50
32x4	Plain	10.00
32x4	N. S.	11.50
33x4	Plain	12.00
33x4	N. S.	12.50
34x4	N. S.	12.50
35x4½	Plain	13.00
35x4½	N. S.	15.00
37x4½	Plain	16.50
37x4½	N. S.	17.50
37x5	Plain	20.00
37x5	N. S.	21.00

Mail Orders Filled Day Received.

Prices Subject to Change.

JANDORF AUTOMOBILE CO.

1763 BROADWAY - - - - NEW YORK

Wholesale and Jobbers in All Makes

New Factory-Blemished Tires and Tubes.

Also Large Stock of Standard Makes

WRITE FOR PRICES

DOUBLE TREAD TIRES

GUARANTEED

for big, low cost mileage. They save you 65%. We build splendid double thickness tires by special process, giving you the unusual strength and resistance qualities so essential for heavy work in the country.

Sizes	Tires Plain	Red 9 Ply Tubes
30x3	$4.50	$3.00
30x3½	6.00	3.60
32x3½	6.25	3.65
34x4	7.75	5.00

All sizes from 28x3 to 38x5½ in stock.

Tires, Fisk, Red and Gray Tops, 2nd's. Special Prices.

Three years ago we introduced DOUBLE TREAD TIRES to the farmer. Square dealing, honest values and p romp delivery have built the largest retreaded tire busi ness in America around our "*Doutrè*" trade mark. Compare these prices on tires and tubes. Send for book-let and detailed lists.

Sizes	Tires Plain	Red 9 Ply Tubes
34x4½	$9.50	$6.60
34x5½	10.00	6.75
36x4½	10.00	6.90
37x5	12.00	8.20

75 cents additional added on all non-skid tires.

20% Deposit Required on C. O. D.

DOUBLE TREAD TIRE CO., Inc.

104 WEST 52nd STREET NEW YORK CITY

80x8½ STODDARD

New, first quality. No mileage guarantee. $8.75. Ribbed Tread, Non-Skid.

STAR RUBBER CO., 1781 Broadway, New York

DOUBLE SERVICE TIRES

At the Lowest Possible Prices. Send for Price-List.

Hartford Tire Co., Inc , 149 W. 51st St., New York

Tires

FRESH STOCK

Ball Bearing Tread Tires

GUARANTEED 4,000 MILES

NON-SKID

We have a tremendous stock of the Endurance Ball Bearing Tread and Hamilton Cable Cord Tires in factory blemished on hand, at the following prices:

Size	Price	Size	Price
30x3	$7.63	34x4	$17.25
30x3½	9.88	34x4½	21.50
32x3½	11.88	35x4½	22.50
32x4	15.50	36x4½	23.00
33x4	16.50	37x5	27.00

Mail orders promptly attended to and sent subject to examination. No deposit required. Send your order to-day.

The TIRE SALVAGE CO., Inc.

251 W. 55th Street New York City

Fair Proposition to Dealers

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
37x5	5.00	9.00	12.00

Ship Your Old Tires by Prepaid Express

McDANIEL RUBBER CO.

613 Ohio Street Cairo, Ill.

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$4.00	35x4	$8.00
30x3½	4.50	36x4	8.50
32x3½	5.50	36x4½	9.00
32x4	6.00	36x5	9.00
33x4	6.50	37x4½	9.00
34x4	7.00	37x5	9.50
34x4½	7.50		

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.

236 WEST 48th STREET, NEW YORK

CHEAP DOUBLE TREAD

NEW AND SECOND HAND

Tires and Tubes

Write for Prices

JAFFE BROTHERS

260 West 54th Street NEW YORK CITY

GRIPWELL TIRES

CARRY 4,000 MILE GUARANTEE

MR. DEALER WRITE FOR OUR PRICES. WHICH ARE RIGHT.

UNIVERSAL RUBBER CO.

BROAD AND WOOD STREETS, PHILA., PA.

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Tires

SPECIAL SPRING OFFER
—ON—
DOUBLE TREAD TIRES
AT A SAVING OF 75%

A Special Discount of 5% When Cash Accompanies Order. We Also Give Special Discount to Dealers.

The following are our net prices on Double Tread Tires and New Tubes of Standard Makes kept on stock:

Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3	$4.00	$4.50	$1.95	35x4	$9.00	$10.00	$3.70
30x3	5.00	5.50	2.05	36x4	9.00	10.00	3.80
30x3½	6.00	7.00	2.40	34x4½	10.00	11.00	4.40
32x3½	7.00	7.50	2.55	35x4½	10.00	11.00	4.50
34x3½	7.00	8.00	2.70	36x4½	10.00	11.00	4.60
30x4	7.00	8.00	3.15	37x4½	10.00	11.00	4.75
32x4	7.00	8.00	3.35	35x5	11.00	12.00	5.35
33x4	8.00	9.00	3.45	36x5	11.00	12.00	5.45
34x4	9.00	10.00	3.60	37x5	11.00	12.00	5.55

For retreading your old tires, prices on request.

Make sure when ordering tires to state whether Q. D., Straight bead or Clincher type.

We carry a full line of New First and New Second Tires at a big saving. Write for prices mentioning sizes. Prices upon request.

TERMS: 10% DEPOSIT, BALANCE C. O. D.

I. JAFFESS

Two Stores, 1319A Fifth Avenue, 241 West 54th Street, NEW YORK CITY

HERCULES TIRES
GUARANTEED 4,000 MILES

If a tire fails to run 4,000 miles, we will replace with another tire for one-half of below price.

Size	Plain	Non-Skid	Tube	Size	Plain	Non-Skid	Tube
28x3	$5.95	$6.95		35x4	$13.45	$14.95	$3.30
30x3	6.50	7.50	$1.90	36x4	13.95	15.50	3.35
30x3½	7.95	8.95	2.15	34x4½	16.95	18.95	4.00
32x3½	8.95	9.90	2.25	35x4½	17.45	19.45	4.10
34x3½	9.50	10.45	2.35	36x4½	17.95	19.95	4.15
31x4	11.45	12.60	2.95	37x4½	18.45	20.45	4.25
32x4	11.95	12.95	3.05	35x5	19.45	21.95	4.90
33x4	12.45	13.50	3.10	36x5	20.45	22.95	4.95
34x4	12.95	13.95	3.20	37x5	21.25	23.25	5.05

WE SHIP C. O. D. MAIL ORDERS PROMPTLY FILLED
WE PAY ALL EXPRESS CHARGES WE CARRY A LARGE STOCK

Special Propositions to Good, Live Dealers

HERCULES TIRE CO.

612-14 N. BROAD STREET PHILADELPHIA, PA.

Phones: Poplar 5169—Race 6019-D

SPRING REDUCTION ON
DOUBLE TREAD TIRES AND TUBES
GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90
30x3	4.50	1.75	32x4½	9.00	2.75
30x3½	6.00	2.10	34x4½	9.00	3.00
32x3½	6.50	2.15	35x4½	9.00	3.00
34x3½	7.50	2.25	36x4½	9.00	3.10

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
30x4	7.00	2.50	37x4½	9.00	3.10
32x4	8.00	2.75	34x5	9.50	3.25
33x4	8.00	2.75	35x5	10.00	3.25
34x4	8.00	2.75	36x5	11.00	4.00
35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street NEW YORK CITY 112-A East 100 Street

THE HOME OF DOUBLE TREAD TIRES

Tires

INSYDE TYRES,
inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.
AMERICAN ACCESSORIES CO., Dept. AD3, Cincinnati, Ohio

INDIAN HEAD TIRE CO.

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GEARS
FOR ALL MAKES OF CARS
SEND IN YOUR OLD ONES

THE DAYTON AUTO PARTS CO.
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(EDWARD CAVANAGH)
285-287 MORRIS AVENUE
Near 138th and 3d Avenue NEW YORK CITY

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CLEARANCE SALE ON **BRAND NEW AUTO TIRES**

GUARANTEED 3500 MILES. **ALL STANDARD MAKES.**

30 x 3	Plain	$6.75	Non-Skid	$7.50
30 x 3½	"	9.75	"	10.50
32 x 3½	"	11.00	"	12.50
33 x 4	"	15.00	"	17.00
34 x 4	"	15.00	"	17.50
36 x 4	"	22.00	"	24.00

ALL OTHER SIZES ON REQUEST.

When ordering state bead of tire required, **Q. D. CLINCHER** or **STRAIGHT SIDE.** Mail orders filled same day, upon receipt of 10% deposit. **SEND YOUR ORDER TO-DAY.** If size is not on the above list, write us for **PRICE LIST** without delay, as you are **SAVING** money by buying your tires now.

M. LIBEN & CO., 205A West 48th Street, NEW YORK

Tires

Bearings

BOLTS

(SPRING)

Diam.	Length		Price Net
½"	3"	Grease cup and nut	$ .50
½"	3¼"	Grease cup and nut	.50
½"	3¾"	Grease cup and nut	.50
½"	4"	Grease cup and nut	.50
⅝"	3¾"	Grease cup and nut	.60
⅝"	4"	Grease cup and nut	.60
⅝"	3½"	Grease cup and nut	.60

SPINDLE

Hudson M/20, 1910	$1.00
Hudson M/33, 1911	1.00
Hudson M/33, 1912	1.00
Buick M/10, 1910	1.00
Buick M/17, 1911	.90
Chalmers 40, 1907	1.75
Chalmers 40, 1909-10	1.75
Chalmers 40, 1911-12	1.25
Abbott 44, 1911-12-13	1.00
Jackson, 1910	1.00
Cole, 1910	1.00
Penn 30 H.P., 1909	1.00
Thomas 60 H.P., 1912	1.75

CROSS ROD

Hudson 1910, 1911, 1912	.40
Cole, 1910	.40
Buick, 1910	.40
Buick, 1911, M/17	.50
Jackson, 1910	.40
Jackson, 1911	.50
Chalmers 40 H.P., 1907-08-09-10-11	.60

BUSHINGS—Bronze

Hudson 1910 Piston Pin	1.00
Continental M/E	.50

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Bulletin No. 4

J. C. Gorey & Co.

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Automobile Mechanics Corporation
223 W. 53d St. Tel. Circle 3575 **New York**

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WORKS: BOONTON, N. J.

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AUTO TOPS

Regular and *"One Man"* style, for Ford and all other cars.

"E. Z. ON" Top Recoverings

For Ford Cars always in stock. For all other cars made in two days. Special measurement chart guarantees a perfect fit. You save expense of returning old top.

SEAT COVERS

To fit all cars. Special high quality, actually tailored o fit.

Exclusive makers of **"Stik-Tite" Windows and Roof Patches.** Attached by anyone in ten minutes. No metal fasteners—no stitches.

Big profits for dealers and jobbers. Catalog free.

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CINCINNATI, OHIO

Radiators and Lamps

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We also make and repair
FENDERS, HOODS and TANKS of all kinds.
DAVIS & SCHEGG CO., 2124 Broadway, New York

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PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

AUTOMOBILES at Rock Bottom Prices, overhauled and repainted. Good assortment of Pleasure Cars and Motor Trucks. Good agents wanted. Inclose stamp for Special Bulletin. Eureka Auto Co., Rebuilders, Beavertown, Pa.

FOR SALE—$275 value for first $25 money order. American Ever Ready Starter for six cylinder. Good as new. Geo. F. Cass, Manchester, N. H.

FOR SALE—Motorists, Decarbocide Intensifies your fuel, increases mileage, removes carbon. Is positively harmless. Grace & Company, 3205 W. Washington St., Los Angeles, Cal.

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PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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World's Largest Dealers
56th Street and Broadway, New York — 1210 Michigan Ave., Chicago

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BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

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Complete stock repaired Annular Bearings. Special Bearings made to order, all sizes for exchange. BILODEAU BALL BEARING W'KS, Inc., 66B Stanhope St., Boston, Mass.

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CYLINDER GRINDING PISTONS — AND — RINGS

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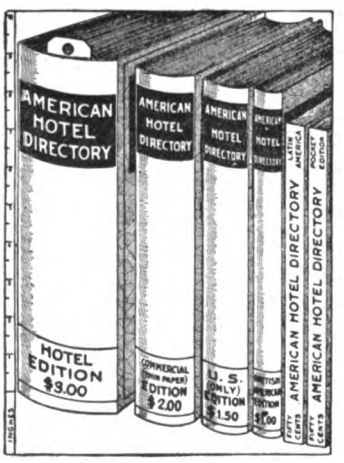
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Water Gas Carburetors.

The Water Gas Carburetor is manufactured by the Water Gas Carburetor Company, of Kansas City, Mo. It is a very highly finished and beautifully designed sight feed double jet instrument which is a credit to any car. The manufacturers claim that this carburetor is scientifically correct in every detail, trouble proof, and absolutely controlled by an air-balanced governor to prevent overfeeding or underfeeding at varying throttle speeds. The water, which must be absolutely clean filtered water, is drawn through the instrument by the suction from the intake manifold of engine, while the adjustment for feeding water at the rate of 60 to 120 drops per minute (according to motor size) is controlled by the left-hand needle valve. Those who are familiar with these instruments state that they are very efficient and the manufacturers have received very strong testimonial letters from motorists all over the country. The Water Gas Carburetor Company also makes a line of other specialties, including a very clever automobile bed and house tent, suitable for use on long tours. While this bed is perhaps more conveniently carried on a trailer, it may be packed on the running board of the automobile in a remarkably compact form without causing any discomfort or inconvenience to the car passengers. The new bed and tent eliminates every discomfort heretofore experienced in camping on the road, because your wigwam is elevated high and dry, away from all ground dampness, and the bed is an exceedingly comfortable one. But our readers who may be interested in this device cannot comprehend the value of the outfit without seeing the illustrations contained in a special circular which is issued by the manufacturers. Many of our readers will undoubtedly wish to read for themselves this circular and other printed matter illustrating all the useful specialties made by the Water Gas Carburetor Company.

AUTOMOBILE SALESMANSHIP. By J. H. Newmark. Automobile Publishing Co., Detroit, Mich. Price $1.50.

This book, comprising 121 pages, is chock full of useful and practical information to the man who is entering the business of selling automobiles. It takes up the qualities which make for best salesmanship and advises all salesmen if they haven't a taste for mechanics to cultivate one and know all about the car they are selling.

AUTOMOBILE DRIVING AND REPAIR. American Technical Society, Chicago, Ill. Price $2.00.

This volume is designed for the owner, or the driver, who wishes to properly take care of his car, and for the repairman who is anxious to broaden his own experience. Part II covers a multitude of helpful repair suggestions for all parts of the car from the engine to the differential, from the steering gear to the tires. The section on tire vulcanizing with the description of proper tire repair methods will be found especially helpful. In Part III is given an excellent article on welding as applied to the repair shop. The increasing use of this handy method of making difficult repairs gives this section special interest. The cost data will be found exceptionally valuable.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

COMPRESSED AIR TANKS—

SCAIFE COPPER-BRAZED TANKS are used to the exclusion of all others by the leading builders of Air Compressors.

We positively guarantee them to hold air indefinitely without loss of pressure.

Send for Catalogue

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.

New York Office: 26 CORTLANDT STREET

Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

This Tirefiller is made of the finest quality of pure rubber treated under special processes, never gets "flat" and will last indefinitely.

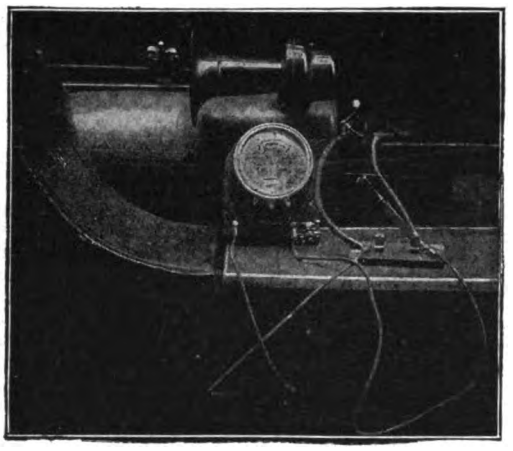
One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.

National Rubber Filler Co.

MIDLOTHIAN · · · · · TEXAS.

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How AMBU Attaches to Battery

THE PRESIDENT'S WARNING

STOP WASTE!!!

From President Wilson's historical appeal: "It is evident to every THINKING man that our industries, on the farm, in the shipyards, in the mines, in the factories must be made more prolific AND MORE EFFICIENT"—

The President's appeal was a warning to every line of business endeavor. It sounds the keynote of logical business development, increased production, with lowest possible production cost—

It means do more work, do the best work, efficiently—without guess work—

It applies to Electrical Starting and Lighting repairs as well as to the raising of food—building of ships, mining of ores and manufacturing of automobiles—

The logical step in making your repair department more prolific and more efficient in Electrical Starting and Lighting repairs is the adoption of—

TRADE AMBU MARK

ELECTRIC TROUBLE SHOOTER

Ambu Electric Trouble Shooter is an instrument which automatically detects and locates accurately and quickly trouble in any American made starting and lighting system used as standard on any American made cars—

and shows you *what* the trouble is and exactly *how* to repair it—

Autolite, Remy, Bijur
Rushmore, Delco, Westinghouse,
Dyneto, Entz, Gray & Davis,
Splitdorf, Apico, North East,
U. S. L., Wagner, Ward Leonard,
Adlake, Deaco, Disco,
Allis-Chalmers, Bosch, Jesco,
Esterline, National
Leece-Neville, Simms-Huff

AMBU SERVICE

Ambu service consists of Ambu wiring diagrams—showing the exact layout of every electrical system as applied to automobiles; covering 400 or more cars.

Ambu Repair Charts—giving concise and practical working information and complete instructions on how to make repairs quickly and positively.

Ambu Service Bulletins keep you posted on all changes, additions and improvements which may be made in the various systems.

Ambu Engineering Advice—to help you out of any unusual difficulties.

The complete Ambu Service contains information impossible for you to obtain in any other way—viz., showing internal hidden wiring connections rarely shown by the makers themselves—classified, systematized, readily accessible, and filed in a handsome, substantial metal case with lock—a compact authoritative service.

It's the step from a perhaps limited Electrical knowledge from guess work from searching all over the car in a half blind way to the possession of an accurate complete knowledge and definite assurance of a quick successful repair job every time you tackle one—

And a good price for the work, too—because you and the car owner know it's right.

Ambu enables you to make your Electrical repairs more prolific and more efficient.

Ambu puts you—no matter where you are located—in the same class with the best informed starting and lighting repair men in the country—

With Ambu you become expert—quick, an authority—a prolific producer—

Because—you know where the trouble is—after making 3 short tests with Ambu—what it is—and you quickly and efficiently repair it—

It takes less time—if you use Ambu to make authoritative and lasting repairs than by the old methods, so you can do more jobs each day—better work—quicker work—more work—satisfied car owners.

That's the result of the possession and regular use of Ambu—

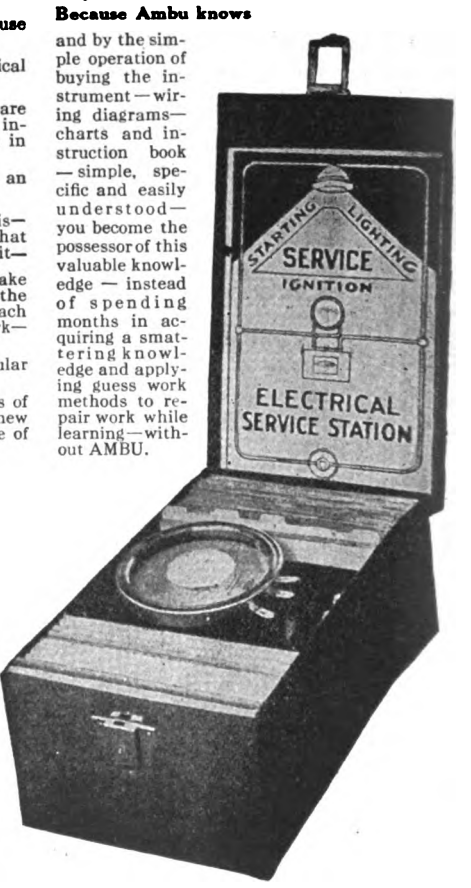
If you knew all about all the many makes of starting and lighting systems—if you knew the wiring and adaptations on every make of car you would not need Ambu—

But it's humanly impossible for you to know all this—there are too many and you have not the time or opportunity to master this overwhelming detail.

So you do need **AMBU**

Because Ambu knows

and by the simple operation of buying the instrument—wiring diagrams—charts and instruction book—simple, specific and easily understood—you become the possessor of this valuable knowledge—instead of spending months in acquiring a smattering knowledge and applying guess work methods to repair work while learning—without AMBU.



Ambu Endorsed by Big Men in Automobile Business

Big men seriously endorse Ambu because they quickly see its wonderful value—

We have scores of enthusiastic letters from owners and users of Ambu,

the seal of approval from men who know and who are making their shops more prolific—more efficient and reaping a nice income—

We will gladly supply their names and facsimile copies of their letters if you desire that evidence.

And remember—our interest does not stop with your purchase, it centers in you as long as you are in business and are using Ambu—we show you the way to more and better business—

Battery Repair Tools

As a further extension of our work to make electric repairs more efficient we have perfected a kit of Battery Repair Tools—A tool for each phase of battery repairs—Enables you to make battery repair—in your shop—Now you don't have to send the Battery back to the maker—write us for full particulars—

We are waiting the opportunity to answer any question you care to ask regarding the application of Ambu to your business.

We want only the chance to show you how Ambu quickly pays for itself and at the same time brings in repeated profits. *Write today, please.*

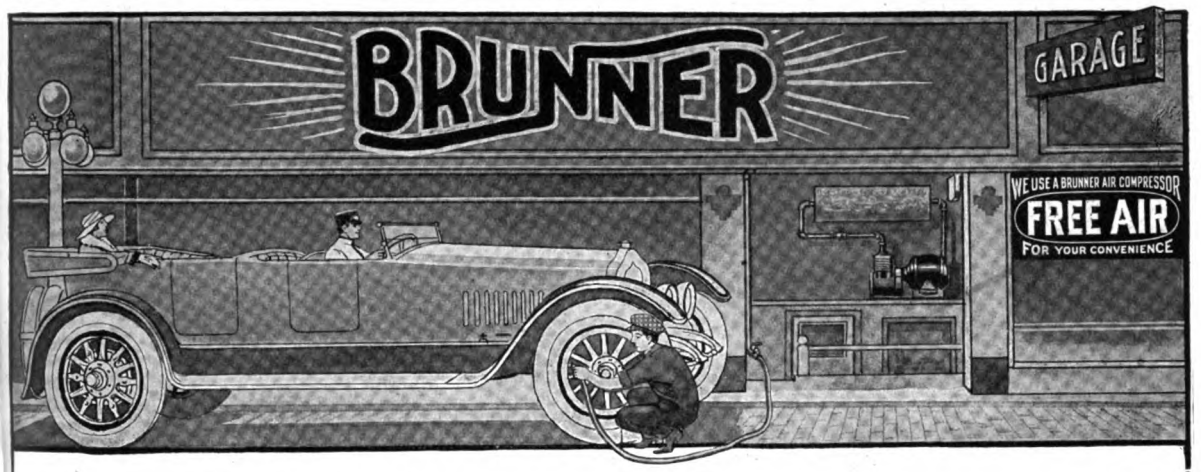
ADDRESS:

AMERICAN BUREAU OF ENGINEERING, Inc.

Automobile Department

1018-28 So. Wabash Avenue **Chicago, Illinois**

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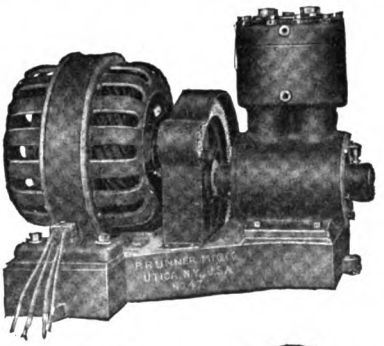
The motorist who is Brunnerwise, With tires of the largest size, Knows Brunner Service satisfies— That's why they call him Brunnerwise.

Yes, Mr. Garageman, the Brunnerwise Motorist knows that Brunner Service satisfies and he knows that when he pulls up in front of the garage bearing the Brunner Sign that he will find an ample supply of pure, cool air at his disposal.

Thousands upon thousands of motorists are mapping out their summer tours, and thousands of them are Brunnerwise Motorists with pleasant memories of the Brunnerized Garages along the way and they will speed along the trail with one eye on the road and the other eye on the lookout for the Brunner Sign, and the Brunnerwise Garageman will get their business.

Mr. Garageman, these Brunner "ads" are making Brunnerwise Motorists every day. Motorists read these "ads" and are prompted to investigate Brunner Service; and when they do investigate Brunner Service, they become Brunnerwise and accept the Brunner Sign as a sure sign of prompt and efficient service.







INVESTIGATE THE BRUNNER AIR COMPRESSOR

Be honest with yourself and investigate the garage air compressor question thoroughly, before deciding on your new equipment; the Brunner will stand investigating and the more thorough the investigation the more certain will be your decision in favor of Brunner Service, because it not only insures compressed air efficiency of the very highest order, but it also insures that very desirable and liberal patronage of the Brunnerwise Motorist, which follows the Brunner Sign.

We will be glad to send you the name of the Brunnerwise Jobber who covers your town, also our catalogue and Garageman's Handbook on Compressed Air—a book which every garageman should read carefully—they are all free for the asking.



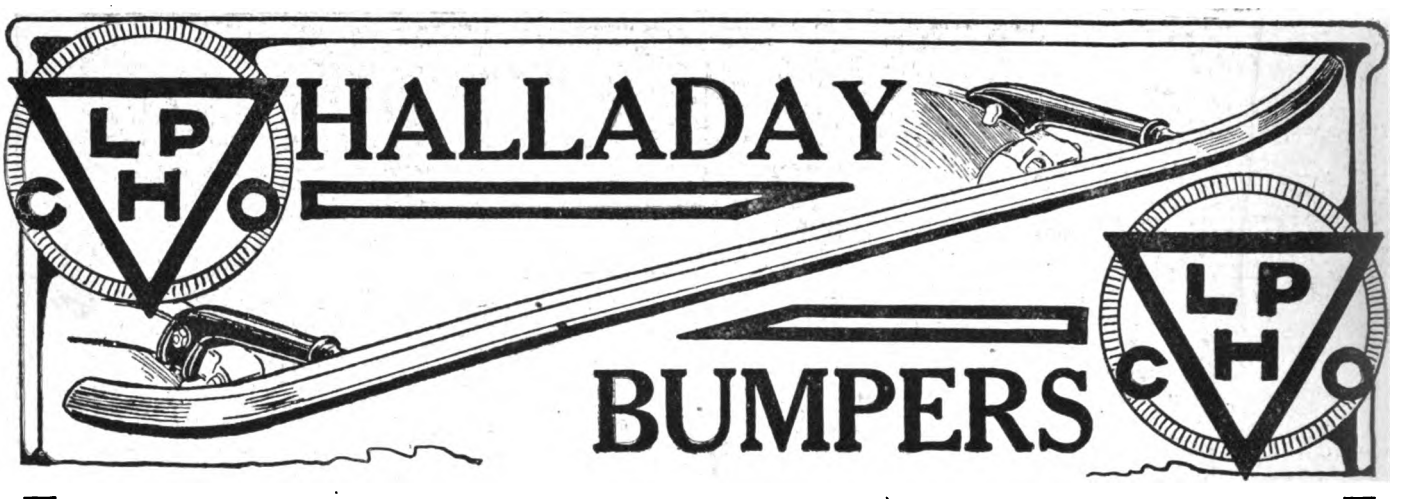
BRUNNER MANUFACTURING CO.

Main Office and Plant: Utica, N. Y.

Cincinnati Branch: 419 First National Bank Bldg., Cincinnati, Ohio



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Spell "Dealer Profits"

Because

Every Buyer of a Halladay Bumper is a satisfied customer who recommends the Bumpers to his friends.

Halladay Bumpers are made of the best quality of Cold Rolled Steel, finished in Nickel and Black Japan, and add class and finish to the appearance of a car.

Halladay Bumpers are furnished in three sizes of Channel Bar, Diamond Channel, Full Diamond, Round and Spring Bars and are made to

FIT ALL CARS

with special models for those cars of special construction such as Cadillac, Cole, Chevrolet, Franklin, Ford, Packard, Pathfinder, Saxon "6", Briscoe, Dodge and others.

The Halladay line includes special rear Bumpers for the Buick, Cadillac, Mitchel, Overland and Saxon.

Halladay Dealers Get the Benefit

of a national advertising campaign in the leading Automobile publications of the United States.

Wise dealers who build for future business carry the Halladay Line.

Pin this advertisement to your letterhead and send it to us, and we'll see that you receive our 1917 catalog describing the line of Automobile Accessories and Bumpers made by the House of Halladay.

L. P. HALLADAY & COMPANY, Streator, Illinois

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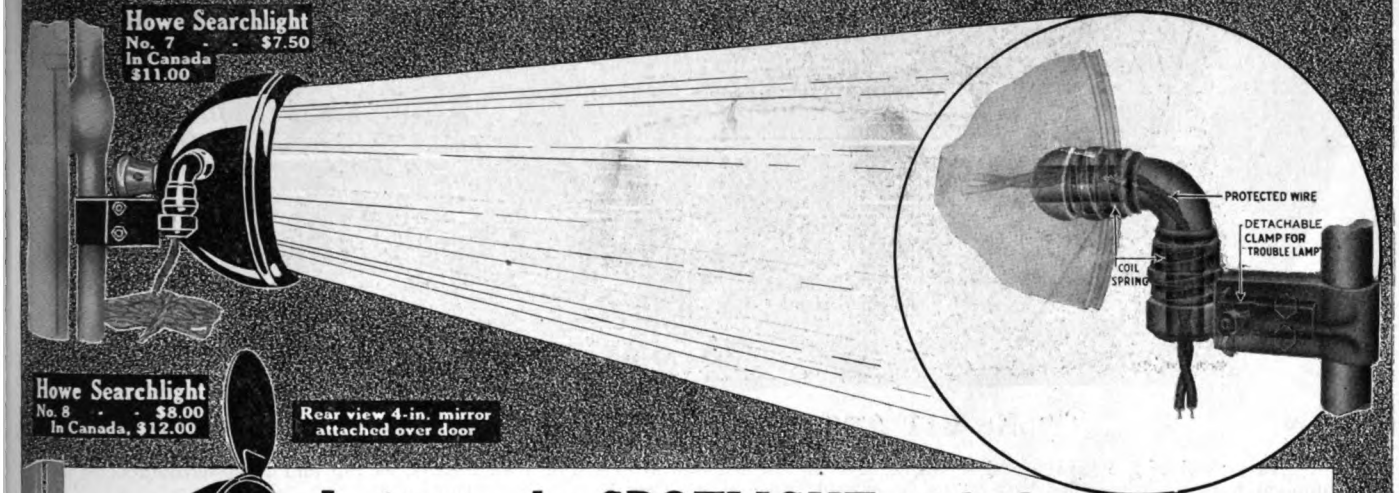
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HOWE Searchlight

"The Spotlight with the wonderful bracket"

Howe Searchlight
No. 7 - - $7.50
In Canada $11.00



Howe Searchlight
No. 8 - - $8.00
In Canada, $12.00

Rear view 4-in. mirror attached over door



Insist on the SPOTLIGHT with the wonderful spring controlled bracket

—That turns easily as you point the finger —and stays put wherever you turn it

Howe Searchlight
No. 9, with 4-in. rear view mirror . $8.00
In Canada, $12.00



No other spotlight turns as easily—no other stays just where you direct it, regardless of jars and vibration—no matter how long it is used. Because the Howe alone has the WONDERFUL SPRING CONTROLLED UNIVERSAL JOINT BRACKET.

It hits the spot where you want light with a direct one-way turn. No up and down, then to right or left motion as is necessary with right-angle joints. No sticking or locking—and wherever you direct it, it "stays put." It never works loose, flops around or rattles, because the turning joints are held in a *firm, unyielding grip by two coil springs.*

The hollow bracket also contains the wire. Prevents twisting, wearing, broken strands, short circuits.

The Howe two-piece clamp is made in seven styles to fit every windshield post perfectly and permanently whether it's oval, round or square.

The on-and-off water-proof switch is right in the neck of the lamp. Works easy while turning lamp.

The Parabolic reflector gives a true spotlight at all distances. 100% light efficiency is given without danger of glare. National Mazda, nitrogen gas filled 21-candle-power bulbs are used.

Loosen a set screw without disturbing the clamp, attach an extension cord, and you have a powerful trouble light.

The Howe Searchlight is entirely made from stampings, and therefore light in weight. It has a perfect streamline body and the finish is equal to that of your car.

Tell Your Dealer You Want the Howe Searchlight

No other spotlight has the spring controlled bracket. No other is directed so easily or quickly. No other absolutely STAYS PUT. The Howe is wonderfully superior to spotlights with taper joints, swivel or friction disc brackets. If your dealer hasn't the Howe Searchlight, send us his name and remittance for the model you want. We will ship prepaid.

The Howe Junior No. 11 is a single shell with the same bracket and two-piece detachable clamp as the Standard Howe, $4.00. With mirror, $4.75. In Canada, $6.00 and $7.50. *Fill out the Coupon* →

HOWE MANUFACTURING COMPANY
1732-36 S. Michigan Avenue Chicago, Illinois

Howe Manufacturing Co.
1732-36 S. Michigan Ave., Chicago, Ill.

Name.....

Street No......

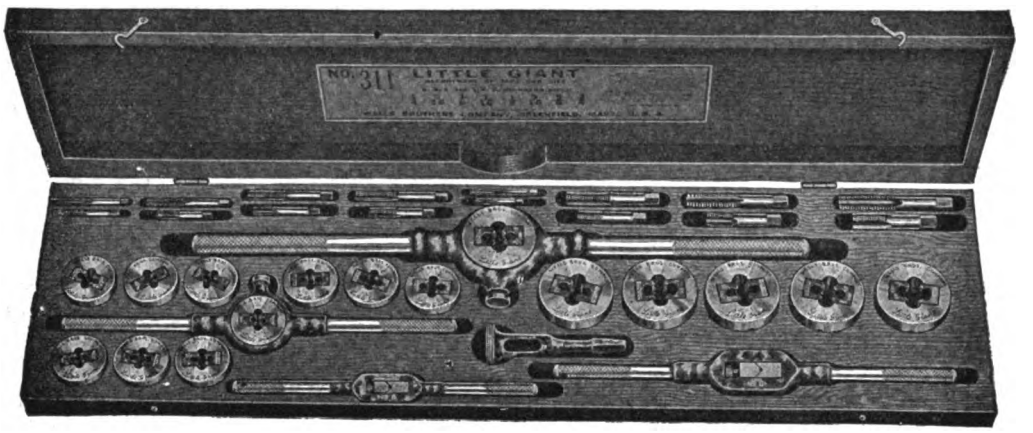
City.....

Dealer's Name.....

DEALERS.—Be sure to get your order in early this year, for Howe Searchlights, to insure protection on deliveries. Pin this to your letterhead for Special Free Display Stand Offer.

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How Complete is Your Screw Threading Equipment?



No. 311 *Little Giant* Combination Screw Plate

Every need of the garage and repair man, or the car owner who makes his own repairs, for tap and die assortments can be supplied from the diversified line of the Greenfield Tap and Die Corporation. For instance, the

Little Giant Combination Screw Plates

(Shown above)

contain both United States and S. A. E. standard taps and dies; each die is contained in its own collet and is adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in hard-to-get-at places.

A few more assortments are shown below.

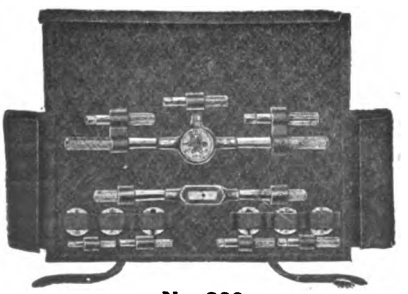
Send for No. 37 Catalog—showing the complete line.



No. 2501
G. T. D. Garage Repair Set
For Ford Cars

Seven sizes taps and dies. Two reamers for important bushings. Die stock and tap wrench.

A new set that is meeting a real demand.



No. 308
G. T. D. Screw Plate
In Leather Roll

Seven sizes taps and dies. Stock and tap wrench. Very convenient and compact for emergency cases.

Look for one of these trade marks on any screw plate you buy:

Little Giant

GREENRIVER

SMART LIGHTNING

G T D

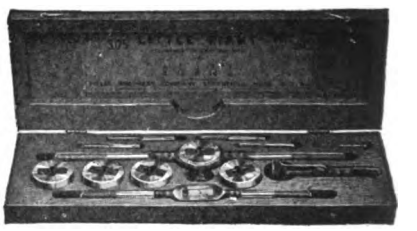
Greenfield Tap & Die Corporation

GREENFIELD, MASS.

Wells Brothers Co. Division
Wiley & Russell Mfg. Co. Division
A. J. Smart Mfg. Co. Division

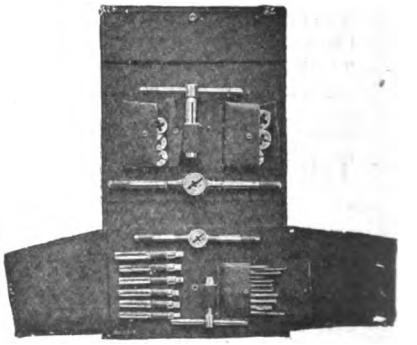
New York, 28 Warren St.
Chicago, 13 So. Clinton St.
London, 149 Queen Victoria St.

Canadian Factory
Wells Brothers Co. of Canada, Ltd.,
Galt, Ontario



No. 305
***Little Giant* Screw Plate**
One of the most popular assortments.

Five sizes taps and dies. Die stock, tap wrench and bit brace die holder.



No. 2500
G. T. D. Emergency Kit
For Ford Cars

Sixteen sizes taps and dies—being practically every screw thread on Model T Ford that ever needs replacing. Thousands of these are in use.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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YOUR NAME BIG

See how it stands out on this handsome calendar. Your name and your store are emphasized through the new Firestone advertising plan.

Read below—then mail coupon for all the facts.



THIS 10-COLOR CALENDAR WILL INCREASE YOUR SALES

MOST modern reproductive processes bring out every line, every tint of this wonderful painting by Earl Christy. Original painting and printing rights owned by the Firestone Company. Can be obtained only from us. Just one of the startling sales features of the New Firestone Advertising Plan that saves your time and develops new business fast. Practically automatic. Takes care of itself during the busy summer months.

Send coupon for complete details. Learn how to land sales by advertising.

FIRESTONE TIRE AND RUBBER COMPANY
AKRON, OHIO

Mail Coupon Now

FIRESTONE TIRE AND RUBBER CO.
AKRON, O.

Please send me complete details of your advertising plan for increasing the tire and accessory sales of my store. It is understood that this places me under no obligations whatever.

Name _____

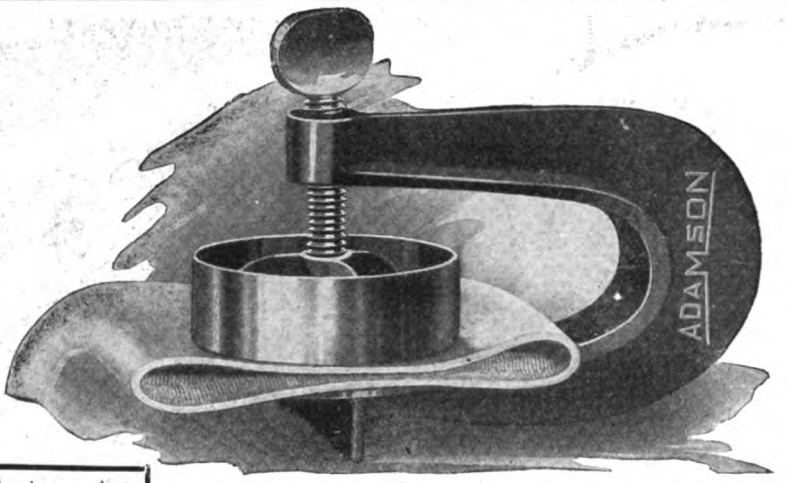
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Street and Number _____

Town _____

State _____

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ADAMSON

5-Minute Vulcanizer

(Model "E")

Meets the demand for a light and handy outfit for the quick repair of tube punctures.

Uses common gasoline—the most convenient and dependable fuel. Will vulcanize your tubes ***anywhere*** in five minutes.

Designed on the same proven principles that have made ADAMSON Vulcanizers the most practical and largest selling line in the world.

Complete with box of a dozen "Adamson" 5-minute Repair Gum Patches, for $1.50. Extra box of 12 patches only 25c.



DEALERS: This outfit will be a tremendous seller —Order now from your Jobber.

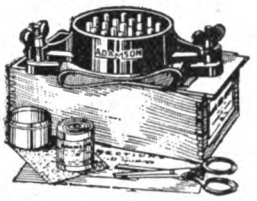
Sold by All Jobbers

ADAMSON MFG. COMPANY
EAST PALESTINE, OHIO

For larger tube injuries, tire and tube blow-outs, tread cuts, etc., the old reliable "Adamson" line is complete with several models for car owner and garage use.



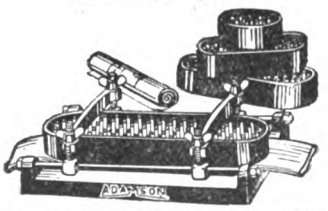
For all casings and tubes
Model "U" $3.00



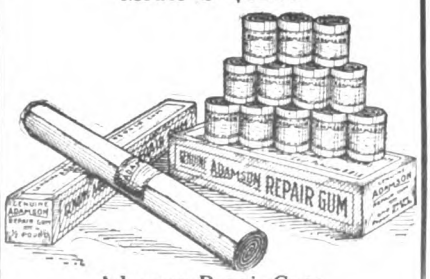
For all sizes of inner tubes
Model "T" $2.00



For Tubes 3½" and under
Model "M" $1.50



For private garages and repair shops
Model "S" $12.00



Adamson Repair Gum
A special quality for portable Vulcanizers. Essential for best results.

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MAXFER

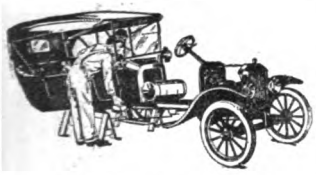
Fastest Selling Truck Ever Produced



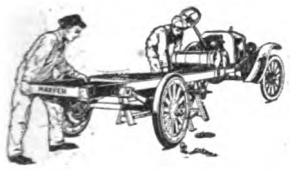
Tools used to make a MAXFER THE WHALE FOR WORK TON TRUCK



Removing Ford rear wheels



Taking off the body



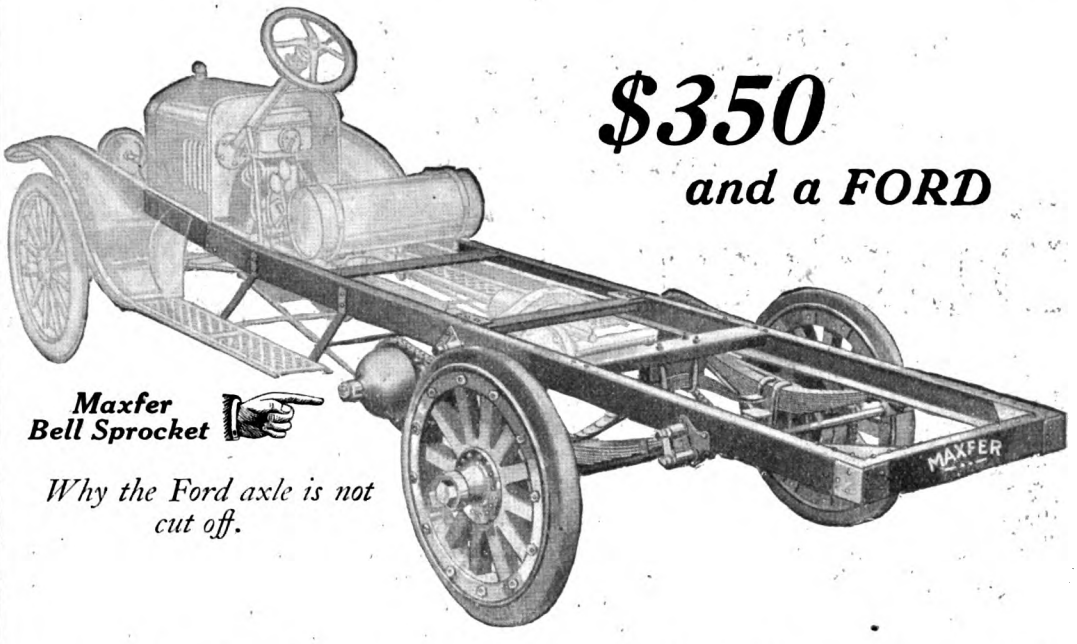
Making a MAXFER one ton truck



Putting on MAXFER Bell sprocket



MAXFER
THE WHALE FOR WORK
TON TRUCK



$350
and a FORD

Maxfer Bell Sprocket

Why the Ford axle is not cut off.

A MAN is known by the record he makes. A truck is known by the record it makes. In the last nine months the Maxfer Company have added over 1100 dealers.

The reason for this, is that the Maxfer is the most economical, easiest and quickest method ever invented of making a one-ton truck from a Ford. The Maxfer truck maker does not require you to cut off the axles, does not require you to cut off the frame. When you have finally completed the change of a Ford into a Maxfer one-ton truck, you have the best selling proposition ever offered to a dealer.

We are proud to say that we have the largest distributors of trucks in the United States as our dealers — and more are coming into our organization every day. You cannot afford to stay out of the Maxfer organization if you handle trucks.

Maxfer makes a Ford, used or new, into a one-ton truck, at $350. It slips around and over the Ford frame, strengthening it all the way.

Write or wire to us and find out whether your territory is open. We have some good territory still left. Our dealers have sold 12,000 of these trucks in nine months.

Maxfer Truck and Tractor Co.
908 So. Michigan Avenue
CHICAGO, ILLINOIS U. S. A.

Maxfer Truck & Tractor Co.
908 Michigan Ave., Chicago

Please mail to me full particulars of the Maxfer Truck.

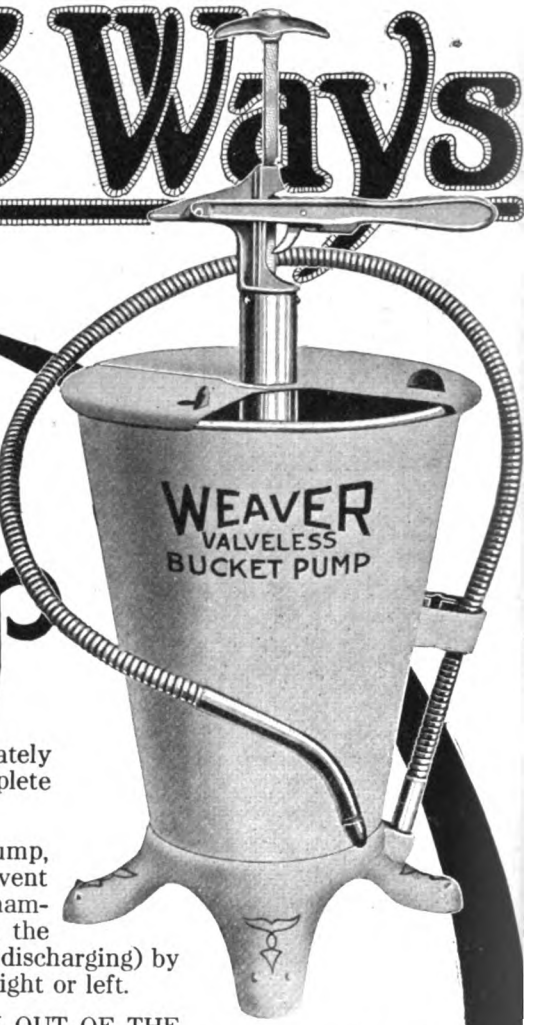
Name .....

Street .....

City..... State.....

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There are 3 Ways of using The WEAVER VALVELESS Bucket Pump





THE LUBRICANT CAN BE PUMPED FROM THE BUCKET DIRECTLY INTO THE CAR—and accurately measured as it is delivered. One complete discharge measures one pound.

There is no valve employed in this pump, as is true of other suction pumps. An open vent at the bottom of the brass barrel or inner chamber is thrown into communication with the bucket (for filling) then with the hose (for discharging) by simply turning the handle ¼ turn to the right or left.



THE LUBRICANT CAN BE DRAWN OUT OF THE DIFFERENTIAL or transmission of the car and discharged into a separate receptacle WITHOUT disturbing the contents of the Bucket.

This is accomplished by letting the vent (referred to above) remain in communication with the hose while the used grease is drawn into the barrel of the pump and again discharged through the hose into the separate receptacle.

The used grease gets no further than the inner barrel so does not contaminate the contents of the main bucket.



A LUBRICANT OF A DIFFERENT QUALITY THAN THAT CONTAINED IN THE BUCKET-PUMP CAN BE PUMPED INTO THE CAR.

This is accomplished in the same manner as described above. The nozzle of the hose is inserted into the can of foreign lubricant, the barrel of the Pump drawn full and discharged into the car without disturbing the contents of the Bucket-Pump.

Another Great Advantage

of this "valveless" construction is that the unobstructed opening in the Pump barrel enables the Weaver Bucket-Pump to handle heavier lubricant than other suction pumps employing a trap valve.

Indestructible Metal Hose

This Pump is equipped with a flexible steel hose instead of the usual rubber hose. Grease and oils do not affect it.

WRITE FOR COMPLETE CATALOG



WEAVER MFG. CO.
2175-79 SOUTH 9th STREET
SPRINGFIELD, ILLINOIS



Weaver Auto Ambula

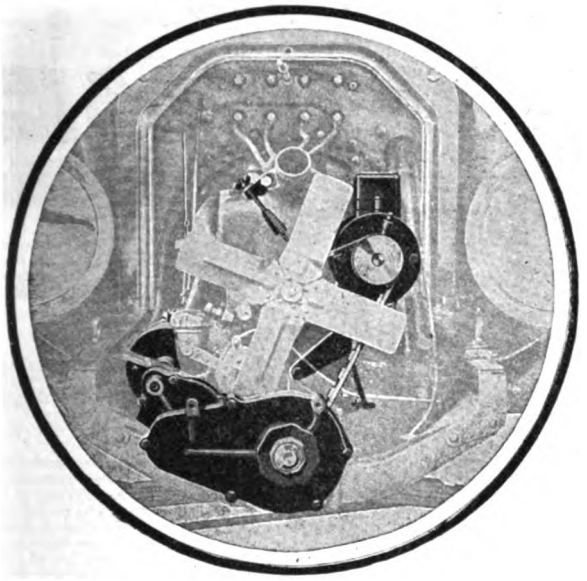
Will tow your crippled safely, quickly and econ cally. Fits either axle.



Weaver Towing Pole

Gives a rigid connection between the two cars and inates the dangers of the tow line. The spring ab all shocks. Cars can be backed when necessary.

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A·B·C

TWO-UNIT SIX-VOLT

STARTING & LIGHTING SYSTEM

for Ford Cars

Here are a few reasons why it is easy for All Dealers to sell A.B.C. Starting and Lighting Systems

1—The A.B.C. is a two-unit system—the same type used on all high-priced cars.

2—The A.B.C. is the lightest and most compact system on the market.

3—The A.B.C. starting motor puts no drag on the engine. The starter is idle while the engine is running.

4—The A.B.C. generator consumes but one-eighth horsepower.

5—The A.B.C. is the only Ford starter that eases off the strain of "backfiring.

6—The A.B.C. has no chains to break and rattle.

7—The A.B.C. has its weight equally divided on each side of the car.

8—The A.B.C. does not interfere with the accessibility of the Ford engine.

9—The A.B.C. put less "draw" on the battery than any other Ford system.

10—The A.B.C. puts the starting strain at the exact point where Ford designers intended it should go.

11—The A.B.C. requires no change to be made in Ford construction.

12—The A.B.C. Starting and Lighting System is absolutely guaranteed against construction faults and material defects.

13—The A.B.C. System is more easily installed than any other starting and lighting system for Fords.

14—The A.B.C. is "priced to the people's purse"; but it is just as well made, efficient and durable as the highest priced system on the highest priced car.

Read 1, 3 and 7 again. They'll convince any intelligent Ford Owner that the A. B. C. System is the best for him

You know—and every other well-posted Dealer knows—that there's a big demand for Ford Starters. Every Ford Owner is a prospective purchaser. The dealer with the right kind of starter—the starter that makes good, not only once, but all the time—is the one who makes the money. No "single unit" starting and lighting system will do the work and do it well. You know that. The single unit system was discarded by manufacturers of high-priced cars, because it failed. It fails on Fords. Ford Owners won't tolerate the discards of other manufacturers. They want the best. You can give them the best—at no greater price than they would pay for a single unit system. If you sell a poor system you buy trouble. You lose time and labor. You're all the time listening to kicks—making repairs and adjustments. You spend yonr profit on the sale, making it "stick."

A·B·C STARTER·COMPANY DETROIT

As a matter of policy, principle and profit, you can't afford to sell anything but the best. That's the A.B.C.,—from every angle. The A.B.C. Starting and Lighting System is easy to sell—easy to install—and—it stays sold. It lets you keep the money you make.

YOU'LL BE GLAD TO GET WHAT THIS COUPON WILL BRING YOU

A.B.C. Starter Co.
Dept. H.
Detroit, Mich.

Gentlemen: Please send full information regarding the A.B.C. Two-unit Starting and Lighting System, including literature, prices, terms, discounts, etc.

Name.....

Address.....

City.....State.....

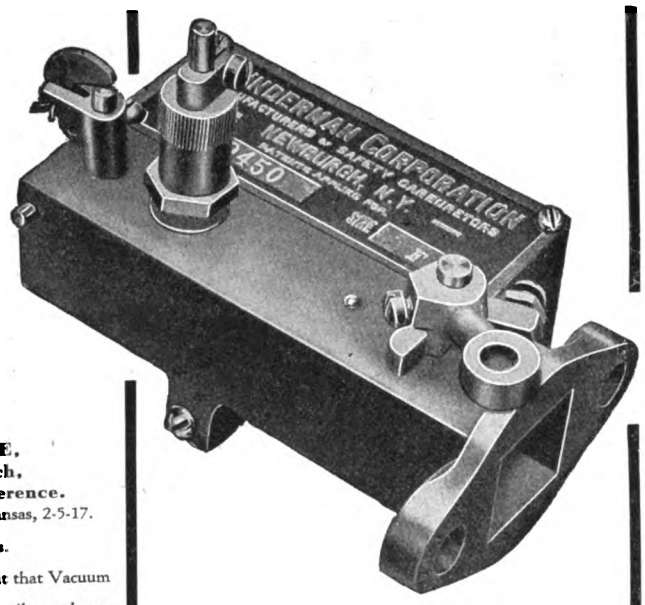
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$5 SUNDERMAN $5

Vacuum Carburetor

F. O. B. Newburgh $6.50 for other than Ford or Metz

F. O. B. Newburgh $6.50 for other than Ford or Metz



FORD
Bering Cortes Hardware Co., Houston, Texas.
"Our man made THIRTY-SEVEN MILES PER GALLON on a Ford with your carburetor, and is much pleased with it."
August 22, 1916.

R. H. CHENEY,
Grundy Center, Ia.
Last night I took a drive of 9 miles and back (18 miles) and consumed only ½ gallon of gasoline. On Sunday I drove 98 miles on 3 gallons and 1 quart of gasoline. The Sunderman is the greatest carburetor I ever saw.
Sept. 2, 1916.

REV. W. A. PIERCE,
Pastor M. E. Church,
Northwest Kansas Conference.
Kirwin, Kansas, 2-5-17.

Mr. H. H. Dean, Mgr.,
Cedar Garage Co., Cedar, Kansas.

Dear Sir:—
Will write you this morning about that Vacuum Carburetor that I bought of you.
It idles along on high gear at 4 or 5 miles per hour, and seems to behave quite decently, but when some one comes up behind, it insists on staying in the lead.
Then it has another trait which might be changed. If I turn on a few notches of juice, when going up hill, it will grab the bit in its teeth and go for the top of the hill like a wild Texas steer after a red rag.
Now as to the mileage, I have gotten as low as 25 miles per gallon. One day the conditions were ideal for this time of the year and I did succeed in making 15 miles, on three pints. My average is only 31 miles.
When it gets good weather, I hope to be able to make a good mileage. Guess that it is worth $5.00.
Cordially, W. A. PIERCE.

CAPT. WM. APPLEBY ROBINSON,
Cornwall, N. Y.
"Since using the Sunderman Carburetor I have increased the mileage on my three thousand pound Overland car from 9.7 miles with regular equipment to 15.5 miles with the Sunderman, two years, average mileage.
"I wouldn't take $50.00 for the carburetor if I couldn't replace it." May 23rd, 1916.

S. W. SLINKARD,
143-37 Wright St.,
Los Angeles, Calif.
"I received the Sunderman carburetor you sent me for my Pierce-Arrow car. It now runs fine, makes from 14 to 16 miles per gallon, while from the old carburetor I only received from 7 to 10 miles."
February 14, 1917.

THE A. J. FAWCETT COMPANY,
Manufacturing Confectioners,
1629 Dodge Court.
Cleveland, March 27th, 1917.

The Sunderman Corporation, Newburgh, N. Y.

Gentlemen:—
The carburetor which I ordered from you was duly received and installed on my **Lozier No. 51.** On a test the car showed over 9½ miles to the gallon of gasoline, which is over 50% better than I ever got out of it before, using a ——. My car also shows more power than I ever thought it possessed, and will throttle down slow on a heavy pull without loading up, which is something very few will do.
Kindly advise carburetor you make for Type L 30 Locomobile, also price of same.
Very truly yours, A. J. FAWCETT.

Proving Value

The value of a carburetor can be shown only by use. And when users become enthusiastic enough over a carburetor to write the dealer who sold it or the manufacturer who makes it, the only logical inference is that the carburetor is UNUSUAL.

You who read these Sunderman advertisements remember that we claim a 30 to 50% saving in gasoline. That's all we CLAIM — yet the unsolicited letters on this page show a uniformly greater saving. They should satisfy even the most incredulous of the Doubting Thomases.

Hundreds of letters of this kind are in our files—coming from every section of the country. High altitudes and low, dry climates and moist—all are represented in testimonials.

Therefore, car owners should order at once. Dealers should get our proposition without delay and manufacturers should give us the opportunity to show what the Sunderman Carburetor can do as equipment.

Write now—before the selling season swamps you

Sunderman Corporation

9-11 Chambers St., Newburgh, N.Y.

Western Office: 403 Kresge Bldg., Detroit

Law office of
JOHN H. SCOTT,
Sutton, Nebr.
Sunderman Corporation,
Newburgh, N. Y.
Gentlemen:—
The garage who is handling your carburetor here loaned me one that they had just received in stock and I installed it upon my car. It not only starts easy but gives excellent mileage and greater power.
I made a run yesterday over country roads with plenty of hills and faced quite a strong wind part of the time and made 37 miles to a gallon of gasoline.
I have had as high as 34 miles per gallon and again over the same road with the same load along, about 22 miles drive, with the same adjustment.
Yours truly,
JOHN B. SCOTT.
Mar. 30, 1917.

H. F. PARKER & CO.,
Automobile Accessories,
623 W. North Avenue,
Baltimore, Md.
"The first Sunderman Carburetor left with us is being used on a Ford delivery that makes the same measured course each day and has been getting 12 miles to the gallon; it is now getting 29½ miles to the gallon and this is on a baker's delivery in the city with a great number of stops."
July 10th, 1916.

THE WASHINGTON SANITARIUM GARAGE,
Takoma Park, Washington, D. C.
Sunderman Corporation,
Newburgh, N. Y.
Gentlemen:—
The SUNDERMAN CARBURETOR is doubling mileage on my Ford car.
Very truly yours,
The Washington Sanitarium Garage,
Per R. A. Diehl, Supt.
Mar. 29, 1917.

THE PUBLIC AUCTION MART,
71-73-75 Chambers St.
Newburgh, N. Y.
The Sunderman Corporation, Newburgh, N. Y.
Gentlemen:—
I have been using a 50 h.p. Overland Special for the past two years and with the regular stock carburetor. The best I could get out of it was **12 to 16** miles on a gallon of gas.
About three weeks ago I had one of your SAFETY CARBURETORS put on. After having it properly adjusted I gave it a trial covering **103 miles**, consuming a trifle over 4 gallons of gas. It is needless to say that I am pleased as well as surprised with the working of this carburetor.
H. C. ROSENBERG, Proprietor.
May 12, 1916.

YELLOW TAXI SERVICE,
Albany, N. Y.
"With the regular equipment on our Ford Taxi Cabs we averaged 15.4 miles, with the Sunderman Carburetor we got 24 miles per gallon."
May 13th, 1916.

LEROY C. SMITH,
28 State Street, Seneca Falls, N. Y.
"I have one on a Two Cycle Chase Truck that is giving 14 miles with a Sunderman against six miles with an old style carburetor."
August 23, 1916.

POLKADOT ICE CREAM PARLOR,
N. B. Tweddell, Prop.
Tennanah Lake, N. Y.
"I have used the Sunderman Carburetor since September 24, 1916, and find it a great satisfaction, getting one-third more mileage, more power and speed." October 16, 1916.

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What Would You Think of a Manufacturer—

—who wrote to you with a stub pencil—"We are saving much money because we do not use typewriters and telephones."? You might well wonder whether his merchandise was as much out of date as his business methods.

You know that modern time and labor saving appliances are not added expenses, but that they have superseded slower and more costly processes.

The concern that uses your business paper to tell you its business story is simply making it easier for you to buy intelligently with the least waste of time on your part and theirs.

For the right kind of advertising shortens the distance between human minds just as certainly as the railroad has shortened the distance between places. It is still possible to walk from New York to Chicago, and it is still possible for a business to get along without advertising, BUT—

—don't forget that the seller who does not advertise, is not only paying for the results that such advertising would get him, but he is also *paying more than necessary.*

Progressive advisers are progressive merchandisers and it pays to do business with them.

THE ASSOCIATED BUSINESS PAPERS, INC.

The International Association of Trade, Technical and Class Publications

ALL OF WHICH HAVE SUBSCRIBED TO THE "STANDARDS OF PRACTICE"

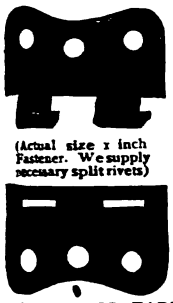
Advertising & Selling
American Architect
American Exporter
American Hatter
American Machinist
American Paint & Oil Dealer
American Printer
American Blacksmith
Automobile, The
Automobile Dealer & Repairer
American School Board Journal
Architectural Record
Boot & Shoe Recorder
Brick & Clay Record
Buildings & Building Management
Bulletin of Pharmacy
Canadian Grocer
Canadian Railway & Marine World
Cement World
Clothier & Furnisher
Coal Age
Concrete
Domestic Engineering
Drygoodsman, The
Dry Goods Economist
Dry Goods Reporter
Editor & Publisher
Electrical Review & Western Electrician
Electrical World
Electric Railway Journal
Electric Traction
Engineering & Mining Journal
Engineering News-Record
Farm Machinery—Farm Power
Furniture Manufacturer & Artisan
Grand Rapids Furniture Record
Haberdasher, The
Hardware Age
Hide & Leather
Hotel Monthly
Illustrated Milliner
Implement Age
Industrial Arts Magazine
Inland Printer
Iron Age
International Trade
Lumber Trade Journal
Lumber World Review
Manufacturing Jeweler
Marine Engineering
Merchants Trade Journal
Metal Worker, Plumber & Steam Fitter
Metallurgical & Chemical Engineering
Modern Hospital
Motor Age
Motor World
National Builder
National Druggist
National Petroleum News
Power
Practical Engineer
Railway Age Gazette
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Shoe & Leather Reporter
Shoe Findings
Shoe Retailer
Tea & Coffee Trade Journal
Textile World Journal
Transfer & Storage
Woodworker

HEADQUARTERS: 220 West 42nd Street, NEW YORK CITY

Information concerning Business Papers cheerfully supplied.

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"LAKEWOOD" QUICK ATTACHABLE FAN BELT FASTENERS



(Actual size 1 inch Fastener. We supply necessary split rivets)

Take the "jinx" off Fan Belt Repair troubles.

On or off in a jiffy — makes Fan Belt Repair profitable to you and enables you to quickly handle "special" fan belts to order. Outlast belts.

Car Drivers will buy them separate also.

Write us direct or ask your Jobber to get them for you.

LAKEWOOD FABRIC BELTING & MFG. CO.
1516 Highland Ave. Lakewood, Ohio, U. S. A.



HAND-I-WASH
COMBINATION
Water-Soap-Towel
All in one, ready for use. Every motorist should have one. At your dealers or direct, $1.00 prepaid. Refillers 50c., (tube of liquid and roll of paper towels,) 2c. a wash. Weight 29 oz. Size, 11x3½".
TAY-MILLER MFG. CO., Inc.
1714 Cherry Street PHILADELPHIA, PA.

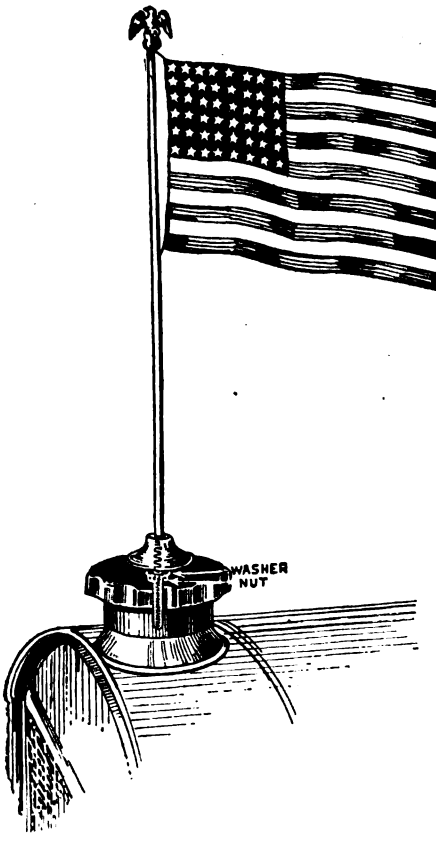
EXCESS POWER
in The New Disco Starting and Lighting System for Ford cars, assures easy starting under all conditions. The motor is equipped with the famous Bendix-drive used on the highest priced cars—why not get *full* information—write today.
DISCO ELECTRIC STARTER CO.
Detroit, Mich.

Ten Million People
are reading about
BENFORD'S
GOLDEN GIANT SPARK PLUGS
Get Your Stock Ready!

OUR PORTFOLIO
Shows how we give a *free* course of instruction in *Practical Battery Work* to our own Service Stations—how we help them get business—the Portfolio is jammed and packed full of profit bearing points—get it today.
DETROIT BATTERY COMPANY
109 E. High St. Detroit, Mich.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray Street, New York

American Flags For Automobile Display



We Have Solved the Problem of Real American Flags For Automobile Display

The demand for American Flags for display on cars is tremendous. Practically every auto you see has one or more flags tied on—wired on—invariably attached in some make-shift way.

We have solved the problem with a **Real Flag on a Real Sturdy Steel Staff.**

The Flag is 4x6 inches in size, made of highest grade, extra strong silk; processed to shed water; hemmed at the edges to withstand the whipping of the breeze; steel eyeletted and attached with steel wires to the staff.

The Staff is 11 inches high, and of sturdy steel highly nickeled; surmounted by a cast gold plated eagle. Rod passes through a graceful nickeled base which rests on the radiator cap. Lower end of rod is threaded and fitted with washer and nut which hold it firmly into cap.

This emblem is not to be compared with the many crude flag carrying devices with which the market is flooded. The FLAG IS RIGHT and the CARRIER IS RIGHT. Both are made for their especial purpose. The Metal Rod, Eagle and Base are the product of skilled specialists in Metal Work. The Flag is made to meet the strenuous exposure it will receive on the cap of an auto in service.

THIS IS WHAT YOUR PATRONS WANT!

The List Price of this No. 8577 Old Glory Emblem is 66c. Each
and is subject to your usual liberal discount.

Orders by mail and telegraph are taxing our facilities. BETTER WIRE yours immediately. Just say
"Express.....Gross, No. 8577—Old Glory Emblem."

Send for our New Complete Catalog of Auto Cap Emblems.

THE ART METAL WORKS
Specialists in Fine Radiator Cap Emblems and Ornaments
9-15 Mulberry Street NEWARK, N. J.



SMOOTH-ON
IRON CEMENTS
No. 1 and No. 3
are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight. Expands and contracts with the metal to which it is applied and not affected by heat, cold, water, gasoline or oil.
For Sale by Supply Houses.
SMOOTH-ON MFG. COMPANY, Jersey City, N. J.
Chicago 221 N. Jefferson St. San Francisco, 36 Sacramento St.

GENUINE
Armstrong Stocks and Dies



FOR THREADING PIPE OR RODS
HINGED PIPE VISES PIPE CUTTERS
Manufactured by
THE ARMSTRONG MFG. CO.,
335 Knowlton St., Bridgeport, Conn.

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THE PETELER FOOT TIRE PUMP

REVOLUTIONIZES TIRE PUMPING

Every car owner in the country will give *buying* consideration to the Peteler Foot Tire Pump—because it revolutionizes the job of inflating tires.

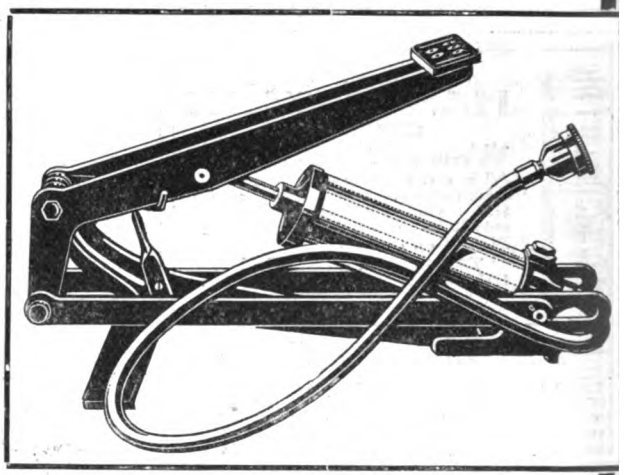
Blisters on your hands, and a crick across your back accompany the longshoreman's job of pumping a tire with even the best of the hand pumps.

The Peteler does it by using your weight and a simple, easy leg motion; you do not bend up and down, you don't *handle* the pump, you don't finish the job wheezing like an old man with asthma. And you finish much *sooner.*

This pump will be the best seller in any line this year—simply to show it and demonstrate it makes a sale. It will sell in every locality to owners of any and every make of car.

The man with a hand pump *needs* it—the man with a motor-driven pump will *want* it when he sees how easily it works.

They'll both *buy* it when they find how efficient it is and note its splendid finish and stanch construction—and remember, *finish* and *substantial construction* are characteristics of every accessory we have ever offered.



The Peteler FOOT TIRE PUMP

Write at once for details.

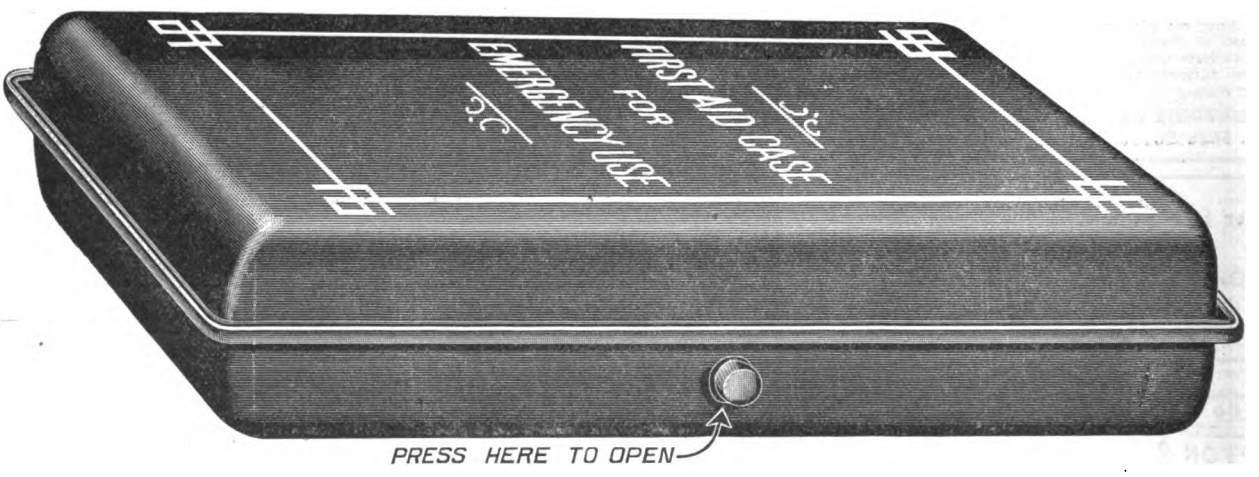
Price, $5.00

MOREAU & PRATT, Inc.
1834 Broadway, NEW YORK CITY

IT MAY BE YOUR TURN NEXT

TO MEET WITH AN ACCIDENT ON THE ROAD.

It may also be a case of life and death to have the materials at hand for prompt treatment. We have recently made arrangements for a First Aid Case for emergencies especially for the readers of the AUTOMOBILE DEALER AND REPAIRER.



This case is made of heavy Bessemer Steel, size 11½x5¼ and 2¼ inches deep, finished in Black Baked Japan and fitted with a strong instantaneous snap. It is strong enough to resist injury to the contents through accident or dampness.

The contents have been carefully selected to supply the needs in an emergency, before the doctor comes. All gauze, bandages and cotton have been prepared in aseptic laboratories under the same rigid inspection as those supplied to the United States Army and Navy.

The contents of this case consists of:—1 "First Aid to the Injured" Instructions. 1 Yard plain Sterilized Gauze for dressing large wounds. 10 Yards 2-inch Sterilized Gauze Bandages for dressing cuts and bruises. 10 Yards 2½-inch Sterilized Guaze Bandages for dressing cuts and bruises. 1 Package Sterilized Absorbent Cotton for pads and dressings. 1 Box Carbolic Salve for burns, sores, insect bites, etc. 1 Yard 1 inch Zinc Oxide Adhesive Plaster for retaining dressings and covering small wounds. ½ Ounce Tincture of Iodine, an antiseptic for immediate use on all wounds and abrasions. ¼ Ounce Spirits of Ammonia for use in case of shock, heart failure and faintness. ½ Dozen Safety Pins.

The retail price of this outfit is $2.50. We have made an arrangement with the manufacturers of such a liberal character that we can supply this outfit with a subscription to the AUTOMOBILE DEALER AND REPAIRER for a year, for the regular price of the outfit, $2.50.

In case you have already subscribed for this year, we will send you one of these outfits, postage prepaid, on receipt of $1.60, which may be remitted by check, money order, or in any convenient way.

Every subscriber to the AUTOMOBILE DEALER AND REPAIRER should have one of these outfits. It may mean the saving of your own life or the life of some friend. *ORDER AT ONCE AND THEN YOU WON'T FORGET ABOUT IT.*

Address, **MOTOR VEHICLE PUBLISHING COMPANY,**
Publishers of the AUTOMOBILE DEALER AND REPAIRER, 71-73 MURRAY STREET, NEW YORK

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KEEP YOUR STOCK IN ORDER



KEEP your stock clean, facilitate stock taking and make the most of your floor space by organizing your place in a common sense, systematic way.

Stevens Service Cabinets

can be built up like sectional bookcases with selection of units to suit your needs. We carry a great variety of units with drawers of all sizes, both sections and half sections.

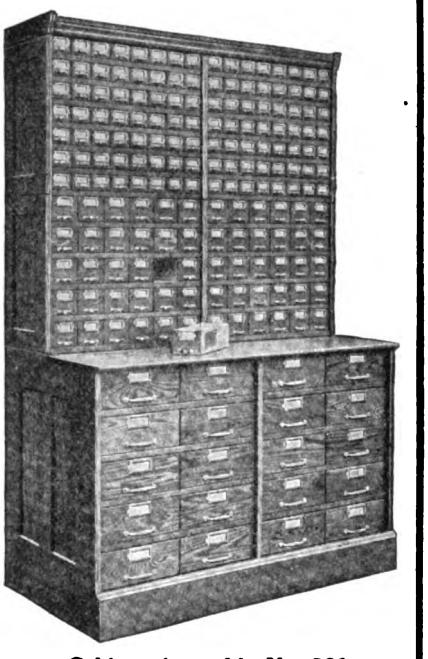
Cabinet Units have a heavy oak frame with rich antique finish. The drawers have oak fronts, with combination pull and card holder.

The sides and bottom of the drawers are of heavy galvanized steel and cannot warp or stick. Cross divisions for drawers obtainable.

Stevens Handy Cabinet

A handy little cabinet with metal drawers for counter or work bench. Dealers' price,

$5.00



Cabinet Assembly No. 280
Net Dealer Price, Complete,
$56.70
No. 280½ (one-half width and number of drawers.) Price . . **$28.35**

Send for Complete Catalog

Stevens & Company
375 Broadway New York City

Cabinet Assembly No. 281
Net Dealer Price,
$84.90
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STEVENS SERVICE CABINETS



Master Calorite Spark Plug. Regular Length, $1.00 each.

A Distinctive PLUG

MASTER CALORITE SPARK PLUGS

DISTINCTIVE—BECAUSE—

—Adopted for the entire requirements of the U. S. Post Office Department—
—Improved in design—yet retaining every quality characteristic which has made them nationally famous and popular.
—The Master Calorite Insulator is ultra sturdy.
Master Calorite Spark Plugs will endure not only the severest requirements of legitimate service—
But also anticipate the possibility of mechanical carelessness.

And Because—

our plans for 1917 are designed to assist jobbers and dealers to the utmost. You can take pride in unreservedly recommending Master Calorite Spark Plugs to your customers as we do to you—

Because—

Every user is protected thus—
"We guarantee Master Calorite Spark Plugs against all defects of material or workmanship and will replace free of charge any Calorite Insulators broken by heat which are returned to us transportation prepaid."
The Master line provides a plug for every style and type of engine—Six styles—Half-Inch Regular, ⅞" Regular, Metric, ⅞" Long, Half-Inch Long, Model "F" for Fords and Reos.
The New Master Calorite Spark Plug Display Stand is ready—It is a silent salesman—placed on the window or on the show case.
It will pay you to handle Master Calorites this year—The already heavy demand is rapidly increasing—Do you want your share?—

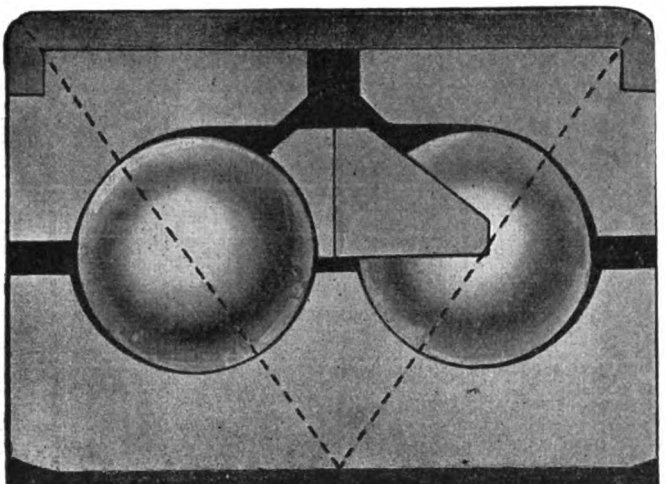
Write us *now* for full particulars, prices and our proposition to jobbers and dealers.
MASTER CALORITE SPARK PLUGS Made in U. S. A.

Manufactured and Guaranteed by

HARTFORD MACHINE SCREW COMPANY

514 CAPITOL AVENUE, HARTFORD, CONN.

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Three In One

THE first ball bearing to do successfully the work of a radial and two thrust bearings—the New Departure "Double Row".

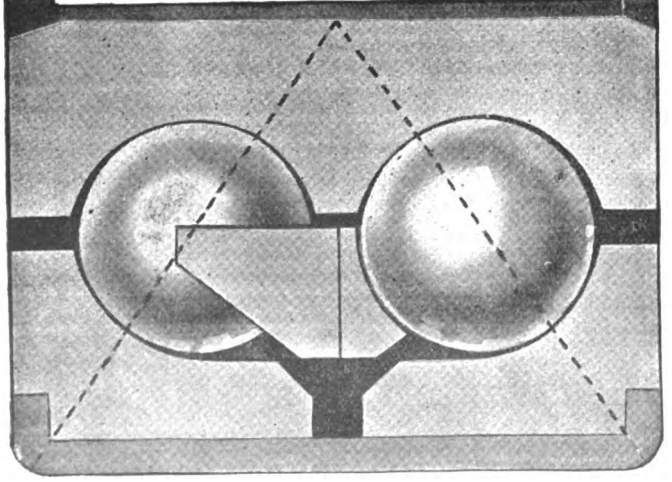
It carries loads from any and all directions, economizes cost, space, time and labor of assembly—and is permanently in correct adjustment.

In general use in American motor cars of all types and load ratings.

Have you a copy of the "Brown Book", describing the full New Departure line – double row, single row, and radax ball bearings?

THE NEW DEPARTURE MFG. CO.
BRISTOL CONNECTICUT

NEW DEPARTURE BALL BEARINGS



It's EASY with a QUIK-EZY

TO CHANGE TIRES ON A SPLIT RIM



The Quick-Ezy Tire Tool with its powerful screw will yank any old rusty split rim apart in a jiffy. It grips at three points and won't bend or slip.

Every garage needs it to give quick service to tire customers and to save time and money.

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It's new. *The Quick-Ezy.* Write today for full information.

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2183 North St., CANTON, OHIO



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36,931 Automobile Dealers, all kinds, U. S., price $50.00 or $2.50 per thousand by states.
8,884 Ford Dealers, U. S. and Canada, price $18.50 or $2.50 per thousand by states.
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2,780 Auto Tire Dealer, price $10.00 for the list.
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All commercial lists are typewritten, show financial rating in dollars and are 1917 compliation, and guaranteed 98% correct. Ask for Price List No. 82, showing 2,506 other classifications of dependable mailing lists.

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AUTO PARTS CO., Providence, R. I.

Atwater Kent Ignition



For Your Car
Atwater Kent Mfg. Works
Philadelphia, U.S.A.

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Let BILL Do It

If you are careful to retard the spark of your Ford Car to a point of safety before cranking the motor and are then able to hurry back to the spark lever and advance the spark before the engine stops, you will be successful in starting your motor, but—"You've got to go some."

If Your Motor Is Equipped

WITH A

Bill Automatic Spark Retarder

you may start it with perfect safety, every time.



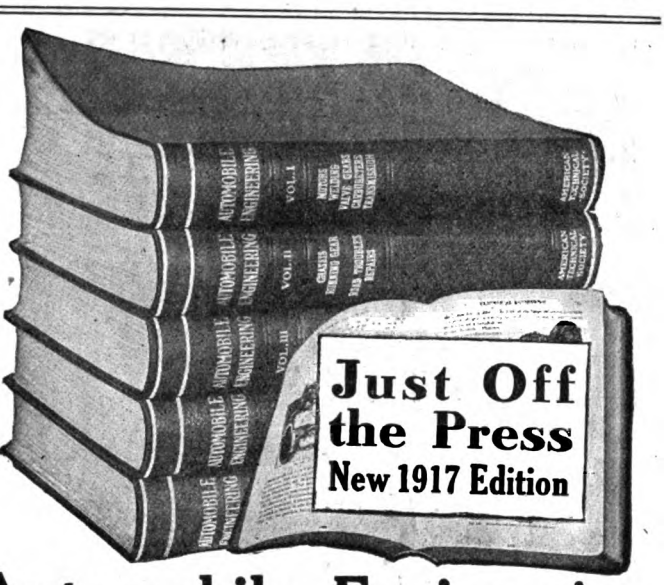
Attaching the crank automatically retards the spark to a point of absolute safety and on the first power stroke of the motor the spark is automatically advanced to the running point.

BILL saves your arm, your time and your nervous system, all for **$3.50.**

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BILL MFG. CO.

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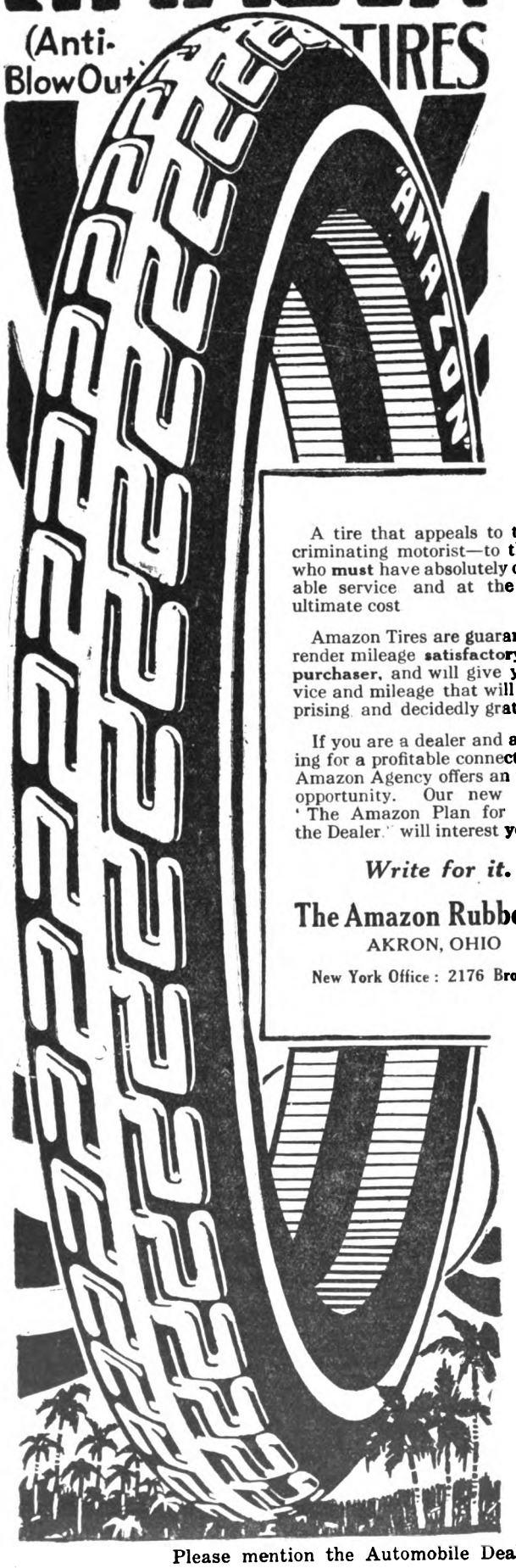
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A tire that appeals to the discriminating motorist—to the man who **must** have absolutely dependable service and at the lowest ultimate cost

Amazon Tires are guaranteed to render mileage **satisfactory to the purchaser**, and will give you service and mileage that will be surprising and decidedly gratifying.

If you are a dealer and are looking for a profitable connection, the Amazon Agency offers an unusual opportunity. Our new booklet, "The Amazon Plan for Helping the Dealer," will interest you.

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LIBERAL DISCOUNT TO DEALERS

HAY DEE EXTENSION *For* FORDS

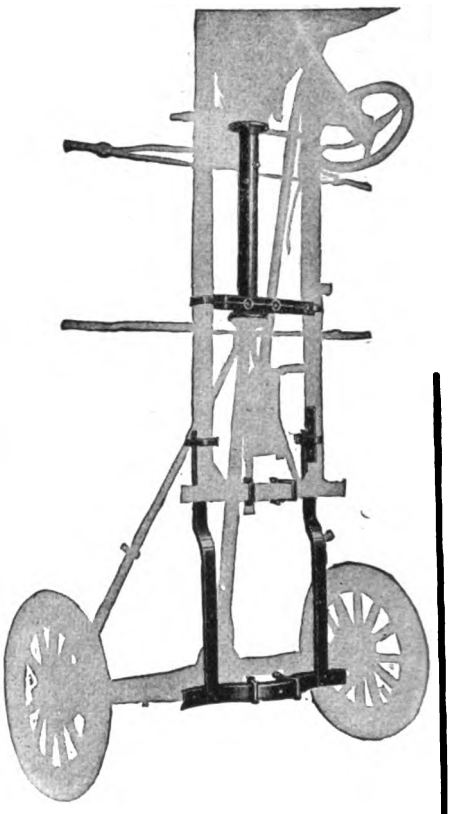
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130 INCH WHEELBASE

TAKES ANY TYPE OF BODY

90 - 96 INCHES

LOADING SPACE BACK OF DRIVER'S SEAT



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Now Called HAYDEE

It's the same well known epoch making, dependable Extension that Dealers have found so profitable to handle. Trade marking our Extension necessitated our calling it

HAYDEE

Merchants all over the country are demanding HAY DEE Extensions and 90 to 96 inches loading space.

One Extension sells another. Dealers are telegraphing for more. HAY DEE'S are leaving by express, on Rush orders, almost daily.

No drilling, machining, or cutting necessary. Wrench and hammer only tools needed.

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These Extensions open a field for big profitable business in Merchant delivery bodies, Ambulance, Undertakers, Florists, Furniture, etc., etc.

Full information and catalogues by return mail. Write to-day. It pays to be prompt.

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Sterling Leaf Spring Lubricator



Lightest, Prettiest and Most Convenient Oiler Made

No Bolts Used
No Tools Required
Easily attached and easily re-oiled without removing.

Perfect Automatic Lubrication Assured

Price, 25c. each
Ford Set $1.00

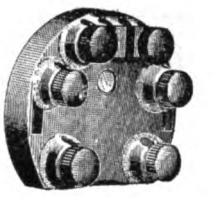
If your jobber does not handle them, take no substitute; write us.

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JOINTLESS
PATENTS PENDING

The Master Ring of Piston Packing
Price, each - - - $1.00

DETROIT PISTON RING COMPANY
Manufacturers
General Sales Office: CHICAGO, Ill.



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FOR ALL MAKES OF MAGNETOS AND COILS

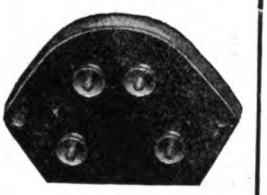


SPARK COIL PARTS
TUNGSTEN CONTACTS
STARTER AND GENERATOR BRUSHES



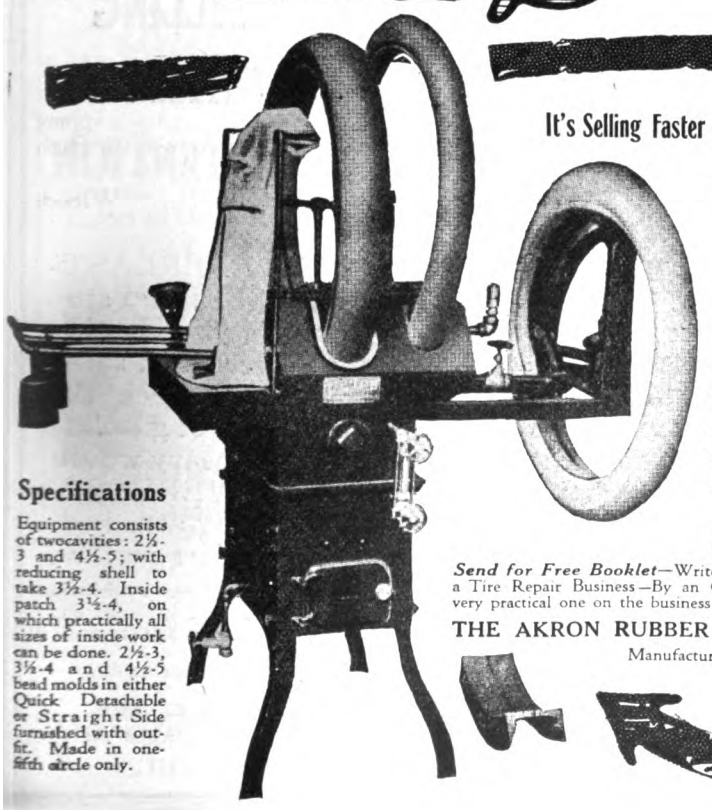
ALL PARTS ARE GUARANTEED AGAINST DEFECTIVE MATERIAL.

Write for our Catalogue and special agency proposition.



GUARANTEED MAGNETO PARTS CORPORATION
1765 Broadway **New York City**

THIS IS IT



It's Selling Faster Than We Can Make Them, Because It's What Tire Repairmen Want

TYPE "F"

BIG CAPACITY VULCANIZER

SELF-CONTAINED OUTFIT

Now Only $125

We still have a stock on hand, however, and if you write at once, we can make shipment promptly from our stock.

This is unquestionably a remarkable achievement in the building of tire repair equipment—look at the illustration; read the specifications on the side. A big capacity vulcanizer that will take the wide range of work that this equipment does, so that you can make almost any kind of repair on both inner tubes and outer casings of practically any size or make—with a self-contained source of steam supply so that you do not need to buy a separate steam boiler or generator—and having the high quality and specifications of this one, has never been offered before for $125.

Specifications

Equipment consists of two cavities: 2½-3 and 4½-5; with reducing shell to take 3½-4. Inside patch 3½-4, on which practically all sizes of inside work can be done. 2½-3, 3½-4 and 4½-5 bead molds in either Quick Detachable or Straight Side furnished with outfit. Made in one-fifth circle only.

We make a complete line of Tire Repair Equipment

and are in a position to furnish outfits to meet various requirements of service, output and adaptability, at prices ranging from $50 to $225. If interested, ask us for complete catalog.

Start a Tire Repair Business—Make Big Money

Everybody connected with the automobile business is making big money—you can too. Start now, while the best locations are still available.

Send for Free Booklet—Write today for free booklet, "How I Would Conduct a Tire Repair Business—By an Old Tire Repair Man"—a small booklet, but a very practical one on the business end of the tire repair business.

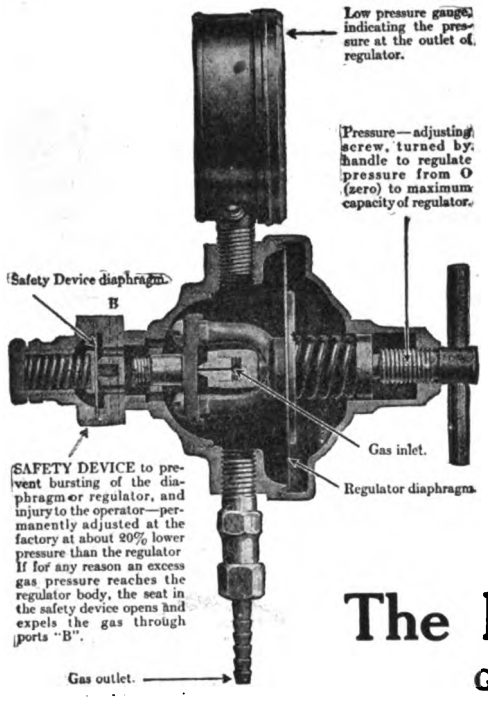
THE AKRON RUBBER MOLD & MACHINE CO.
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Dealers Wanted Everywhere

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Please send me further particulars regarding your Tire Repair Outfits and copy of your Free Book.
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SAFETY FIRST FOR WELDERS



B-B-B Diaphragm Safety Device

How often have you heard of a serious accident because of the poor design or weakness of a regulator? Because of the nature of oxy-acetylene welding and cutting it is of the utmost importance that the apparatus used be properly designed and made to insure the operator.

Accidents are Impossible

The B-B-B Diaphragm safety device takes care of any excess gas pressure—the safety device works like the blow-off on a steam boiler. The pressure never reaches the danger point. B-B-B regulators are strong, durable and reliable.

Welding and Cutting Torches

B-B-B welding and cutting torches are made with the same care and thought as are B-B-B regulators. They are built to give maximum results with perfect safety.

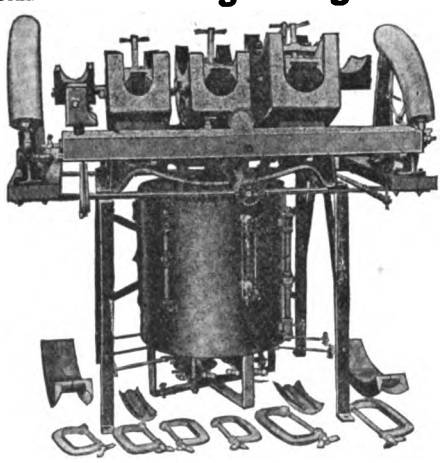
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The Bishop-Babcock-Becker Co.

General Offices and Factories: Cleveland, Ohio

Branches in the larger cities

Vulcanizing With A Vanderpool Vulcanizer Brings Big Profits.

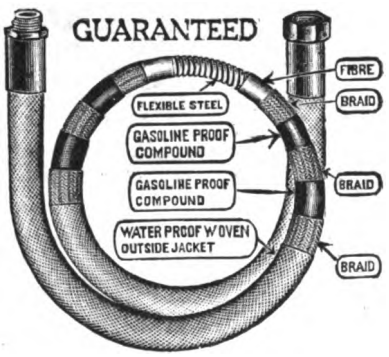


3 Cavity Combination Vanderpool Vulcanizer

HERE is an exceptional opportunity for Garages as well as Vulcanizing Companies to secure a vulcanizer that will turn out high-grade work at a small cost. The fuel saved alone, will pay for the machine in a short time then you will "cash in" on your investment. This plant, the *Vanderpool Vulcanizer*, is meeting with the enthusiastic approval of hundreds of satisfied users all over the country. Unsolicited testimonials from the various companies now using the "*Vanderpool*" testify to the dependability, efficiency and economy of this "Vulcanizing Wonder". One man writes that the first month's profits paid for the plant. No experience needed—we teach you how. It occupies very little floor space, and "once bought, you will never have to buy again".

Send in this ad with your name and we will mail catalog and prices.

VANDERPOOL COMPANY, Box 53, Springfield, Ohio.



GASOLINE FILLING STATIONS ATTENTION

EQUIP your pump with EVERLASTING GASOLINE HOSE, and stop that leak. In purchasing Everlasting Hose you get guaranteed service and satisfaction. Note the illustration! See the steel core covered with two plys of gasoline proof compound protected by a heavy woven cotton jacket. The genuine EVERLASTING has one year guarantee tag attached. Ask for EVERLASTING, not just gasoline hose.

Made in two sizes, ¾ and 1¼ inch.
Sold in standard lengths, by all jobbers.

CHICAGO TUBING & BRAIDING CO.
CHICAGO, ILL.

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ALL YOUR GAIN



It Is a Hobby with Some Men to See How Good They Can Make a Thing

IN THIS CASE IT HAPPENS TO BE THE

Testite Piston Ring

And a very—VERY Good Ring It Is

Made with an eye single to absolute technical precision. You would hardly imagine it possible that such a supposedly common thing as a piston ring could be made so uncommonly good.

Testite Piston Rings are made in all sizes to fit all motors.

Testite Piston Rings save gas by utilizing the entire fuel charge in the production of power. There is no waste. No loss of power, no waste of exploded gases past piston ring openings.

Testite Piston Rings are a boon to marine, and also to aeroplane motors, where the highest compression is so vitally important.

Testite Piston Rings make your motor measure more power, make it more responsive, and though the highest in efficiency, are the lowest in price for piston rings of their character.

Every ring is inclosed in a separate envelope with directions for installation and are packed twelve in a box for the trade.

Our literature, we believe, treats the Piston Ring question in an intelligent manner—learn more—write us—today—that's better than forgetting it.

STEVENS PISTON RING CO., Inc.

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Standard Tire & Rubber Co., 104-6 Portland Street, Boston, Mass.
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$1.00 *Break-Not* **$1.00**



Break-Not Battery Tester

Dealers:-

This is a big seller. Have you a stock of ***Break-Not*** Hydrometers? If not, get in touch with your nearest Jobber at once and write us for prices. Retails for one dollar! Interesting proposition to Dealers! Best instrument of its kind.

E. EDELMANN & CO.

341-363 East Ohio Street **Chicago**

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Add to Garage Profits by Oxy-Acetylene Welding

Savings made please your patrons and pay good substantial profits.

PREST-O-LITE

Dissolved Acetylene

(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high-grade welding apparatus for $75.00 (Canada $100.00). The average user will also need gas cylinders at an additional cost, and about $10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.



Send for details of Prest-O-Lite Service for Oxy-Acetylene Welding.

THE PREST-O-LITE CO., Inc.

The World's Largest Makers of Dissolved Acetylene

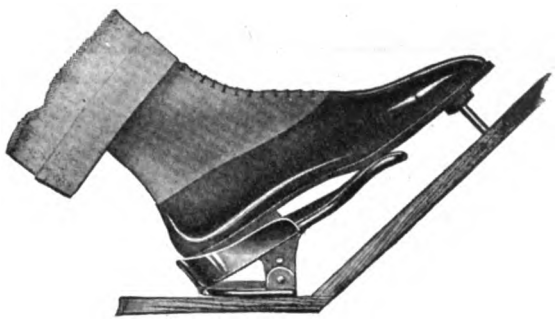
U. S. Main Office & Factory, 820 Speedway, Indianapolis
Canadian General Office, Dept. X, Toronto, Ont.

Do You Remember

—last summer—how often on a long run you had to change from foot throttle to hand throttle, just to give that tired foot of yours a rest?

Yet foot-throttle control is more desirable; it is quicker and therefore safer, because it doesn't take the operator's hand from the steering wheel.

And do you recall how frequently your heels would wear unsightly holes into the floor covering, and how in negotiating some particularly bumpy roads your foot controlling the throttle would bob up and down, often with disastrous results to the operation of your motor?



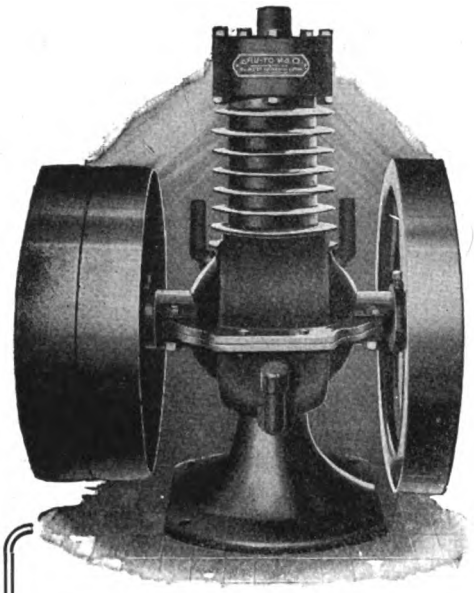
Here is a new device, the invention of a seasoned motorist, which is preventer of foot fatigue, which positively does away with the paralyzing feeling that assails your foot, knee and hip during every prolonged run.

If your accessory dealer doesn't carry this foot rest (the leading dealers do) send us $1.25, and we will mail one of these foot rests to you. You will find it one of the best little investments you ever made.

THE GENERAL APPLIANCE CO.
129 Federal Street
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Compressed Air *Always* on Tap!



Most any air compressor could be installed in an automobile plant, but there is only one genuine **Au-To Air Compressor.** Remember this and specify the **Au-To Air Compressor No. 0.**

ALWAYS. Not **sometimes.** Air in abundance for every requirement in garage and repair shop with plenty to spare for the man with a soggy tire. No cumbersome truck machine to drag about from place to place, but a stationary plant that occupies very little space in the cellar with pipes extending to shop and street. A dependable, year-in and year-out machine at low cost—it is the

AU-TO AIR COMPRESSOR

Small in Size but Large in Capacity

Built so sturdily that it stands up under severest service. Sold and used wherever motor cars are driven. Every **Au-To Air Compressor** is sold under rigid guarantee. We have never yet made a charge for repairs.

Furnished separately or with pressure tank, relief valve and 3-way cock.

Sold by Jobbers Everywhere—Write for Catalog

The Au-to Air Compressor Co.

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ENTIRELY REWRITTEN AND ENLARGED—UP-TO-DATE

SOME FACTS CONCERNING THIS ENLARGED 5TH EDITION:

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84 pages and 239 illustrations on **Engines** and **Parts.**
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4000 lines to the **Index.** This is a feature worth noticing, as it means a ready reference on everything pertaining to motoring.
Index is printed on **colored** paper, easy to refer to.
Dictionary is also included, which gives the meaning of motoring terms.

You must see this new 5th Edition in order to appreciate just how complete a book it really is—Order N-O-W.

The Price is still **$3.00** (or **$3.32** postpaid).

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COX "SPLASH-PAN" TYPE BUMPERS

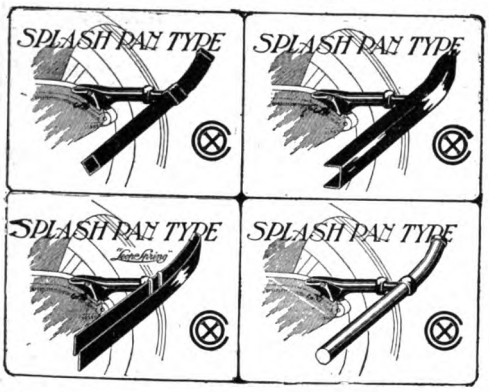
For Chalmers, Hupmobile, White, Mitchell, Oldsmobile, Studebaker, and the constantly increasing number of other cars with splash pan extended to the end of the frame.

They are firmly attached to the frame without disfiguring the splash pan in any way by means of a special hook and bolt.

Write for prices and information about the whole Cox Bumper line—the most complete line and the best dollar value in the market.

COX BRASS MFG. COMPANY

HOME OFFICE AND FACTORY: ALBANY, N. Y.



THE "KNOW-HOW."

20 Years of Engineering Practice is behind the

CYLINDERS we REGRIND

and the

PISTONS, RINGS and PINS

which we furnish.

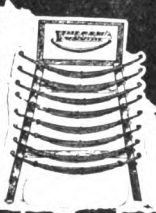
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1124 East Georgia

Established 1897
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Get this display rack FREE

It will pay you to carry Jenkins Vulcan Springs in stock because you make a good margin of profit and at the same time satisfy your customers. With your order for an assortment of one dozen or more, this hardwood display rack sent Free. Send for prices-trade discounts.

JENKINS VULCAN SPRING CO.
1410 Chestnut St., St. Louis, Mo.



Distributing Houses at
Sumter, S. C., 29 Caldwell St.
Minneapolis, Minn., 1024 Hennepin Ave.
Fort Worth, Tex., 708 Commerce St.
Reading, Penna., 538 Franklin St.

There Is No Way to Success Equal to Making Good

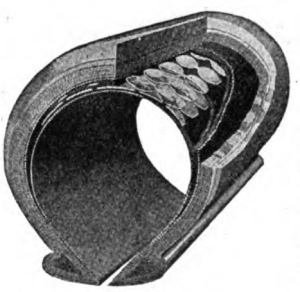
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Has now been on the market a year and thousands are far exceeding all expectations and our own guarantee, not only eliminating every thought of tire trouble during the life of the tire but in many instances more than doubling the mileage.

An equally important feature of the Armored Inner Tire is that it is in no way fastened to or secured to the tire and may be taken out and transferred to a new casing as easily as changing a tube.

We do not claim that the Armored Inner Tire is absolutely everlasting, but it is a fact that many have already run from 20 to 25 thousand miles and we have not yet known of any that have worn out.

They are built for service by men who know how, from all the best materials obtainable; put together in the right way by selected workmen.



The double layer of inter-connected over-laping steel discs is an absolute preventative of punctures, cuts and blow-outs.

Live Dealers Are Making Money Selling the Armored Inner Tire

If you are a dealer who has not yet seen the light, get busy.

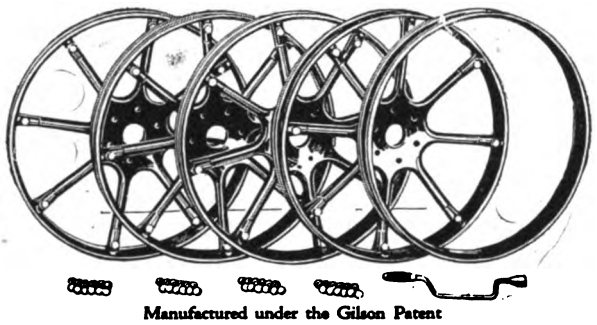
If you are a car owner, and your local dealer is blind to his own interests, write us direct for complete information.

ARMORED TIRE CO.

1321-23 Michigan Avenue, Chicago, Ill.

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PARKER-HYDRAULIC
PRESSED — STEEL — WHEELS
FOR FORD CARS



Manufactured under the Gilson Patent

Price Per Set - - $32.00

F. O. B. Cleveland, Ohio

YOUR CHOICE OF EITHER RED OR BLACK SPOKES

Each set consists of four wheels, one spare rim, new hub bolts and socket wrench. Instruction Tag with each set.

These wheels are formed from two pieces of steel plate welded together, making a tubular construction. They are unbreakable—yet weigh but half as much as wooden wheels with demountable rims. They give you the easiest and quickest demountable rims. Tires can be changed in three minutes. These wheels have a handsome baked-on finish that will not rust—always looks well and is easily cleaned.

DEALERS: *Write for our attractive contract giving exclusive territory.*

THE HYDRAULIC PRESSED STEEL COMPANY, 3158 E. 61st St., Cleveland, O.

"THE RETURNS"
that we get from our Advertisement in "THE BLACKSMITH & WHEELWRIGHT"
— ARE GOOD — VERY GOOD !!

NO matter what kind of Auto Equipment you manufacture, you ought to advertise it in "The Blacksmith and Wheelwright." These "Smiths" and "Wrights," all over the country are now Repairing Autos and Selling Auto Goods. They seldom or never get a look at an Automobile Journal—but they do swear by every printed word they see in their tried and true friend, "The Blacksmith and Wheelwright." They are on the keen edge to know what auto equipment men have to sell—and they buy.



"The Blacksmith and Wheelwright" is the oldest journal of its kind in the world, having been published for more than 37 years under the same ownership and management, and recognized as a leader in its field.

Write for Rates and Free Sample Copy

M. T. RICHARDSON CO.

71-73 MURRAY ST., NEW YORK

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THE Fisher PATENTED "RIM-GRIP" SUB-CASING

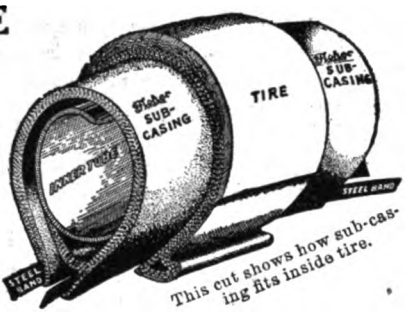
MORE MILES PER TIRE
LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

RIM-GRIP SUB-CASINGS reinforce the fabric of the tire at all points from bead to bead. They make a partially worn tire stronger than it ever was. It can be worn out completely and the sub-casing used in another tire. As the cost of equipping a car with new tires is much greater than last year, it will pay you to investigate Rim-Grip Sub-Casings. *Write for particulars.*



This cut shows how sub-casing fits inside tire.

FISHER MANUFACTURING CO.

1706 PAYNE AVENUE, :: :: CLEVELAND, OHIO

NO MORE MUTILATION OF SPLASH PANS



OBVIATED BY USE OF

SAGER SPLASHER

FIT-ALL BUMPER

Effective, Simple, Attractive.
No Machine Work.
Attached in Ten Minutes.
ALL KINDS OF BUMPER BARS.

Jobbers and Dealers, this is your Opportunity to Stock this Practical Universal Bumper.
Our Proposition is Worth Writing For.

J. H. SAGER COMPANY

39 South Water Street ROCHESTER, N. Y.

WARNS BUT DOES NOT OFFEND

This improved signal says "car coming," but not as a harsh command to "Get out of my way." It calls attention rather than gives an order. It does not startle.

"LIBERTY BELL"
Definite and Distinctive

The clear bell tone carries through all the sounds of traffic. Its warning is positive and in addition a red light is flashed from a semaphore lens located just above ths bell.

Write for Folder.



The Signal of Distinction

An ornament and a double signal. Made in styles and sizes to suit all makes of cars.

GETS THE RIGHT OF WAY

This signal, combining both sound and sight warning, is amply protected by patents. We will vigorously prosecute makers of infringing devices and dealers who handle them.

"LIBERTY BELL"
A Polite Signal

DEALERS: We have built up a fine business entirely on users' satisfaction. We have proved that owners will buy it, use it and then recommend it. We have an attractive proposition for you.

Write for Prices.

THE LIBERTY BELL CO.

411 Superior Arcade Cleveland, Ohio

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A Good Seller for Any Dealer—

Parry Trailers are in use today by thousands of merchants, truckmen, dairymen and farmers. Their universal use proves that dealers in practically every community in the United States have an unusual opportunity to cash in on the great volume of sales of these popular two and four wheel trailers.

With unlimited buying and manufacturing facilities at our command, we offer the utmost in quantity and quality—plus immediate shipment whenever YOU want them. Write today for details and literature.

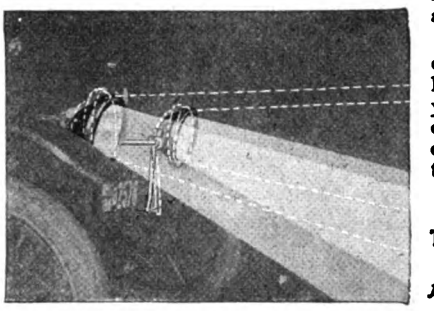
PARRY MANUFACTURING CO.
Indianapolis,
U. S. A.



The Pennock Headlight Tilter

operated from the seat, covers all the conditions of city and country driving, with 40 to 300% more light than other devices.

What about the Overhead Obstruction, or the hill, if you use a fixed device which allows none of your light to rise more than three feet high at any time?



TILTERS absolutely eliminate glare and are legal everywhere. Fit your electrically lighted car, your gas lighted car or your Ford car, and retail at $5.00 the set.

Write—

THE SPECIALTY MFG. CO.
Minerva, O.

for circulars or sample sets.

Bunting Bearing Bronze IN Cored Bars



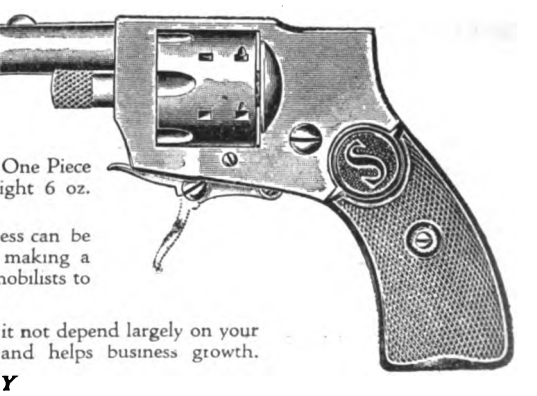
Bunting Bearing Metal is standard today with both Manufacturer and Repairman. Is for sale by most any Jobber or can be purchased direct from us.

Ask for Pamphlet "X." STOCK SIZES

PIECE No.	Outside Diameter	Inside Diameter	Length	Approximate Weight
A	1	½	12	2
B	1¼	½	12	3½
C	1½	¾	12	5
D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15½
K	3½	2½	12	17
L	4	3	12	21
M	4¼	3¼	12	20

The Bunting Brass & Bronze Co., 740 Spencer Street Toledo, Ohio

"BABY" HAMMERLESS REVOLVERS



MODEL 1916 (Cut is ¾ size)

6 Shot—22 Cal. Rim Fire—All interchangeable Parts Positive Fire—Has new Unbreakable One Piece Main and Trigger Spring—Made in Nickel or Blued; Rubber or Pearl Stocks—Weight 6 oz. Fully Guaranteed.

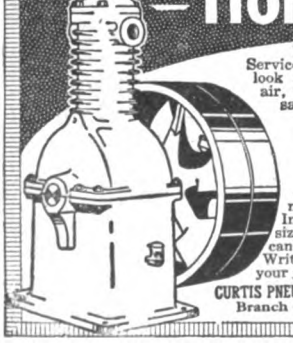
A big revolver is too clumsy to be handled quickly. This nifty little "Baby" Hammerless can be aimed and fired without removal from your vest pocket. A crook would think you were making a move to hand over your watch or money. It has saved the lives of thousands of automobilists to date. Get the best of the crook—don't let him best you!

DEALERS:—What influence do you radiate in your sales personality? Does it not depend largely on your carrying the right goods? Stock this "Baby"—it's a war "baby" all right and helps business growth.

ASK YOUR JOBBER OR WRITE US TODAY

R. F. SEDGLEY, 2311-13 North 16th Street, PHILADELPHIA, PA.

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Install a Curtis Air Compressor in your Garage or Service Station and Draw Trade Your Way. Motorists look for a Curtis Outfit because it gives them clean air, free from oil—and will appreciate your efforts to save them many dollars upkeep on tires.

CURTIS AIR

FREE FROM OIL

means fewer blowouts, fewer punctures, increased mileage, less repairs for your customers.
Install a Curtis Air Compressor NOW. Made in 5 sizes—125 combinations. The only air compressor that can't flood the cylinder with more oil than it can use. Write for full particulars and attractive offer. Or, ask your jobber for prices, but insist on the CURTIS.

CURTIS PNEUMATIC MACH. CO. 1530-A Kienlen Ave., St. Louis, Mo.
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AFTER INSTALLING

PRESSURE PROOF

PISTON RINGS

during a recent exhaustive test conducted among five different makes of cars, the results showed an

Average Increase of 164 Miles Per Quart of Oil



PAT. MAR. 2, '15; FEB. 29, '16

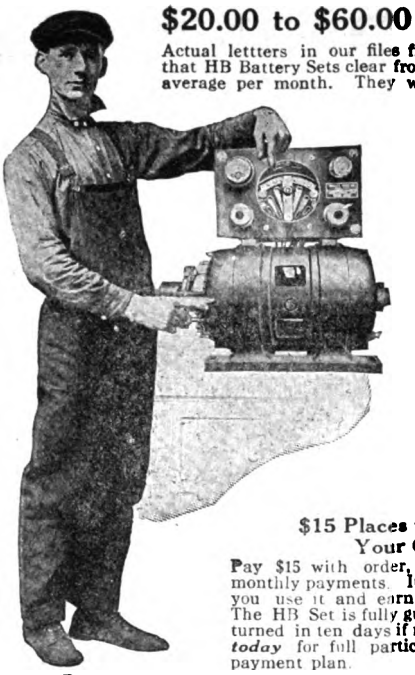
These Rings Guarantee You Without Reservations:

Increased Motor Power.
Constant Complete Compression.
Freedom from Carbon troubles and
A tremendous saving of Gasoline and Oil expense.

Write for "New Facts about Piston Rings." It's Free

PRESSURE PROOF PISTON RING CO.
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"BATTERY-CHARGING BRINGS BIG PROFITS"—An HB Charging Set Can Net Any Garage Owner $20.00 to $60.00 Each Month.



Actual lettters in our files from garage men prove that HB Battery Sets clear from $20.00 to $60.00 on an average per month. They will recharge any make automobile storage battery quickly successfully and *profitably*.

No electrical or mechanical knowledge is necessary to operate the HB Set. It uses your city current, connecting right with the wiring now in your garage. The HB Set will charge one to seven batteries at a time, at an average cost of 15c. You get 75c. to $1.50 per battery from the motorist.

The HB Charging Set is trouble-proof, requires no attention, is never out of order. The most efficient battery charging outfit now on the market.

Big profits easily made.

$15 Places the HB Set in Your Garage.

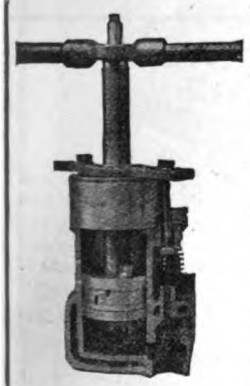
Pay $15 with order, the balance in easy monthly payments. It will pay for itself as you use it and earn a good profit besides. The HB Set is fully guaranteed. Can be returned in ten days if not satisfactory. Write *today* for full particulars about our easy payment plan.

Better Service

Give your customers Hobart Battery Service. Use the HB Set to get their battery business and after that you'll soon get all their trade.

HOBART BROS. COMPANY

Box 25 TROY, OHIO.



THE STORM & O'HAIR

Cylinder Reboring Machine

is adjustable and will rebore practically all makes of

Automobile, Aeroplane, Motor Cycle, Light Marine, Tractor and Stationary Motors.

It is simple, speedy and accurate and can be used by anyone familiar with tools.

Indispensable in any repair shop

Not an experiment but a thoroughly tested and reliable tool.

FOR SALE BY LEADING JOBBERS

For further information address

Storm & O'Hair Company
Box A 26 Thompson, Iowa

You Can't Forget to Lock Your Ford No Thief Can Unlock It Either

When Equipped With a *New*

TRADE K-W MARK **AUTOLOCK SWITCH**



Easily attached—new face plate protects porcelain and prevents thieves from breaking into lock. If your dealer is out—Sent prepaid on receipt of price.

K-W Autolock Switch for Fords Complete, $3.50

TRADE **THE K-W IGNITION Co** MARK

2817 Chester Ave. CLEVELAND, OHIO. U. S. A.

Manufacturers of the 150,000 K-W Master Vibrators

FOX TYPEWRITERS

Factory Rebuilt Like New at $65.



The word "rebuilt" has been abused and misused until it has become a meaningless trade term. When we rebuild a Fox Typewriter we take it all to pieces, re-nickel the nickel parts, re-enamel the frame and replace all worn parts with new ones. The same men who originally built the typewriter do this rebuilding **and do the work just as good.**

50% NEW PARTS AND 3 YEARS GUARANTEE

We offer a rebuilt Fox Typewriter, Model No. 24—*just like new*—for $65.00. These have standard carriages taking paper 10½ inches wide, any kind of keyboard, any kind of type, rubber covers, tabulators, back spacers, two-color ribbons, and are complete with instruction books and cleaning outfits.

Send us any amount you can spare, **from $1.00 up,** as a first payment, and pay the balance $5.00 monthly. Or, send $61.75 all cash. If $10.00 or more is sent with order we will include Free our $4.50 Solid Oak Typewriter Table. Transportation must be paid by the purchaser.



Please order direct from this offer, mentioning Automobile Dealer and Repairer for January. State price you wish to pay and enclose any amount of cash you can spare.

FOX TYPEWRITER CO., 6201-6211 Front Ave., **GRAND RAPIDS, MICH.**

Pay $5.00 Monthly

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INVITE YOUR CUSTOMER

AMERICAN TUBES AKRON

TO CALL AGAIN

Every good repair to a customer's tire or tube is an invitation to call again, which he will invariably accept.

Owing to the increased cost of tires and tubes, every wide-awake tire user will watch the small tire injuries closer than ever before.



The life of your repairs will be the power that pulls you to success. Will this power be weak, or reinforced?





Write for our 1917 "Suggestions to the Repairman"

THE AMERICAN RUBBER & TIRE COMPANY

AKRON OHIO



THERE IS NO ARGUMENT

WITHERBEE BATTERIES

FROM the very start—years ago—we were determined to keep away from slip-shod methods—with the natural result that Witherbee Batteries are today famous all over the world—for longer service than others of the same rated capacity.

People do appreciate high quality—and they've beaten a path to our door. When we accept your money you can rest assured that you are getting the very highest quality battery known to man.

Every requirement in Lighting and Starting Batteries may be filled from our line.

Details of Dealer's proposition will be mailed—write to us this day. Are you a quality man? Desirable Territory still open.

WITHERBEE STORAGE BATTERY CO.
1904 Broadway, New York City
Factory: 643-649 West 43rd St., New York



The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. **Try them and prove it.**

Dealers Wanted. Write for prices and discounts.

Manufactured by AMERICAN PISTON RING CO., 1925 S. Charles Street BALTIMORE, MD.

N. A. PETRY CO., Inc.
1309 Race St., Philadelphia, Pa.
Eastern Representative, North and South, East of Denver.

A. H. COATES
444 Market St., San Francisco, Cal.
Western Rep., North and South, West of Denver.

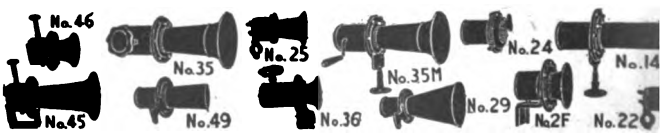


Samson

THE BIGGEST AND BEST LINE FOR 1917.

Protection and Co-operation. ***Write for our proposition.***

AMERICAN ELECTRIC CO., CHICAGO, U. S.



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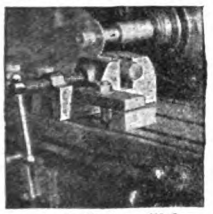
"YANKEE" TOOLS
Make Better Mechanics




No. 1—A steel cylinder in the jaws of "Yankee" Vise, set on surface plate, being center-marked.


No. 2—Centers being punched for the drilling of holes. Cylinder has not been removed from vise.


No. 3—Vise holding cylinder, removed from base and placed upon bed of drill press. Holes are drilled with absolute accuracy. Clyinder has not been removed from vise.


No. 4—Cylinder still firmly grasped in jaws of "Yankee" Vise, fastened to bed of milling machine. Accurate alignment.

"YANKEE" VISE No. 1993
Removable from Base for Continuous Work

No matter how many vises you already have, you want the new "YANKEE" No. 1993: for the reason that this vise—like other "YANKEE" Tools, will work for you in ways and places no other tool of the sort ever worked before.

It holds work on both bench and machine (see illustrations), and can be used on either of its sides or on end, as well as upright.

It is a vise that means accuracy and time saving on important work, therefore better garage-service to patrons.

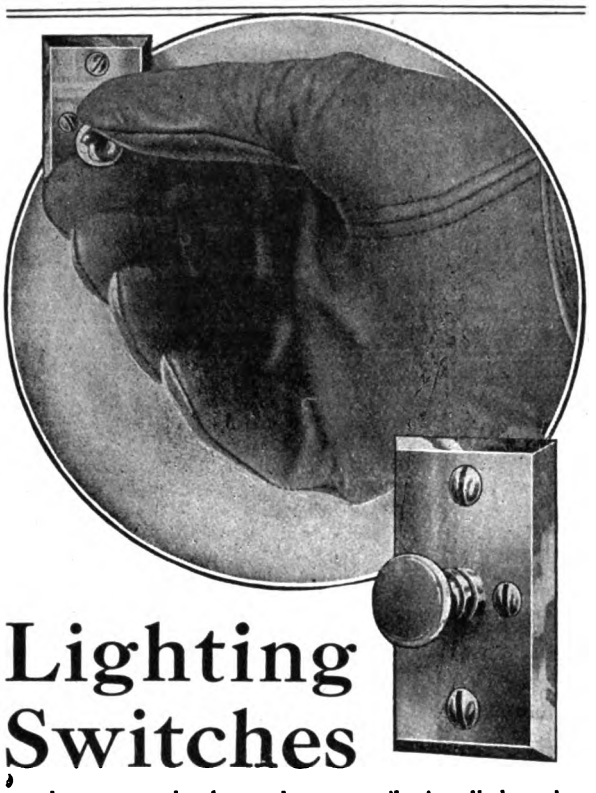
Length, over all, 8¾ inches. Jaws—2¾ inches wide, 1⅞ inches deep, 3⅛ inches open. Jaws faced with hardened steel; and block of same steel, with V-shaped grooves, for holding round or irregular shapes, supplied with each vise.

Your Dealer Can Supply You

Write us for "'Yankee' Tool Book" of metal drilling, wood boring and screw-driving tools, with illustrations showing them in garage use.

North Bros. Mfg. Co.
Philadelphia

CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

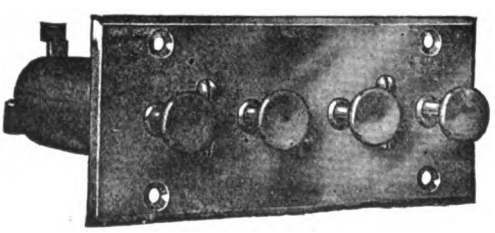
One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP
Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

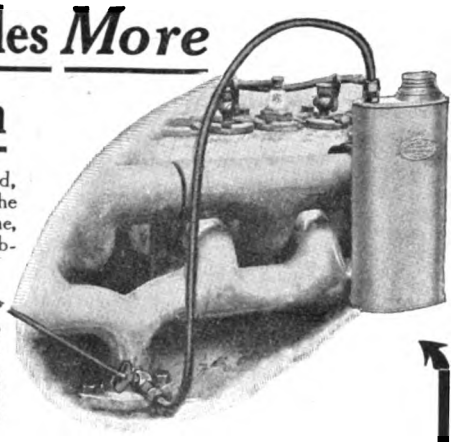
Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.

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2 to 10 Miles *More* per Gallon



sounds pretty good, doesn't it?—with the present cost of gasoline, and the price still climbing?

The "S and H" Gas saver is increasing mileage 2 to 10 miles per gallon (depending on size of motor) for thousands of satisfied owners. And when you install an

"S & H" Gas Saver

on your car you can stop worrying about carbon, too. By the simplest of methods, without fuss, trouble, or expense, with it you can take the carbon out of your motor and keep it out. In this way it sustains the power and speed of your car, and greatly prolongs its life.

The "S and H" is easily and quickly installed on any gasoline motor. No moving parts,—no "wear-out" to it. Controlled by small lever placed on dashboard. It works efficiently summer and winter.

Results Guaranteed. With every "S and H" is a guarantee that after it has been properly adjusted on your car, any time within 30 days you can return it if not satisfied. Price complete, $7.00, Canada $8.50, prepaid, with complete instructions for its adjustment. Order through your dealer or direct from us. *Send for free circular.*

DEALERS Here is an accessory you should handle. It is easy to sell, stays sold,—and there's a mighty liberal proposition for you. Write us today.

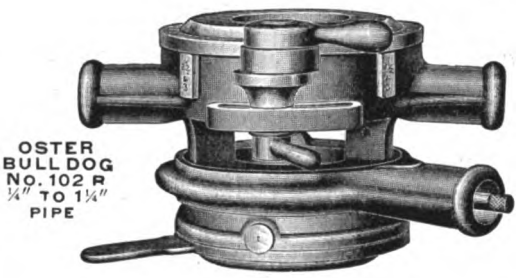
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OSTER BULL DOG No. 102 R ¼" TO 1¼" PIPE

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5 Big features **PLUS the ratchet** makes this the handiest, easiest stock for the repair shop and service station. Every pipe-threading trade knows the 5 big Oster Features—(1) Self-locking dies, (2) Self-centering guides, (3) Dies open up after cut and reset automatically to size—no backing off, (4) No loose bushings, (5) No breakable parts.

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Over 1,000,000 Feet on Hand.

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In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

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The outer ring seals the opening in the inner ring, and equal expansion against the cylinder wall in all directions produces perfect contact at every part. There is no break in the continuity of the bearing service or pressure tightness, either while the rings are new or when they get old.



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COME ALONG
all of you "go ahead boys"—get your can of
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great filler and healer of light scratches, and has a tendency to obliterate flying pebble marks and abrasions. It will positively remove road tar, grease spots and mud freckles,—which can be wiped out in a jiffy. UTILITY is a specialized varnish protector—it sheds water and you can cry defiance to atmospheric changes.

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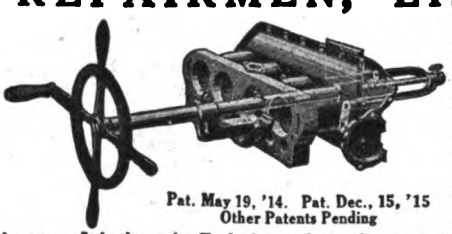
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TIRES and TUBES
Are Cheapest on Mileage

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Stiffen the backbone of your tire whenever it needs stiffening.

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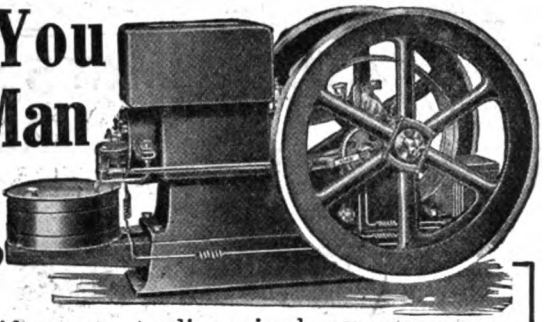
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535 N. Dearborn St. Chicago, Ill.
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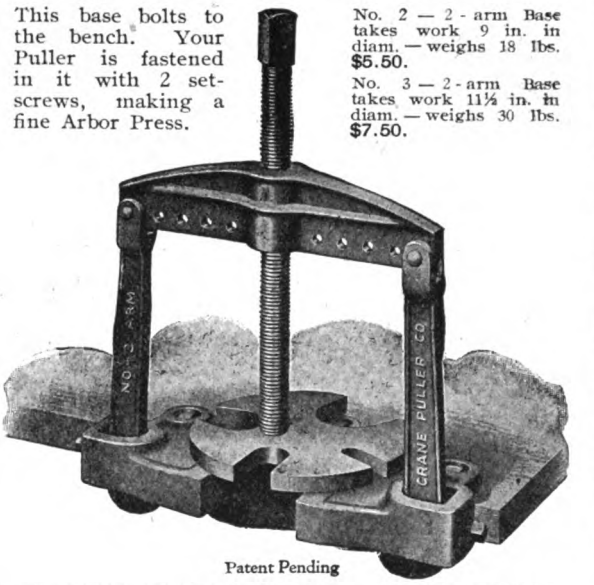
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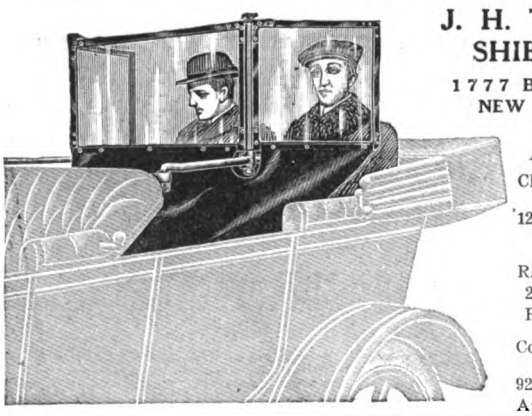
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J. H. TONNEAU SHIELD CO.
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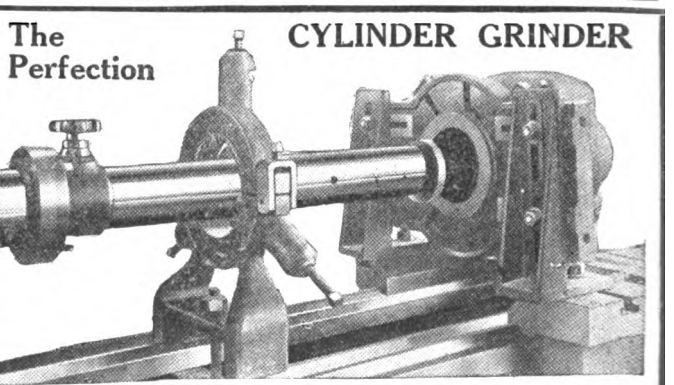
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Makes your engine run like new all the time.





LISTEN!

See that groove controlling the oil?

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Interesting booklet free on request.

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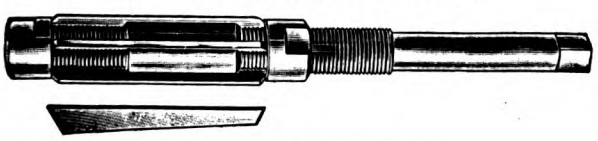
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For Ford Cars

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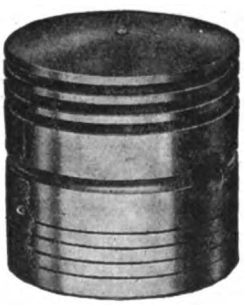
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Weight 1 Lb. Less Than Standard Ford

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The DYER LIGHTWEIGHT PISTON for FORDS possesses all the ADVANTAGEOUS features of alloy and aluminum pistons without their BAD FEATURES such as slapping, oil throwing, seizing and poor compression and COSTS BUT LITTLE MORE THAN STANDARD FORD PISTONS.

This piston is tough, durable, absolutely round, perfectly machined, has a domed head, uniform walls and special oiling features.

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DIXON'S GRAPHITE Automobile LUBRICANTS

spread a smooth, oily veneer over all bearing surfaces. Graphite rides on graphite. Metal cannot wear on metal.

Ask your dealer for the Dixon Lubricating Chart No. 184-G.

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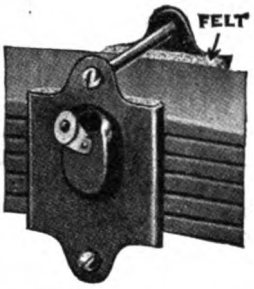
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25c. each



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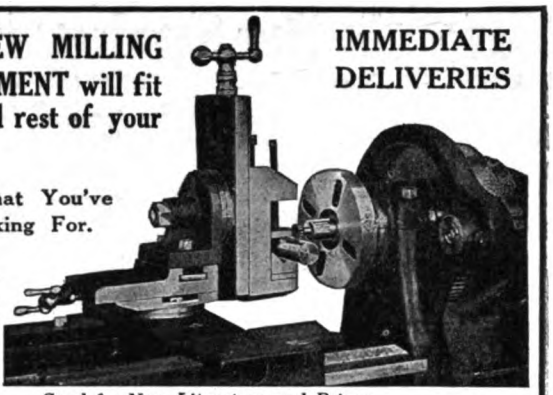
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RIGHT OUT
BEFORE ALL EYES

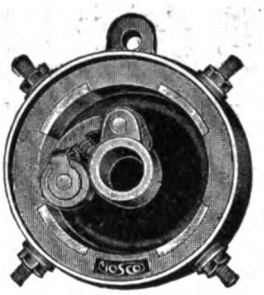
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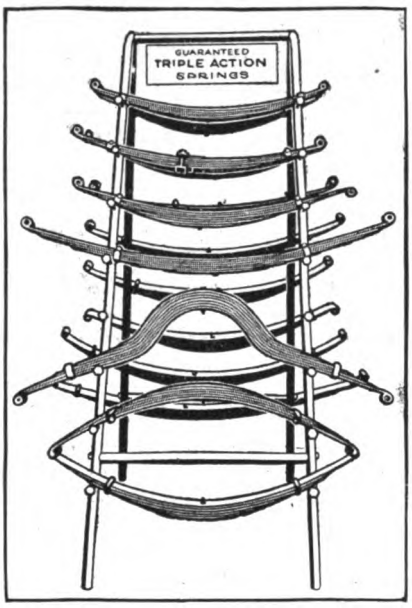
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We put you in a position to give him quick, daily, even hourly, service. He is pleased. He comes to you for all his repair work and most of his accessory purchases.

This is the experience of over *four thousand dealers using our service plan.*



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Put in a small stock of springs for every-day orders. Not much money needed. We have every kind of spring for every make of car since 1903, regardless of whether the manufacturer is out of business or not.

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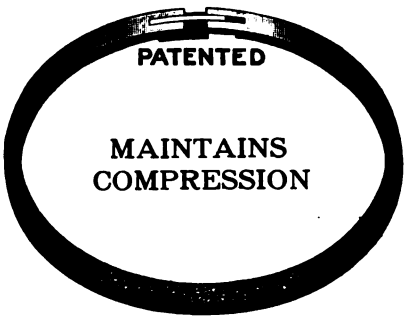
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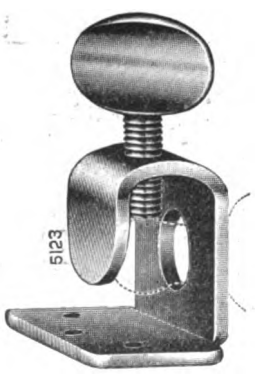
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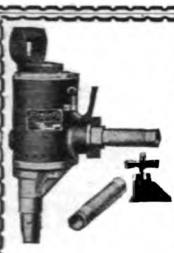


An efficient, yet simple device by which the top can be clamped to the top of windshield side arms.

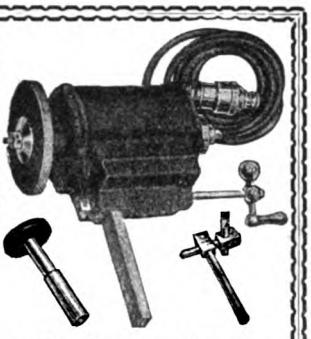
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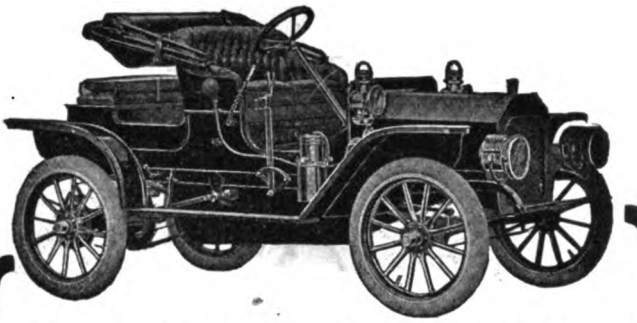
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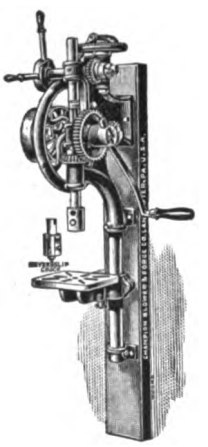
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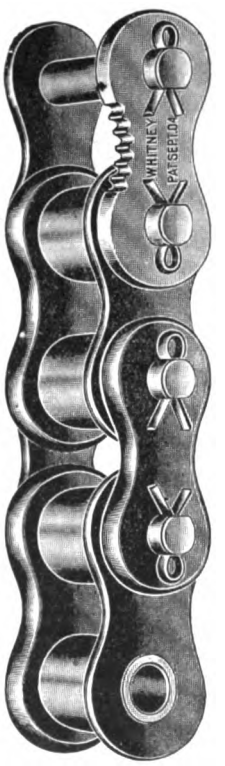
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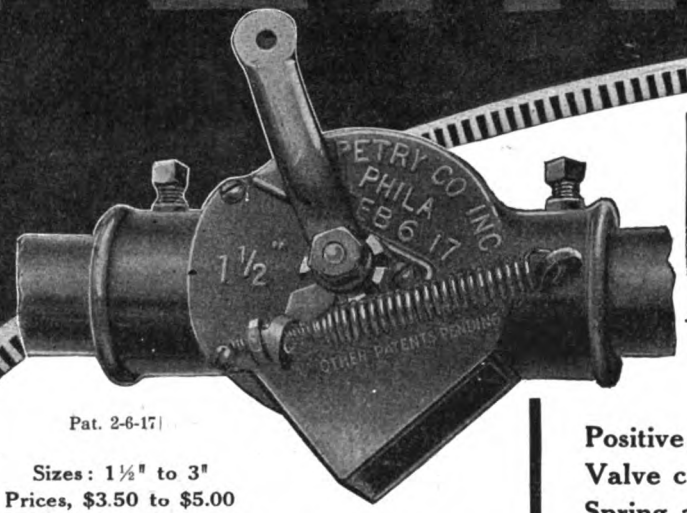
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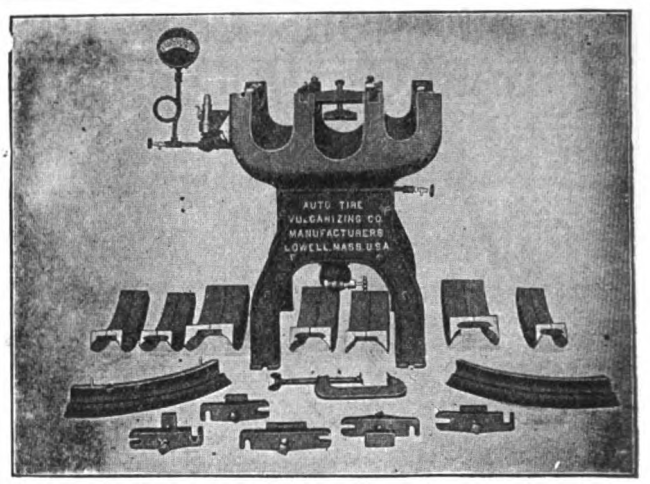
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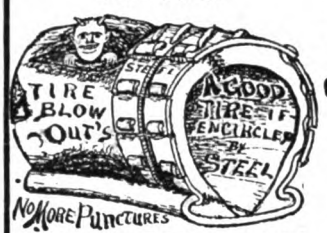
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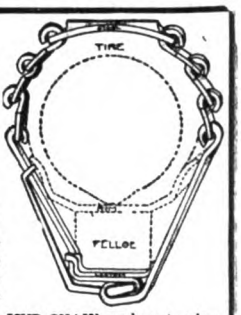
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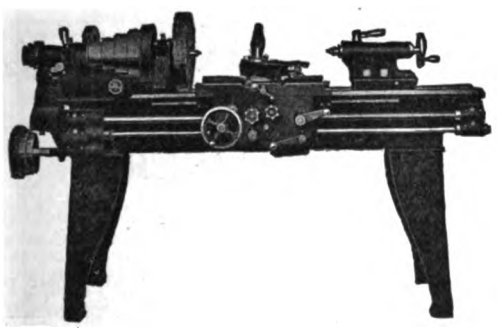






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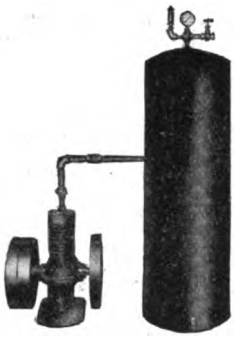
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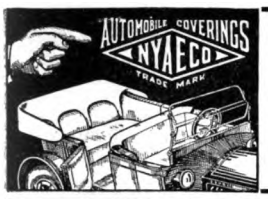
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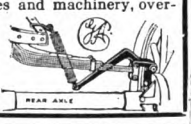


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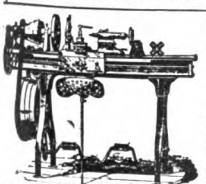
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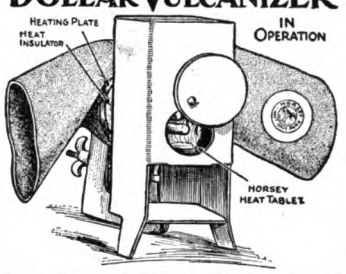
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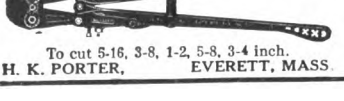


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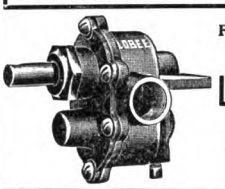
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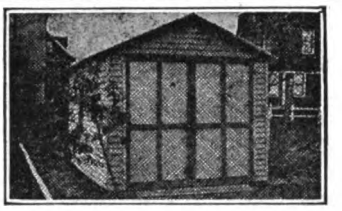


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Don't replace a broken spring with one no better.

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New Era "BETTER" Springs are the oldest and largest used line for replacement—at same price as from car factories. Made for all cars, GUARANTEED one year against breakage or sagging, graphited between leaves for two years' lubrication.

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871 Woodward Ave., Detroit, Michigan.



SANBORN'S
Spindle Arm Silencer
FOR FORD CARS
Patented Aug. 31, 1915

One of the best things ever invented for the Ford. Absolutely stops all rattle in the arm, prevents wear and helps in the steering. Easy to put in by using a pair of nippers. No bolts to take out and not over five minutes time required. Insert from front side. Take hold of spring about half way from end, press ends together and push into place. Once there they will stay and you will have no more rattle from arm. Thousands now in use. Ask your Garage man for them. If he does not have them, send 35 cents and we will send a pair post paid. *Send for Price List.*

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Inner armor for automobile tires. Prevent punctures and blowouts. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details Free. *Distributors and Agents Wanted* Sales Guaranteed. Liberal Profits.

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Vulcanizers—Valve Grinders—Tire Tool—Adjustable Socket Wrench—

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Vulcanizers, Spring Lubricators, Engine Trouble Detector, Fire Extinguishers, Etc.

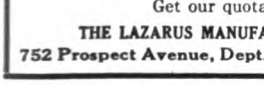
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Furnish efficient and economical protection for cars in dead storage. They are made of heavy, durable paper, in standard sizes to fit any cars.

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THE KENNEDY CAR LINER & BAG CO.,
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Auto Top Roof Cover
"Tailored to Fit any Car"

Roadster $5.95. Touring $7.95. *Parcel Post Paid*

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are sold wherever Ford Cars are found; each sale makes additional sales automatically. Orders are easily closed.

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My Copyrighted Book **"How to Judge Engines"** tells how high-grade semi-steel engines are made, advantages over cast iron, how common coal oil in a WITTE reduces power cost 65 per cent. Write today and get my "How-to-Make-Money" folder, and latest WITTE Engine prices. Ed. H. Witte.





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THIS REINFORCEMENT PREVENTS STONE BRUISES, CURB BRUISES, HINGE CRACKS, BLOWOUTS AND PUNCTURES

THIS NON-SKID CANVAS TREAD EXTENDS ENTIRELY THROUGH THE TIRE, PREVENTS THE TREAD FROM PEELING OFF

PATENTS PENDING

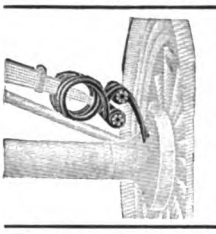
EXAMINE

this Cross Section which is reinforced by the two strips of canvas, also inserts imbedded in the tread, leaving the tread smooth, but gives traction and also prevents the tread from heating. This is the only **NON-SKID** tire from the 1st to the 10,000th mile made. This high grade tire is guaranteed for 6,000 miles but averages 10,000. It draws 25 per cent. easier than tires with **KNOBS** or chains, which is a big saving on **GASOLINE.** Free booklet telling many other advantages and agents' proposition.

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69 Genesee St.
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3 TIMES STRONGER ALL FABRIC

THIS PREVENTS RIM CUTS



Twin Spring
SHOCK ABSORBER
BEST BY TEST.

For Ford, Maxwell, Dodge, Overland and All Cars.

Write for Agents Proposition and Prices

TWIN SPRING CO.,
1000 Boylston St., Boston, Mass.

"IDEAL" Lawnmower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing reel knives. Best money maker you can have in your shop. Over 7,000 in use. **Write for Catalog and Price**

THE ROOT-HEATH MFG. CO., Plymouth, O.

THE AUTOTRAIL

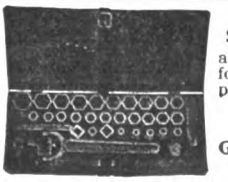
makes it possible for you to use your car for pleasure and business. Consumes less power and gasoline than to carry the same load in car. The Autotrail saves tires, mechanism, upholstering and paint of car. Can be attached or detached in an instant. Write for catalogue. Distributors, dealers and agents write today for special money-making proposition.

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Dept A.D. CINCINNATI, OHIO

LECTROFLATER
ELECTRIC AIR PUMPS

Costs 1/10 of a cent to pump largest size tire. Cheapest, handiest, for garages, service stations, tire dealers, repair shops. Either direct or alternating current. Automatic lubrication 125 lb. air pressure guaranteed, without heating. Prices, $45 to $160, F. O. B. Baltimore. Including gauge, hose, plug, coupling and electric cord.

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121 So. Calvert St., BALTIMORE, MD.



BAY STATE SOCKET WRENCH SETS

are high grade tools made for real mechanics whether professional or amateur.

Four sizes, $3.00 to $10.00

Send for circulars.

GEO. A. CUTTER, Sales Agent, Taunton, Mass.

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KNOWLSON'S Spring Spreader

Gives 100 per cent easier riding

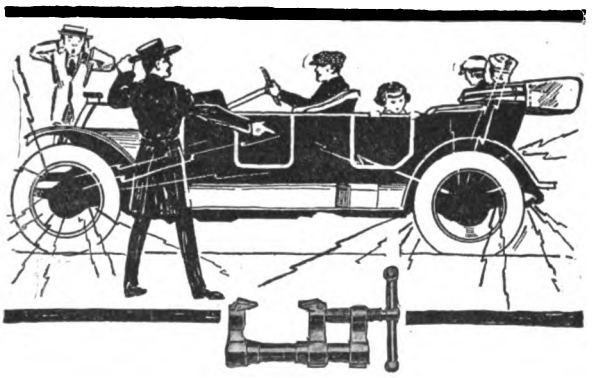
Securely clamps a broken spring.

A durable tool made of drop forgings, nickel-plated and polished.

At all Best Dealers, or sent prepaid for

$1.50

YOUR SPRINGS NEED LUBRICATING!



KNOWLSON'S Spring Spreader

STOPS THE SQUEAK

Adjustable to any size spring.

Protected by Basic Patents and Guaranteed.

Money Refunded if Not Satisfactory.

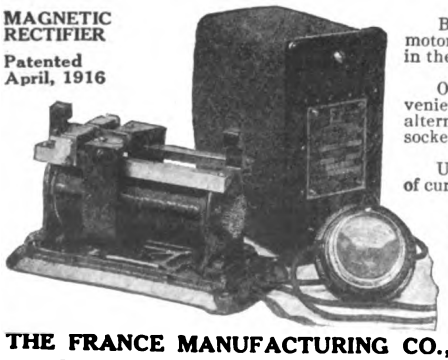
One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., Ann Arbor, Mich.

F-F BATTERY BOOSTER

MAGNETIC RECTIFIER

Patented April, 1916



Brings up the gravity of motor Car Storage batteries in the shortest possible time.

Operates from any convenient 110 volt 60 cycle alternating current lamp socket. 60 watt capacity.

Utilizes the Full Wave of current, has Carbon Electrodes and makes Recharging a profitable business where batteries are taken in to charge.

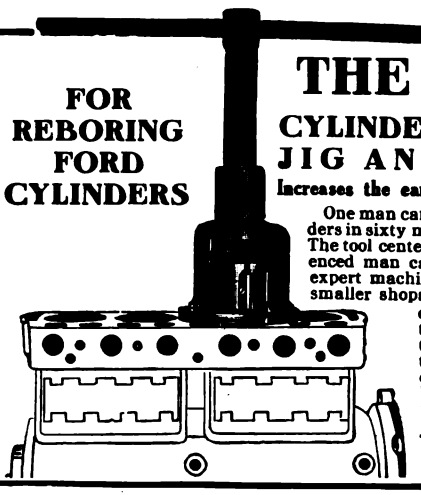
$15.00 Complete F. O. B. Cleveland

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THE FRANCE MANUFACTURING CO., Cleveland, Ohio

Jobbers and Dealers Throughout the United States and Canada

FOR REBORING FORD CYLINDERS



THE DAVIS CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works Hinckley, Ill.

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FAIR LIST PRICES

FAIR TREATMENT

When Goodrich is Behind You

GOODRICH TIRES

Where You See This Sign Goodrich Tires are Stocked

WHEN *you are behind* a Goodrich dealer's sign, Goodrich is *behind you*.

Let us sum up just what it means to you, just what powerful selling forces you enlist by the simple act of placing a Goodrich sign above your door.

First, the great GOODRICH PRESTIGE, which means rubber and means automobile tires to the millions of Americans;

GOODRICH REPUTATION, which spells *quality* in tires, *good faith* of service and guarantee wherever rubber is known;

GOODRICH FAIR TREATMENT, which standing ready to fulfill to a customer anything a Goodrich tire may not, takes *all risk out* of the purchase of a Goodrich Tire.

THE GOODRICH NATIONAL TOURING BUREAU, which through the missionary work of its *route cards* and road maps and its guide posts pointing the way to the automobile tourists, *links* the touring public with the *sign* above your door;

And finally, the *far-reaching, gigantic advertising campaign* of 1917 with which Goodrich is sowing the nation with tire sales you can reap.

Have the great national magazines and weeklies, the metropolitan dailies, the newspapers of your home town, the billboards of your roadside *selling for you by*

HANGING A GOODRICH DEALER'S SIGN ABOVE YOUR DOOR.

GOODRICH

SILVERTOWN CORD TIRES SAFETY TREAD FABRIC

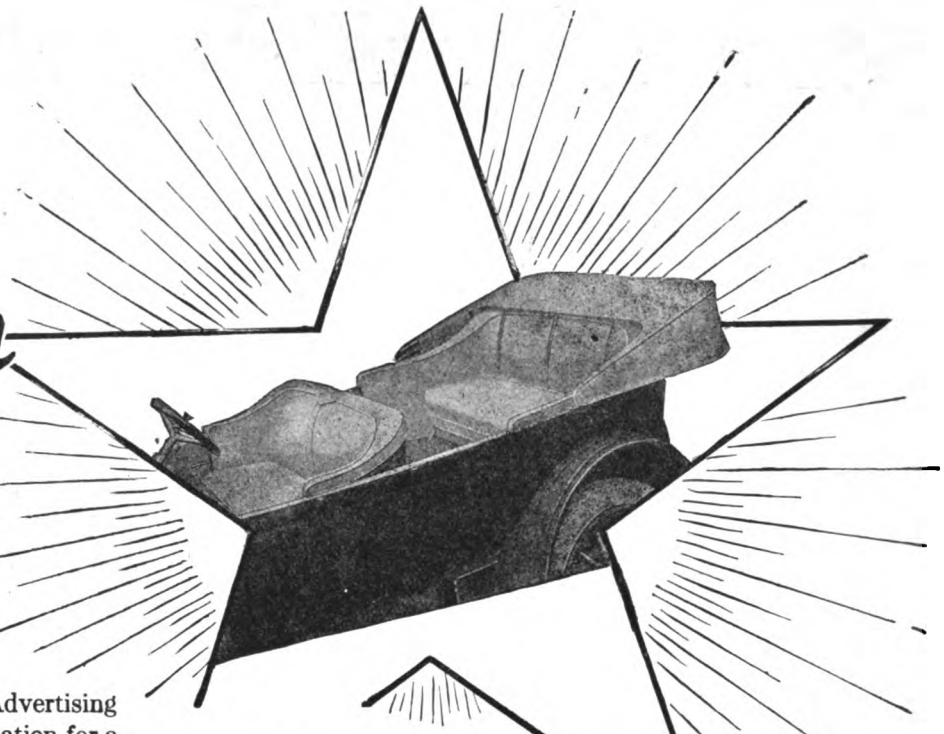
Goodrich Brown Tubes and Gray Tubes

The B. F. GOODRICH RUBBER CO
Akron, Ohio

BEST IN THE LONG RUN

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Hitch Your Wagon to This Star!



GORDON National Seat Cover Advertising is laying a broad and deep foundation for a great future business. Where scores of Gordon Covers have been used with satisfaction in the past, *hundreds* will be used as the season advances. Motorists who heretofore have given scant attention to appearances are beginning to see that Gordon Seat Covers are an actual asset and a practical economy. They see that a Gordon-dressed car has an actual cash value in excess of one with dirty and worn cushions, and that the savings on motor clothes is an item of importance. They see, in a word, that it pays to sit on

GORDON Seat Covers TAILORED TO FIT

Now here is a plain statement of a plain case: Gordon Seat Covers must be reckoned with by every accessory dealer who plans a greater future. They belong to that class of semi-staple products that will always be in demand because of economical use and moderate prices. Nothing in the accessory field promises more for a little selling effort than Gordon Covers.



Hitch your wagon to this rising star in Motordom and at once you draw to your door a volume of Seat Cover business greater than now you think possible. Gordon Covers have been popular for a long time, but there are still thousands of motor cushions to cover and thousands of coats to protect. Will you take the share of this great business that rightfully belongs to you?

Write and let us describe the entire Gordon Automobile Fabric Specialty Line. Our proposition will interest you.

The J. P. Gordon Co.

306 N. Fourth Street Columbus, Ohio

GORDON Seat Covers TAILORED TO FIT

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Courtesy of "Motor Age"

A Tire Lesson from Europe

European Motorists Get 5,000 Miles *More* Service Out of Their Worn Tires

The European War

has taught us a tire lesson.

To meet the demands of economy behind the battle lines of Europe, engineers have made discoveries that should save American motorists thousands of dollars in tire bills.

Tires that have been discarded after only 3,000 to 5,000 miles of wear, can be made to render at least 5,000 miles more service.

England, France and Germany, Austria and Russia—all the fighting nations—have solved the tire problem in exactly the same way; solved it so that they now get at least twice as much mileage out of their tires, few punctures, non-skid service equal to chains, and an enormous saving in money. They did this by using steel studded treads.

Get 5,000 Miles More

You can get at least 5,000 miles **more** service out of the tires you have been throwing away or giving to the junkman for a few cents after you have driven them only 3,000 to 5,000 miles of service.

Over half the car owners in Europe are doing this by applying steel studded treads to their worn tires, and more than 50,000 American motorists have already taken advantage of this opportunity to save from $50.00 to $200.00 a year in tire expense.

Steel studded treads are a perfected product of the world's war. Take a look at the photograph above showing how the military cars at the front are steel treaded. This new tread has proven its value to the satisfaction of military engineers and to thousands of investigating European and American motorists.

It offers you the same economy and security. You are entitled to these advantages and we stand ready to show you at our expense.



Guaranteed 5,000 Miles Without Puncture

Durable Treads are backed in writing by our signed guarantee for 5,000 miles of wear without a puncture. This guarantee holds good whether your tires are new or old. Think of it—to be able to drive your car without the constant nerve racking dread of tire trouble—it really means a **5,000-mile tire vacation!**

We Deliver Free

Without a cent deposit, we prepay express and allow you to decide. Remember the new Durable Treads—the only tire protectors in America built according to the foreign pattern—are gripped by the rim, just the same as the tire—absolutely water and sand proof—and are **applied in your own garage** in a few minutes time.

Special Discount

To motorists in territory where Durable Treads have not as yet been introduced, we offer a special discount on the first shipment **direct from the factory.**

Will you let us show you at our expense and risk? All we ask is your request for information—the coupon below is for your convenience.

Mail the Coupon

Tear it off and mail it **now**—don't run your tires "bare-footed" another week. We have an interesting book—"10,000 Miles On One Set of Tires," sample and copy of guarantee, ready to send to you FREE.

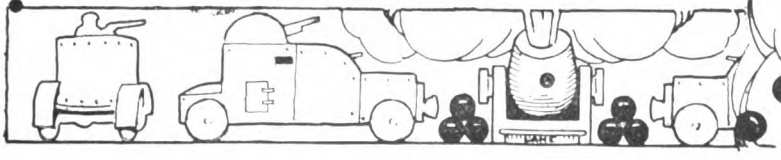
Stop throwing away your worn tires. Let us show you how to get 5,000 miles **more service** out of them, just as thousands of other motorists are doing.

Mail the coupon TODAY—do it now—before you turn the page and forget. You will hear from us within a week.

The Colorado Tire & Leather Co.

65 Tread Building, Denver, Colo.

F-5 Transportation Bldg., Chicago, Ill. 720-56 Woolworth Bldg., New York City



COUPON TEAR OFF MAIL

COLORADO TIRE & LEATHER CO.
65 Tread Bldg., Denver, Colo.
F-5 Transportation Bldg., Chicago, Ill.
720-56 Woolworth Bldg., New York City.

Gentlemen:—Without any obligation send me your free book, "10,000 Miles On One Set of Tires," copy of guarantee, and tell me about your special discount offer.

Name .....

Address .....

.....

My tire sizes are .....

Digitized by Google

Piston Ring service means

McQUAY-NORRIS

LEAK-PROOF

PISTON RINGS



Service to the jobber—the dealer—the garage and repair man—the consumer. Every step of the way down to the motor—and there the greatest service of all.

First, there's our Dimension Book that enables garagemen to fit every customer's car with exact size rings.

Then there are 300 jobbers and supply houses all over the country carrying complete service stocks of all standard size and over-size rings.

Back of them is our factory stock of over 2,000 different sizes subject to mail or telegraphic order. Every size and over-size for every purpose.

Standardized by national advertising. Everybody knows them. Sold only to the trade—not to car manufacturers.

That's McQuay-Norris LEAK-PROOF Piston Ring sales service—every link complete. No other piston ring maker can offer it.

Then comes service in the car. Due to the special design that gives this ring the power of equal and sustained tension, it means new life and power for the motor—saves gas and oil—reduces carbon. Service that makes the owner glad he bought Genuine McQuay-Norris LEAK-PROOF Piston Rings.

This is service that will hold customers and extend your business.

GET THIS BOOKLET—IT'S FREE—"To Have and to Hold Power," the standard handbook on gas engine compression. Every garage and repair man ought to read it. Write Dept. R.

~ the genuine

Manufactured by

McQuay-Norris Mfg. Co., St. Louis, U. S. A.

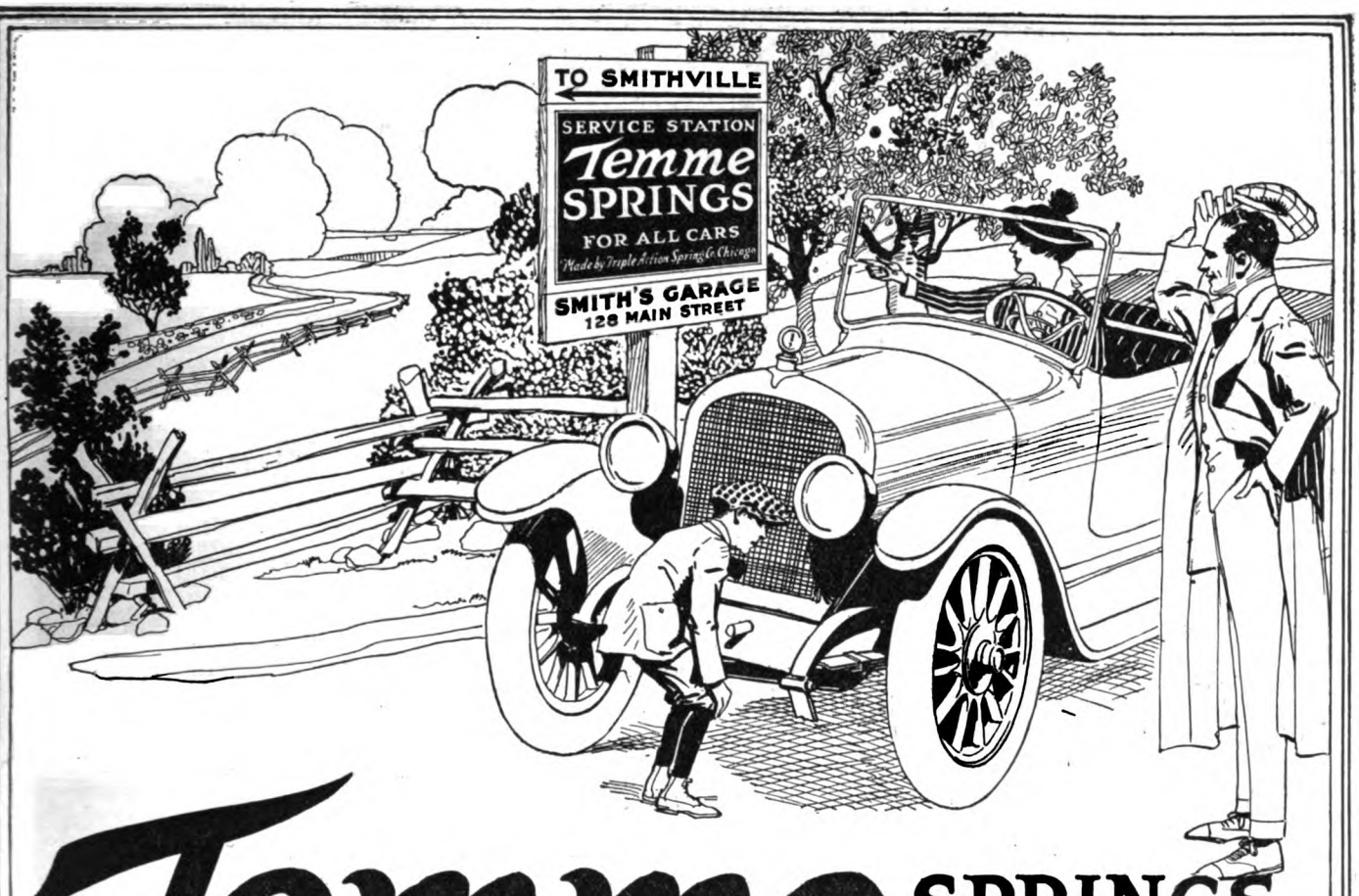
Branch Offices



New York, Pittsburgh, Cincinnati, St. Paul, Chicago, San Francisco, Seattle, Atlanta, Dallas, Philadelphia, Los Angeles, Kansas City, Denver

Canadian Factory: W. H Banfield & Sons, Ltd., 372 Pape Ave., Toronto

Digitized by Google



Temme SPRINGS
FOR ALL CARS



JOHNSON
Shock Absorber

THE picture tells the story. Are *you* the Mr. Smith of Smithville? Are *your* highway signs on all your roads?

Do all the lame cars drive to *your* door for Temme Springs and other things?

If *you* are not Smith, who is? Or who will be? That's the question.

And in most good towns it will be answered soon. For Temme Springs and Temme's Triple Action Service are known to be *as good as gold.*

Hundreds of repairers, who have "banked" on Temme and never lost, are putting up these Temme highway signs today.

These signs *will* bring in business. Temme has tried them, so he *knows*. And now he offers *you* what won for *him.*

Temme Springs *"for all cars"* means just what it says—for all cars *since 1902.* Test us by naming the spring you need. Temme Triple Action Service will have it on the way to you the same day.

"For all cars" means *designed* for all cars to factory specifications. And so good are Temme Springs—so prompt the service—so fair the prices—that dealers in *all* cars now buy from Temme *in preference* to the car maker.

You need these springs, this service, these signs. They will make you money, bring new business, help you build the good reputation you are after.

If you delay you may lose this exclusive proposition. Write or wire us now, saying: "Send Temme Spring Service Station proposition at once."

This is to remind you of the new model of the famous Johnson Shock Absorber—made by us. The only cure for a hard riding car is a pair of Johnsons. Temme Spring Service Stations make good money on them. Write now for our new proposition.

TRIPLE ACTION SPRING COMPANY
79 East 28th Street, Chicago

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90% of the load is carried on the rear Dearborn axle and heavy truck wheels.

Mr. Dealer:
You Can Make Big Money NOW!

RIGHT NOW in your own locality are scores of prospective purchasers of Ford-Dearborns who cannot afford $1500 for a truck, (the average price of a one-ton truck) but who would gladly buy a Ford-Dearborn at $350 plus a Ford chassis. You can get this business.

The Ford-Dearborn makes a *real* one-ton truck that will do all the work that any one-ton truck will do at one-third the cost. And the Dearborn Truck Company is a *real* manufacturing company with a big, well-equipped factory and it is *not* a stock selling organization.

$350 and a Ford, New or Old, Make a

FORD-DEARBORN
One Ton Truck

The Ford-Dearborn is so designed that 90% of the load is carried on rear Dearborn axle with its heavy truck wheels, Baldwin roller chains, Baldwin cut steel sprockets, Jack shaft hangers and back rod hangers hot riveted to frame, not *merely* bolted.

Pruden artillery type wheels, guaranteed hickory spokes and felloes. Bock heavy roller truck bearings are used throughout.

The Dearborn unit is made complete in our own factory and is guaranteed in every detail. We carry on hand all parts which can be supplied quickly.

Wire or write for dealers' Big Money-making proposition.

DEARBORN TRUCK CO.
1252 S. Campbell Ave., CHICAGO

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SUNSHINE SUPER-VULCANIZER

Vulcanizing done in five minutes.

Guaranteed absolutely as long as the tube lasts.

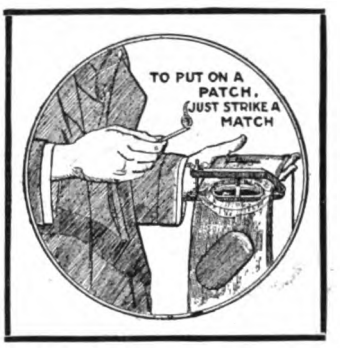


Punctures repaired with the Sunshine Vulcanizer, become part of the tube.



No cement, gasoline, alcohol, acid, electricity, or blaze.

Once tried always used.



No experience is necessary, cannot overcure, no flame to blow out in the wind.

DEALERS: We offer you the SUNSHINE SUPER-VULCANIZER, an outfit consisting of one machine, twelve patches completely assembled, and a piece of sandpaper, as one of the quickest-selling, biggest profit makers ever placed on the market.

THERE IS A LIBERAL PROFIT by selling the SUNSHINE vulcanizers, an accessory which will ring up many a dollar on the cash register. Order the SUNSHINE vulcanizers from your jobber or send your order direct to us. Keep a big stock on hand this summer, and you will please your customers. You will hold your trade. Motorists will call on you to buy SUNSHINE vulcanizers and nothing else will take their place. The reason is this: they have discovered that SUNSHINE vulcanizers are the World's Super-Vulcanizers.

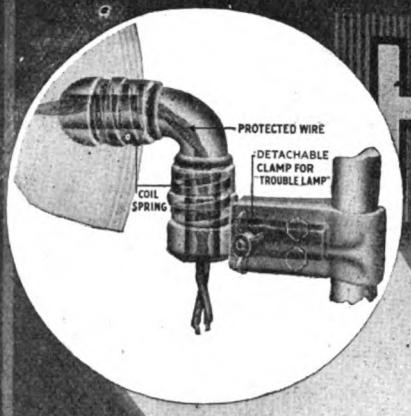
The more you sell the bigger business you establish for yourself, and a permanent profit on reorders for extra patches, which are of an oval shape covering two inches of space, as the motorists will buy them from time to time for repairs on the road.

Ask your jobbers for dealers' prices or write us direct.

SUNSHINE LIGHT COMPANY
SALT LAKE CITY
U·S·A
MANUFACTURERS

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"This same striking page will appear in June 16th issue of 'Saturday Evening Post'—also in all the other leading journals of motoring."



HOWE Searchlight

The Spotlight with the Wonderful Bracket



Howe Searchlight No. 9—$8
with 4-in. Rear View Mirror

In Canada, $12.

Here's the truly *one-hand* spotlight! You operate it as you drive. It turns as easily as you point your finger to throw its powerful spot in front, to the right or left, down, up or *behind* you—*any* angle, anywhere.

This straight-to-the-spot, one-way turn is permitted by the UNIVERSAL SPRING-CONTROLLED BRACKET. Both joints move at the same time. *An exclusive Howe feature.*

The Howe Spotlight gives light where you want it—quick—then *holds* its position, *stays put*, regardless of vibration and jars. Never works loose, or becomes wobbly, no matter how long in use. THE COILED SPRINGS WON'T LET IT. They exert a firm, permanent pressure on the turning joints—take up all loose motion, all wear.

No spotlight is better than its bracket. Get the Howe—with its *wonderful bracket*. In *every other* way it's as *good* as its bracket. Some of its other good features are suggested at the left. Read them—then

Tell Your Dealer You Want a Howe

If he hasn't the Howe in stock, *write us his name* and send remittance for the model you want. We will ship it prepaid. Satisfaction guaranteed.

DEALERS: Again, we say, *order quick*. The public is spotlight-wise this year. The big demand is for the Howe—the one-hand, any-angle spotlight with the wonderful bracket. Drop us a line on your letter-head. FREE window stand offer.

Howe Manufacturing Co.
1732-36 South Michigan Ave.
Chicago, Ill.

12 out of 100 Reasons Why Your Spotlight Should Be a Howe

1—The Wonderful "Spring-Controlled" Exclusive Howe Bracket.

2—A "one-way-turn" Universal Joint that turns instantly to any spot.

3—Always "stays put"—never loosens or flops around.

4—Never sticks—never hard to turn.

5—On-and-off switch in knob works easy while turning lamp.

6—Reflector gives perfect spotlight at all distances.

7—A special clamp to fit each different style of windshield post, round, square or oval.

8—Hollow bracket conceals and protects wire. Prevents wear, short circuits.

9—Quickly detached for trouble lamp.

10—Light weight—perfect streamline body—finish equal to your car.

11—National Mazda Nitrogen gas-filled 21 candle-power lamp.

12—100% light efficiency without danger of glare.

Howe Searchlight No. 7—$7.50



In Canada $11.00

Howe Searchlight No. 8—$8.00
with 4-in. Rear View Mirror Over Door



In Canada $12.00

The Howe Junior No. 11
is a single shell with the same bracket and two-piece detachable clamp as the Standard Howe. $4.00
With Mirror $4.75
In Canada $6 and $7.50



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more money for garages

How often are you called on to locate and correct trouble in Electrical Starting and Lighting Equipment? You are bound to have more and more such calls, especially if you earn a reputation for knowing the electrical side of an automobile and handling it right.

There is money in Electrical Installations, Repairs, Adjustments, Renewals, etc. Some of the most wide-awake Garage Men have found it out. This year, more money than ever before will be made that way, because there will be more electrical work than ever for the man who knows how.

Guesswork won't do. Every time you guess wrong, you are likely to make yourself a peck of trouble and lose a customer in the bargain. What you need, and need right now before you find yourself losing opportunities to make money, is a

Weston

Model 280

GARAGE TESTING INSTRUMENT

This complete Electrical Testing Equipment is made by the world's foremost Electrical Instrument designers and makers. It meets every requirement for making electrical tests in the garage. With this *Weston Model 280*, you can handle anything that comes your way in electrical work. And it doesn't cost a small fortune, either—mighty little for what it will let you make.

With the Instrument, we furnish full information, showing you how to use it. And we have a staff of electrical experts whose advice is yours for the asking any time you think you need it.

We Will Make You a Worth-While Offer

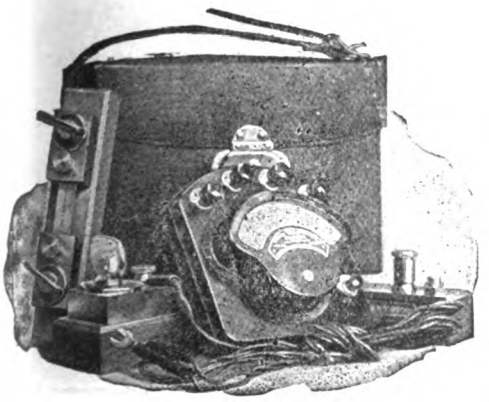
It includes not only the Instrument but Special Service Features which will put you in a position to make the most of this rapidly growing and very profitable business. There is a limit to the number of garages to which the offer can be made, so don't put off looking into it. Write today for full particulars.

WESTON ELECTRICAL INSTRUMENT CO.
2 Weston Ave., Newark, N. J.
23 Branch Offices in the Larger Cities.

Do you want to be able to make quick, accurate tests to locate any defect in the electrical system? Or, do you want to consume unlimited time taking apart every device and running a chance that you will discover the trouble sooner or later?

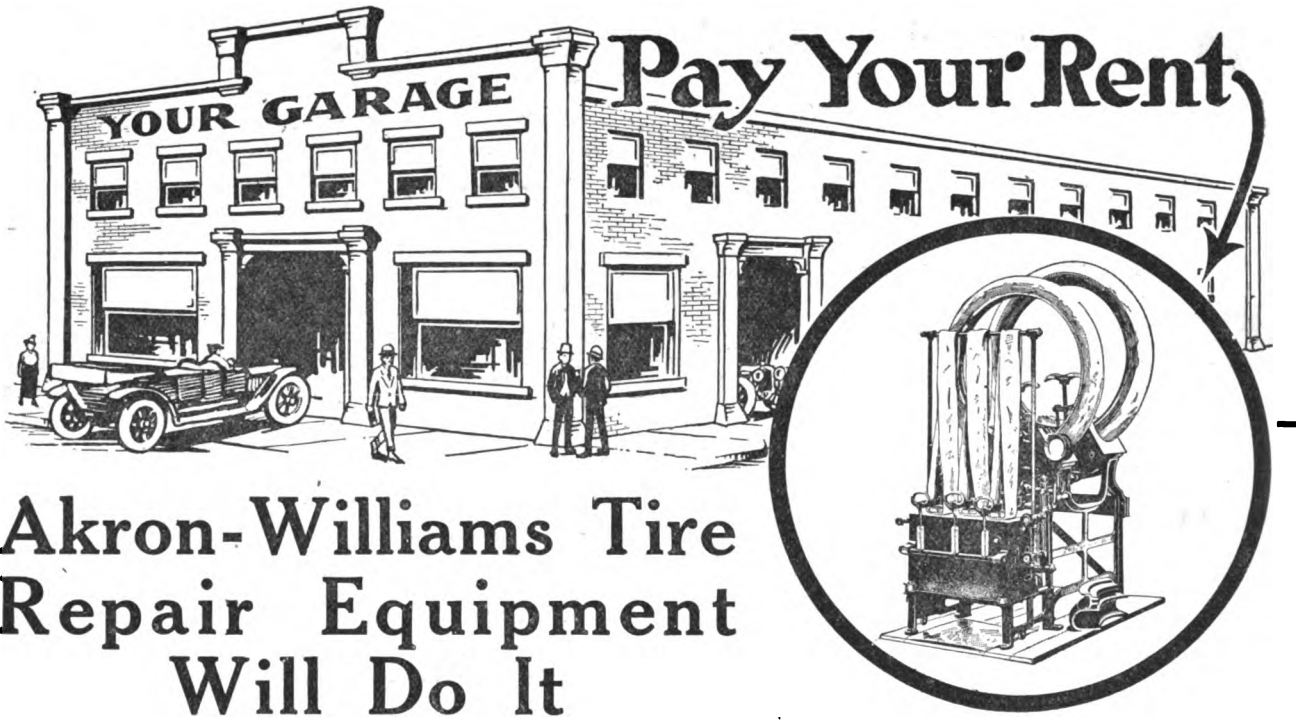
There are scores of places where trouble may occur. Unless you test electrically, you cannot eliminate any possible source of trouble without taking each device apart.

A poorly made, inaccurate electrical instrument merely adds to the uncertainty. What you need is reliable, positive knowledge. This Model 280 really is the equivalent of six separate Measuring Instruments of different ranges. It is extremely accurate, durable and serviceable. With it, you can do the work quickly and intelligently, putting yourself a long way ahead of any competitor who has not Weston Equipment.



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Make that Vacant Corner Pay Your Rent



Akron-Williams Tire Repair Equipment Will Do It

Thousands of dollars are being spent this year on tire repairs, by car owners in your locality. Every motorist going into or past your place is a prospective customer. You can get a good share of this business and profit for the asking—with very little added expense—by doing tire repair work during your spare time.

Akron-Williams

TIRE REPAIR EQUIPMENT

Used and endorsed by 60 leading Tire Manufacturers
(Names furnished on request)

The Akron-Williams equipment we offer you is the same in every way as used by practically all the prominent tire companies and recommended and sold by them to their agencies and dealers all over the country; **could there be any stronger proof of its superiority?** By its use anyone can follow the latest and most approved methods in tire repair work.

Your success or failure depends upon the equipment you select—make the right start with an Akron-Williams outfit.

Write for New Booklet. It illustrates and describes the complete Akron-Williams line of outfits for every size garage; shows many new time and labor-saving devices; and tells you how to build up a paying business **from the very start.**

Don't delay—write at once.

The Williams Foundry & Machine Co.

Glendale Street **Akron, Ohio**

Exclusive Distributors for California: The Waterhouse & Lester Co., San Francisco

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Your Advertisement Takes Entire Back Cover of Milestones



THE new motorists' magazine has in a few weeks attained a circulation considerably in excess of a half million among prosperous car owners of the country. Page 8x11 inches. Art work by best artists in the country. Famous authors and special feature writers make this a wonderful

Monthly Magazine for Your Customers

Goes to your list of customers and prospects with your own advertisements. Holds old customers, stimulates new business. Write us about it. Just one item of the new Firestone Advertising Plan that features your name big throughout. A money maker. Coupon brings the facts. Mail it now.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere

FIRESTONE
TIRE & RUBBER
COMPANY
AKRON, OHIO

Please send me complete details of your advertising plan for increasing the tire and accessories sales of my store. It is understood that this places me under no obligation whatever.

Name _____
Street and No. _____
Town _____ State _____

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Wilmo Manifold

Helps Your Customers Fight High Cost of Gasoline

By actual official tests the Wilmo Manifold gets 34c worth of mileage—and more—from 22c worth of gasoline—whatever the grade.

Think what a real service you can be to your customers by showing how to get the most out of their gasoline the Wilmo Manifold way.

Think what a big talking point that means to you in Wilmo Manifold sales—together with Wilmo simplicity. The Wilmo is attached in a few minutes with a monkey-wrench—then on for good—without need of further watching.

The diagram below shows how the Wilmo Manifold completely vaporizes gasoline and virtually eliminates carbon. So scientifically simple that a mere schoolboy can understand it.

Sales are now in the hundred thousands and going strong, helped by advertising in national publications.

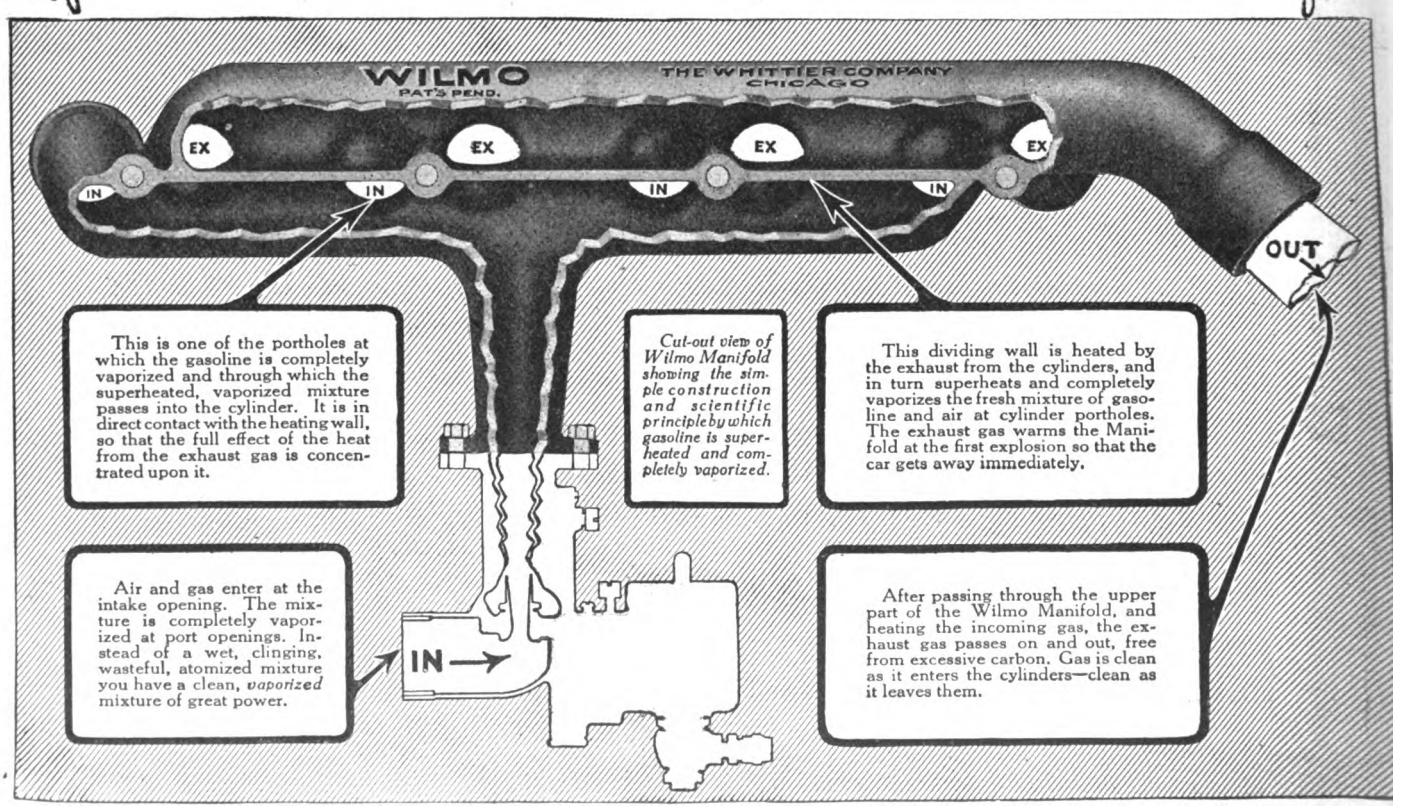
The Wilmo Manifold retails at $7.50 to $15, according to make of car. It stays sold, and continues to advertise you and your service to customers.

Write for interesting test data, testimonials from users telling of many more miles to the gallon, and for helpful selling facts. For here's a year 'round seller that means business and more business—for you.

THE WHITTIER COMPANY

First National Bank Building Dept. 226 Chicago, Illinois

How the Wilmo Manifold Increases Gasoline Mileage 42% to 54%



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DANN INSERT

"The Lubricated Spring-Leaf Bearing"

pays its cost—*by additional mileage gained on each two tires.*

DANN INSERT is sold to you with the understanding that *you can have your money back* if not entirely satisfied within thirty days after having it in your springs.

The ability of DANN INSERT to deliver results is *backed further* by a written guarantee for



1500 Extra Miles

on any new standard make of tire.

What greater assurance can you ask as to its tire-saving merit?

With DANN INSERT, your car delivers an *easy riding quality that is pleasing to the most critical.*

DANN INSERT *stops the squeaks* between the spring leaves.

There is *no speculation* in buying DANN INSERT—if it doesn't deliver results—the guarantee protects you.

More than 100,000 sets of DANN INSERT have been sold, and indications are that a half million cars will be using DANN INSERT before another year is ended.

If you do not have DANN INSERT—order it today.

Name and address of dealer nearest you, who will give you 1500 extra-mile guarantee, sent upon request.

DEALERS—write for proposition.

Mail This Coupon Now!

DANN INSEST is stardard equipment on the following cars:

Winton—Austin—Disbrow

THE DANN PRODUCTS CO.

1095 East 152nd Street, Cleveland, Ohio

"Demand DANN INSERT in the car you buy"

ADR
The Dann Products Company
1095 E. 152nd Street,
Cleveland, Ohio

Please send me complete information relative to the above, as pertains to my requirements.

I am a { Car Owner. Dealer. Manufacturer.

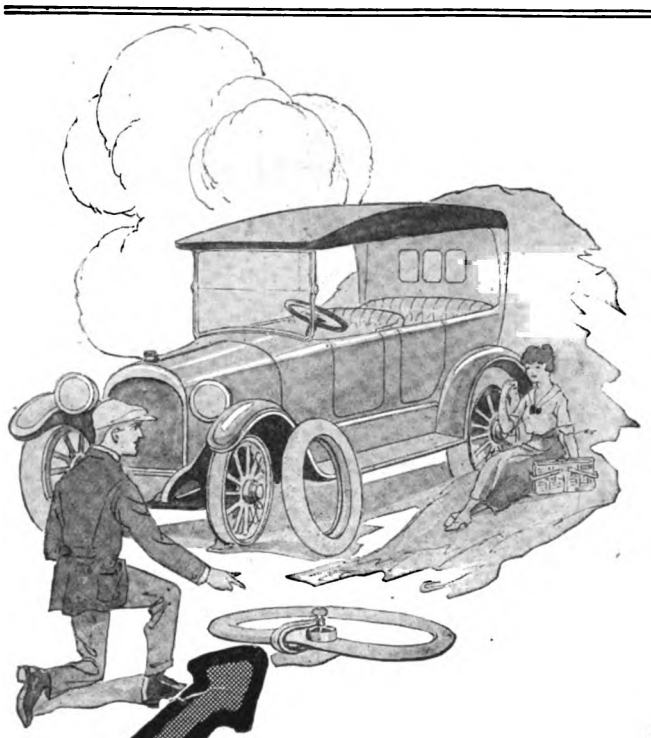
Car.....

Model.....*Year*.....

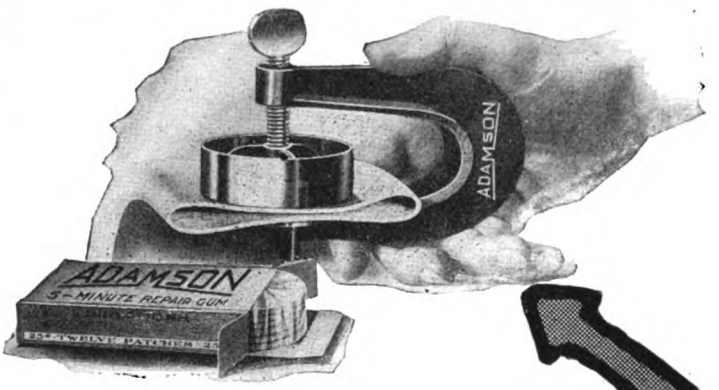
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THE NEW
ADAMSON
MODEL "E"
5-MINUTE VULCANIZER



The Complete Line

For larger tube injuries, tire and tube blowouts, tread cuts, etc., the "Adamson" line is complete with various outfits.

Prices range from $1.50 for Model "M" for tube repairs only, to $12.00 for Model "S" for tire and tube repairs and private garage and repair shop use.



These folders furnished free to "Adamson" Dealers. Order a supply for your customers.

A Light and Handy Outfit For the Quick Repair of Tube Punctures

MAKES REPAIRING A PLEASURE

Uses common gasoline—the most convenient and dependable fuel. Will vulcanize your tubes **anywhere** in five minutes.

Built on the same proven principles that have made "Adamson" Vulcanizers the most practical and largest selling line in the world.

Complete with box of a dozen "Adamson" 5-Minute Repair Gum Patches for $1.00. Extra box of 12 patches only 25c.

DEALERS!

This outfit is a tremendous seller.
Order now from your jobber.

ADAMSON MANUFACTURING CO.
East Palestine, Ohio

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10,000 MILE GUARANTEE Backs This Tire

Every Brictson Pneumatic Tire is sold under a specific 10,000 miles written service guarantee. This guarantee is the ***longest*** and the ***strongest*** ever put behind a pneumatic tire. It is the result of ten years' experience and is a positive protection to every purchaser. Try Brictson Tires on your car at our risk and learn how to cut down your up-keep costs.

"ABSOLUTELY PUNCTURE PROOF"

Brictson Tires are puncture-proof, blowout proof, skid proof, rut proof, rim cut proof, oil proof and gasoline proof. Wonderful resiliency and easy riding qualities as well as economy commend them to car owners. The service and satisfaction they give is rapidly extending their sale.

Retread Your Present Tires

If your present tires are new you should by all means apply Brictson Treads, or tire protectors, thereby making them puncture proof—rut proof—rim-cut proof—gasoline proof and non-skid.

If your present tires have been used and the rubber tread has been worn off or thin, you may get additional service by applying Brictson Treads, also making them puncture proof, oil proof, rut proof, gasoline proof and non-skid.

Free Trial Offer

To convince you that Brictson Tires will give you satisfaction we will let you try them on your car at our expense. Write today for conditions of this Free Trial Offer and full information about Brictson Tires and Brictson Treads.

THE BRICTSON MFG. COMPANY

167 Brictson Building **BROOKINGS, SOUTH DAKOTA**

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Look for the Texaco Sign

WHENEVER and wherever you see the Texaco sign you may rest assured that gasoline and motor oil of the highest quality are sold.

Texaco Motor Products always give a maximum of service to those who use them. Texaco Gasoline is the kind that you can always depend upon. Under all conditions it gives high power and good mileage per gallon.

TEXACO MOTOR OIL

has the visible earmark of a lubricant of the highest quality—a clear, clean, uniform color really distinctive of this splendid oil. Its performance when in use lives up to its appearance.

Texaco Motor Oil reduces friction to a minimum thereby enabling your motor to operate at its highest efficiency. It gives a perfect seal between piston and cylinder and allows no gasoline to leak into the crank case. Due to certain basic qualities it *cannot* deposit a hard carbon crust in the motor. If through the feeding of too much oil to the motor any carbon residue should be left, it will be in the form of a soft, fine soot that can do no harm and is easily wiped off.

Texaco Motor Oil may be obtained at most good garages. The safest way, the best way, to buy is in one or five gallon cans.

THE TEXAS COMPANY

New York Chicago Houston

DISTRIBUTING OFFICES IN MOST CITIES

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MAXFER
MEANS ECONOMY
ECONOMY MEANS SUCCESS

Maxfer Carries — Ford Pulls

THIS advertisement has been written by our dealers---every line and illustration has come from their suggestions. The Maxfer makes a Ford, used or new, into a Maxfer Truck in less time than any other device invented.

It seems impossible that a dealer will take on an agency for any other truck maker except the *MAXFER*, for the reason that all of them---except the Maxfer---require special machine tools and skilled mechanics to convert a Ford, used or new, into a ton truck.

The Maxfer makes a Ford, used or new, into a Maxfer one-ton truck (guaranteed overload 50 per cent) at a cost of $350 and a Ford. One mechanic and a helper can make this conversion inside of 3 hours. The only tools used are illustrated on the right hand side of this page.

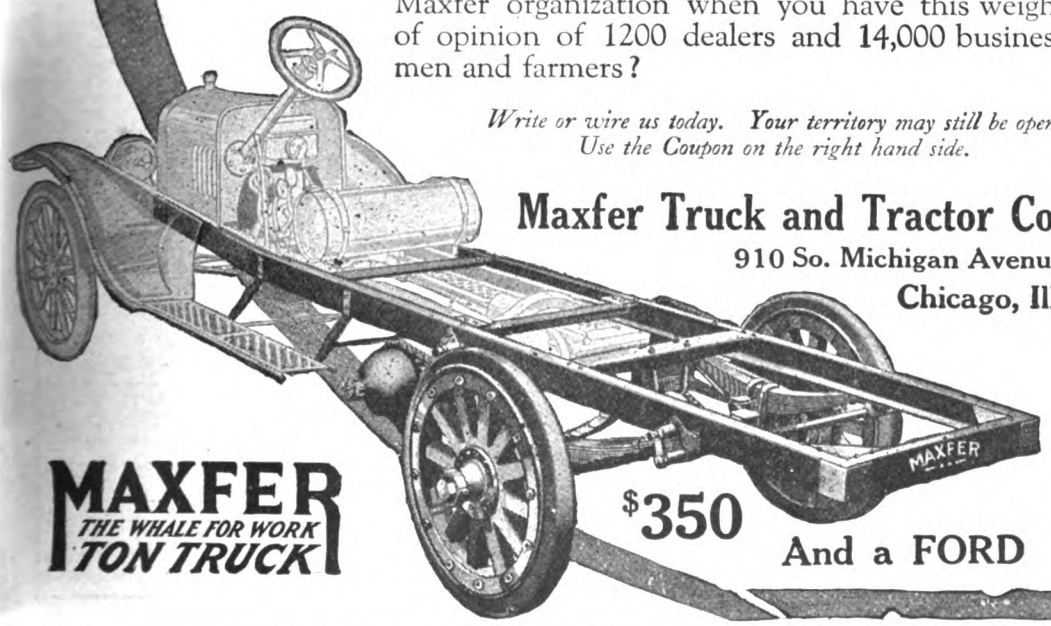
The Maxfer slips around and over the Ford, strengthening it all the way. The Ford frame is not cut off. The Ford axle is not cut off. You are only required to remove the rear wheels and the rear spring of the Ford car and then the Maxfer slips over and around the Ford frame, making the Maxfer ton truck.

1200 Dealers have realized this economy. 14,000 Business men and Farmers have realized this economy.

Can you, as a dealer, reading this advertisement, stay out of the Maxfer organization when you have this weight of opinion of 1200 dealers and 14,000 business men and farmers?

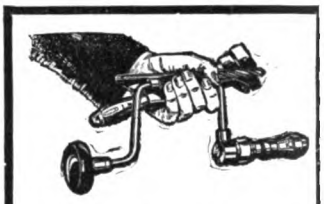
Write or wire us today. Your territory may still be open. Use the Coupon on the right hand side.

Maxfer Truck and Tractor Co.
910 So. Michigan Avenue
Chicago, Ill.

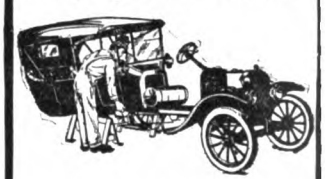


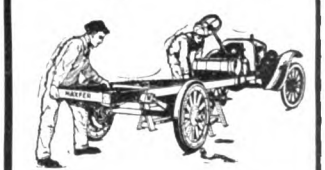
MAXFER
THE WHALE FOR WORK
TON TRUCK

$350 And a FORD


Tools used to make a MAXFER


Removing Ford rear wheels


Taking off the body


Making a MAXFER one ton truck


Putting on MAXFER Bell sprocket

Maxfer Truck & Tractor Co.
910 So. Michigan Ave.
Chicago, Ill.

Please mail me full particulars regarding Maxfer Truck.

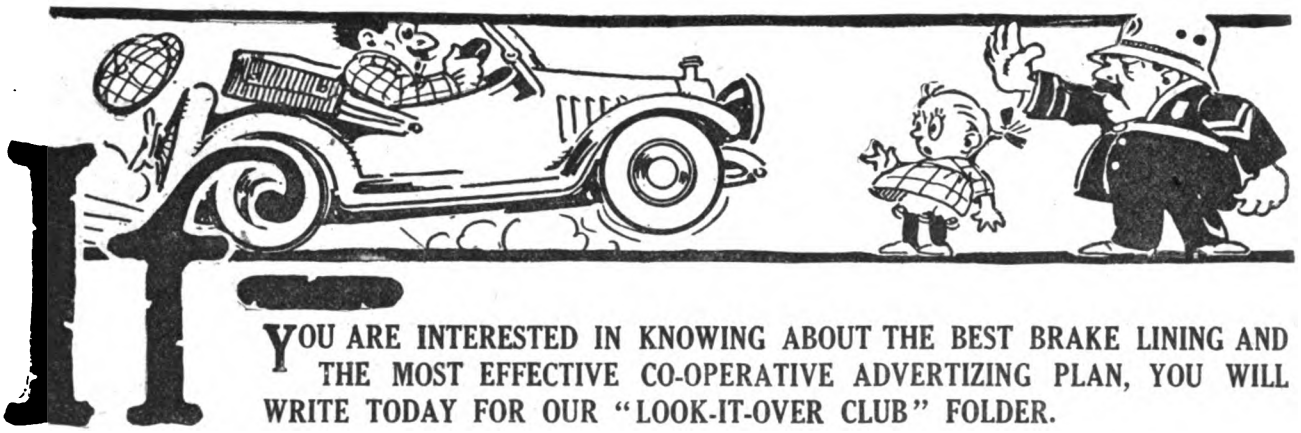
Name .....

Address .....

City.....State.....

ADR

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IF YOU ARE INTERESTED IN KNOWING ABOUT THE BEST BRAKE LINING AND THE MOST EFFECTIVE CO-OPERATIVE ADVERTIZING PLAN, YOU WILL WRITE TODAY FOR OUR "LOOK-IT-OVER CLUB" FOLDER.

The American Asbestos Company was one of the first to enter the asbestos brake lining field, and has at all times anticipated the developments and requirements of the automobile industry, with the natural result that TesTbesTos is today a brake lining perfectly adapted to the purpose for which it is intended and is in no sense of the word experimental.

A great many claims are made and can be made by various manufacturers of similar products, but when reduced to fundamentals, *quality* in asbestos brake lining depends upon three things; the quality of the asbestos used, the care in the manufacture of the yarn and weaving of the fabric, and in the final treatment given the fabric to make it resistant to oils, grit and other injurious substances.

The asbestos used in TesTbesTos Brake Lining is of the very best quality obtainable. It is bought by us in its crude form; every lot is carefully inspected; we weave our own yarn according to our own processes and with machinery that is thoroughly modern, operated carefully and whose product is constantly supervised. The final treatment given TesTbesTos is, we believe, superior to that given any other brake lining on the market. This is a claim that can be substantiated only by the evidence of actual use.

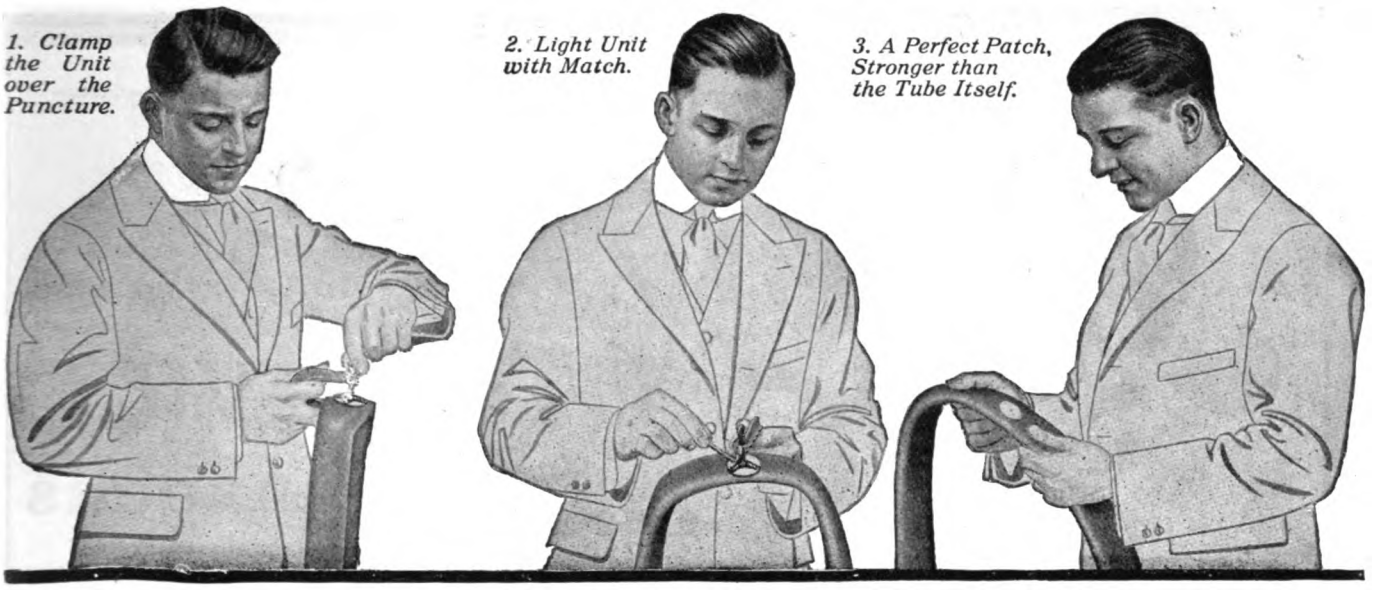
TESTBESTOS
IS ADVERTISED IN
Saturday Evening Post
Collier's Weekly
Scientific American
Popular Mechanics
Life
Literary Digest
Etc.

The manufacture of brake lining is to-day fairly well standardized. There are no great differences in the average quality of various brands, but there is a marked difference in the *uniformity* of quality, and the strongest claim we make for TesTbesTos is that it is uniformly satisfactory, due to our constant watchfulness and careful inspection.

TESTBESTOS
AUTOMOBILE
BRAKE LINING

AMERICAN ASBESTOS COMPANY
1217 Stanbridge Street, Norristown, Pa.
Manufacturers of Asbestos Yarns, Cloths, Theatre Curtains, Tapes, Packings, Gaskets, Multiple Disc Clutch Rings, Etc.

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Mends Punctures in 5 Minutes

THINK, Mr. Motorist, of permanently repairing your inner-tube punctures in 5 minutes—without cement, gasoline, acid or flame! That's what you can do with the Shaler 5-Minute Vulcanizer—anywhere on the road, any time—in wind, rain, cold, heat or storm. Anybody can use this wonderful little vulcanizer. It's as simple as lighting a cigar. Thousands of Shaler 5-Minute Vulcanizers are in use throughout the country. Over 100,000 sold in 60 days! Motorists delighted. A permanent repair in less time than a temporary patch can be stuck on. All you need is a match.

SHALER 5-Minute Vulcanizer

(Low and Miles Patents)

A Clamp—with 12 Patch and Heat Units neatly boxed—that's all there is to a complete outfit. Each unit is complete in itself, consisting of a metal container holding a combustible disc which furnishes the heat, and a piece of quick-vulcanizing Para rubber on the other side. We control the Basic Patents.

You simply clamp the unit over the puncture and light the combustible disc with a match, a lighted cigar or cigarette. It creates just the right amount of heat to vulcanize the rubber firmly to the tube, making a perfect permanent repair in five minutes. It's a wonderful money, time and worry saver.

Complete Outfit Only $1.50

Neatly packed to carry right in your tool box—for $1.50. When you have used up the dozen patches and heat units you can purchase more at 75c per dozen. Besides the Shaler 5-Minute Vulcanizer at $1.50 there are other Shaler models for mending casings and tubes for Motorists and Garages, from $1.75 up, as well as complete plants for public repair shops.

Can't Burn the Tube

Positively no danger of ever burning the tube. No heat—absolutely none—reaches the tube surrounding the patch. There is no flame—no blaze.

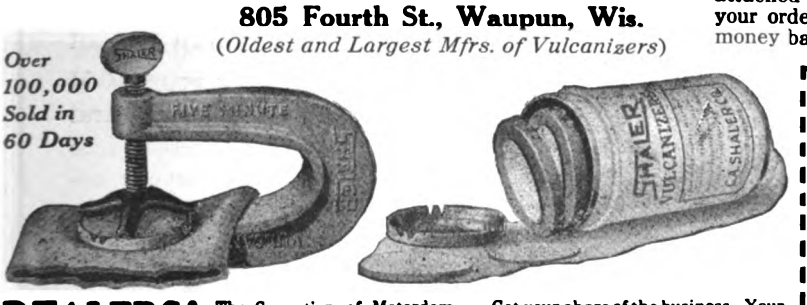
10 Days' Free Trial—Order Today

If your dealer or garage is not able to supply you, use the coupon attached for your convenience in ordering direct from us—or write your order in a letter inclosing $1.50 (check or money order). Your money back if you are not delighted. Order today.

C. A. Shaler Company

805 Fourth St., Waupun, Wis.

(Oldest and Largest Mfrs. of Vulcanizers)



DEALERS! The Sensation of Motordom. 100,000 sold in the first 60 days. It's one of the biggest winners in the history of automobile accessories. Our big National Advertising Campaign will create a great demand for this quick seller.

Get your share of the business. Your jobber has the Shaler 5-Minute Vulcanizer in stock. Order to-day and get the Shaler Display Stand and other advertising matter we furnish Free to Dealers.

Money Back Coupon

C. A. Shaler Co., 805 Fourth St., Waupun, Wis.

Gentlemen: Enclosed find $1.50 for which you will send me postpaid your Shaler 5-Minute Vulcanizer with 12 heat units and 12 rubber patches. I am to have the privilege of returning the Vulcanizer within 10 days and getting my money back if I am not satisfied.

Name.....

Street and No.....

City.....State.....

My Dealer's Name or Garage.....

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Prest-O-Lite SERVICE In Indianapolis



INDIANAPOLIS—one of the great automobile centers of the world—home of Prest-O-Lite, has a big Prest-O-Lite Factory Branch right in the heart of its extensive retail and wholesale automobile district.

This Branch, with its complete facilities and expert organization, is handling a large volume of battery business—helping to solve the battery problems of manufacturers, distributors, dealers and car owners in its territory.

It is a sales depot and service headquarters for the Prest-O-Lite Storage Battery—insuring *factory service* to all customers.

Views above show (top right) front of Prest-O-Lite Indianapolis Branch, 510 N. Capitol Avenue; (top left) Offices of Branch. Lower illustrations give two views of the battery testing, recharging and repair departments.

Battery Business Brings Extra Profits to Dealers and Service Garages

TWO million automobiles now in service are equipped with storage batteries for starting, lighting and ignition.

These millions of car owners are constantly demanding new batteries and battery service, because batteries, like tires, need periodical inspection and attention, and in time wear out, necessitating the purchase of a new battery.

This means an enormous volume of business which dealers, garages and service stations are in a position to share. Many have installed special service station equipment to provide complete facilities for the repair and recharging of batteries.

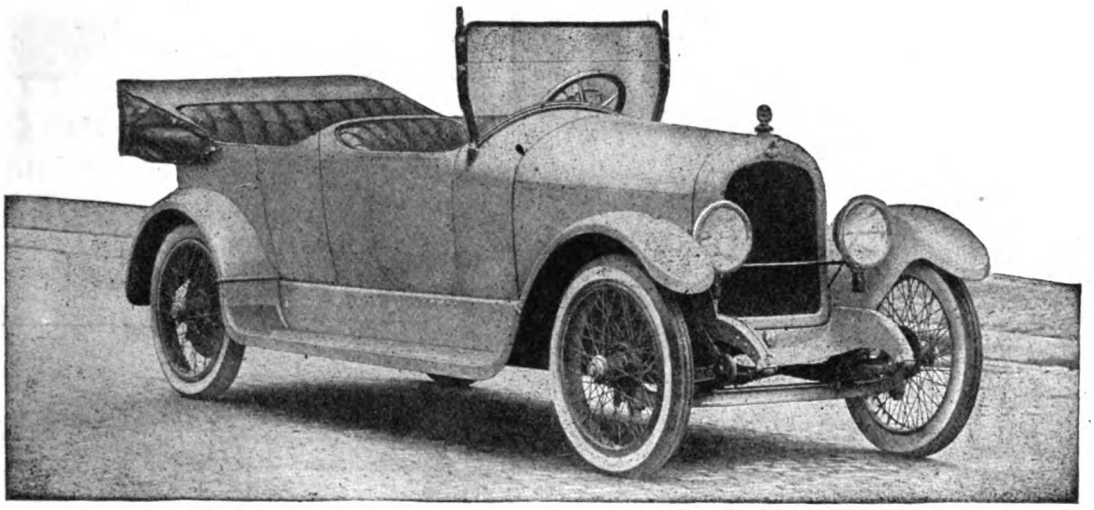
Right in your own locality—wherever automobiles are used—there is growing demand for new batteries and battery service. Put yourself in position to profit by this big demand. The first step is to get full details on the Prest-O-Lite proposition for dealers and learn how our co-operative plan will create more profits for you with very little invested.

The Prest-O-Lite Co., Inc. U. S. Main Office and Factory, 906 Speedway, Indianapolis. Canadian General Office and Factory, Toronto, Ontario.

The Prest-O-Lite Battery is a better battery--backed by a better service

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Did You Note at the Shows How the Marmon Attracted?



Its wide popularity is due not only to its lightness, its fuel and tire economy, its simplicity of lubrication, its comfort and its "roadability," but also to its beauty of line and of finish. On the Marmon cars are used large quantities of

Valentine's Painting Materials

On a Marmon car was first used Valentine's

DUSTPROOF GRAY

the most popular of all the colors brought out in 1916.

Your paint-shop is entitled to handsome, convenient sets of Valentine Color Samples for the asking, including

VALENTINE'S 1917 COLORS

Ten wonderful, attractive shades.

Simply write, "Send us the 1917 box of colors."

VALENTINE & COMPANY

Established 1832

Manufacturers of High-grade Varnishes and Colors

456 Fourth Avenue New York

343 So. Dearborn Street, CHICAGO 74 Pearl Street, BOSTON

TRADE VALENTINES MARK

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130 INCH WHEEL BASE for FORDS

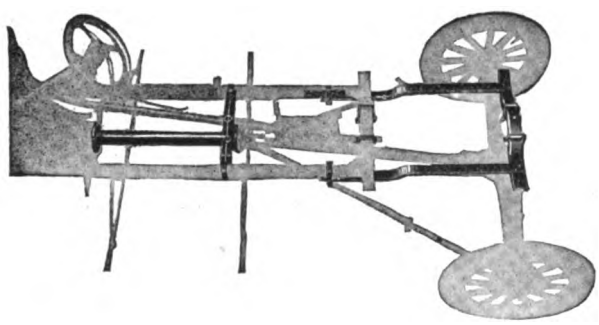
Bind your old customers to you and make a host of new ones, with

H-D EXTENSIONS FOR FORDS
NOW CALLED HAYDEE

96-110 INCHES BACK OF DRIVER'S SEAT

at the small outlay of

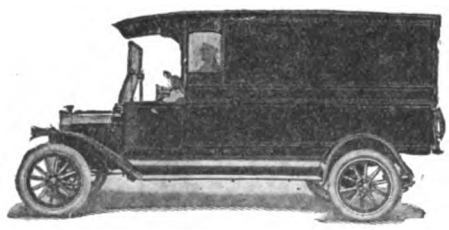
$60 F.O.B. New York City. Liberal Discount To Dealers



It is a grand business builder. Each job sold, starts interested talk about them and makes more sales. Merchants all over the country are demanding Hay Dee Extensions and 90-96 inches loading space. Hay Dees are leaving by Express on Rush orders almost daily.

15 inch Extension $55. 30 inch Extension $60.

Simplicity itself. No cutting or drilling. A wrench and a hammer and a few hours' work, makes any Ford into a big, sturdy dependable chassis that can carry long graceful bodies or big Furniture or Express ones.



We carry every type of body. Hundreds of New York Merchants have solved their delivery problems with them.

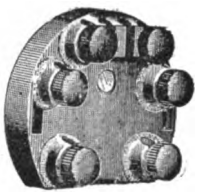
Full information and Catalogues by return mail.

Write today. It pays to be prompt.

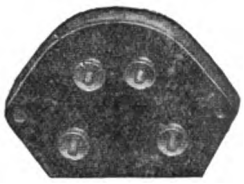
Hayes-Diefenderfer Co., Inc.
234 West 55th St. NEW YORK CITY

Sole Manufacturers and Owners of the Hay Dee Extension. Patented.

MAGNETO PARTS



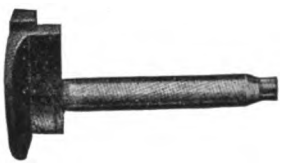
FOR ALL MAKES OF
MAGNETOS AND COILS



SPARK COIL PARTS · TUNGSTEN CONTACTS
STARTER AND GENERATOR BRUSHES

ALL PARTS ARE GUARANTEED AGAINST DEFECTIVE MATERIAL

Write for our Catalogue and special agency proposition.

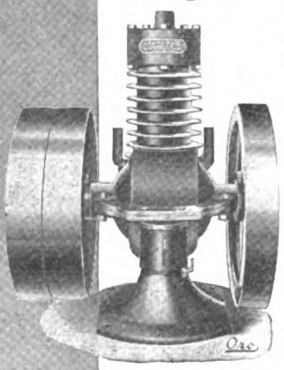




GUARANTEED MAGNETO PARTS CO.
1765 BROADWAY NEW YORK CITY

The AU-TO AIR COMPRESSOR
FOR BIG WORK
and little trouble

This little machine, 21 inches high with 3 inch cylinder, will deliver 6½ cubic feet of air per minute. It maintains a constant pressure of over 200 pounds without overheating and will give you 500 if necessary.



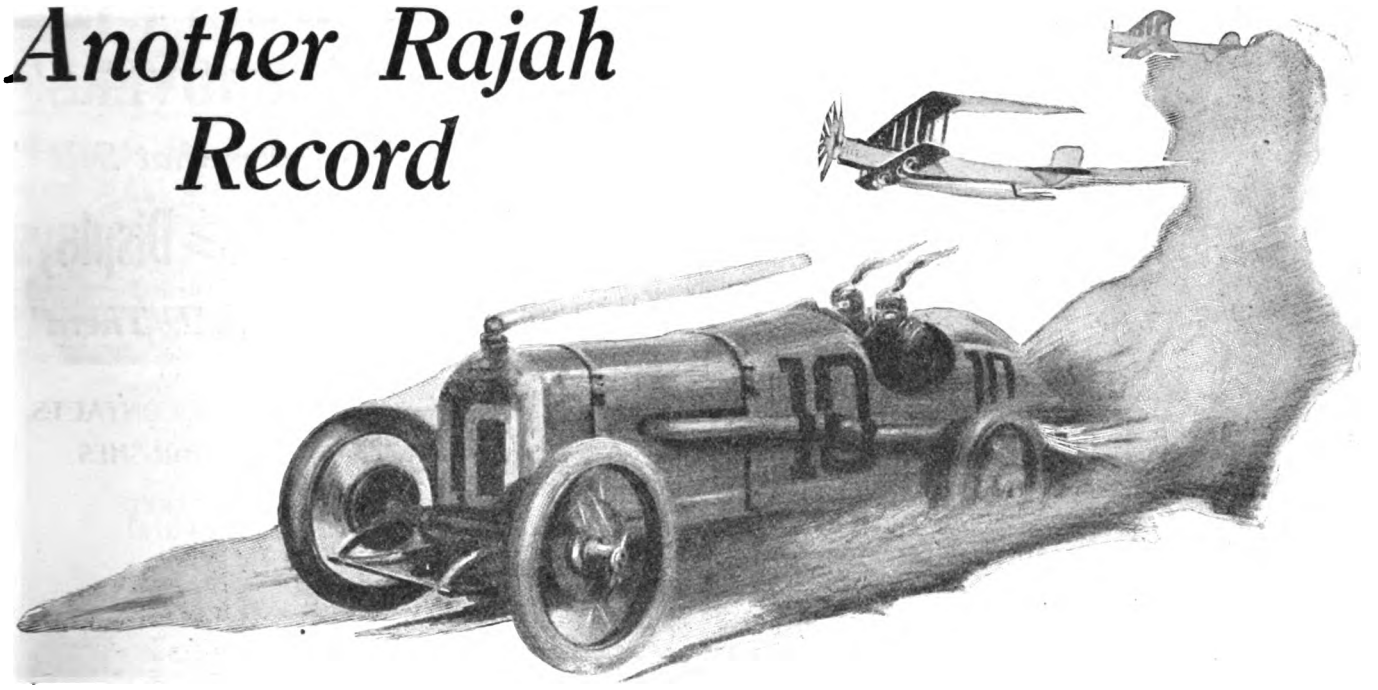
It needs no attention because it is air cooled, crank shaft and connecting rod are of forged steel and all other parts are built to stand every possible strain. Bearings and bushings are of bronze and wear evenly because fly-wheel counterbalances pulleys.

For an absolutely reliable compressor specify the genuine Au-To No. 0. Made by

THE AU-TO COMPRESSOR CO.
Dept. 62 Wilmington, Ohio

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Another Rajah Record



Universal Trophy Race, Uniontown Speedway, May 10th, 1917

7 of 15 cars starting equipped with RAJAH Spark Plugs
7 of 12 cars finishing equipped with RAJAH Spark Plugs

It's the same story every time. Compare the cars that start with the cars that finish. That's the real test of a spark plug.

In the Astor Cup Race 70% of the cars starting and 80% of the cars finishing had Rajah Plugs. At the Chicago Speedway, Rajah equipped 18 out of 21 cars. At the Cincinnati Speedway, 6 out of 7 cars, and at the Indianapolis Speedway, 8 out of 10 cars finishing used Rajah Plugs.

When you sell Rajah Plugs you have a real story to tell—something to make your customers think more about quality than price. We are advertising these Rajah records now—a steady stick-at-it campaign of education. Look over your stock of Rajah Plugs and Terminals. Your jobber is ready to supply any requirements.



Terminals are furnished so that Rajah Plugs can be used on any car

Address RAJAH, *Bloomfield, N. J.*

HUGHSON & MERTON, Inc., *San Francisco, Los Angeles, Portland, Seattle.*

JOHN MILLEN & SON, Ltd., *Montreal, Toronto, Winnipeg, Vancouver.*

RAJAH
SPARK PLUGS

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The beautiful, lustrous finish comes from

PIMBLEY'S
AUTO-NEWER

'Cleans and News any Exterior Finish"

Every car owner ought to know this remarkable restorer of automobiles' handsome *first* finish. The standard for a quarter-century.

Not a polish, paste, wax or oil, just a peerless R-E-N-E-W-E-R. A few drops on a piece of cheesecloth, a few brisk rubs—and, behold! a car that looks like new.

Get it at your dealer's, or write us if he hasn't it. Retail Price 50c. and $1.00.

PIMBLEY'S
AUTO-TOP-NEWER

is a black liquid restorer for all tops of leather, Pantasote or mohair; also for seats or cushions. Apply with a brush. Weatherproof, waterproof, dries quickly, won't rub off. Fine for under parts of car—axles, running board, etc. 50c., $1.00, $1.50.

Dealers: Investigate! Big sales and profits!

Ask for our proposition.

Pimbley Paint & Glass Co.
ST. JOSEPH MISSOURI

"QUICKER TURNOVERS"

of "Just the Wrenches that Sell"

Furnished on Mossberg TRADE MARK Displays

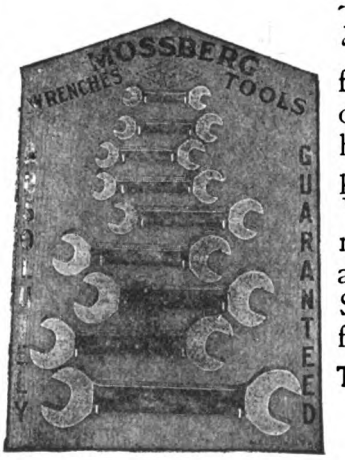
"Just the Way to Sell Them"

This "T" Board, with 23 Small Adjustable Wrenches presents a dandy counter appearance. The board has a natural wood finish, highly polished.

The Guaranteed Wrenches Sell For

$10.00





This MOSSBERG "V" Board has four each of 9 sizes of "full finished" hardened and tempered Double End Wrenches. The milled openings fit all sizes U. S. and S. A. E. Standards from ¼ in. to ¾ in.

The Wrenches List For

$20.00

"R" Boards for FORDS. They exhibit 10 "better" tools for FORDS. Each tool does a particular job—well. 27 such tools come with this board.

They Sell For

$10.00



Send for Catalog 191-B

FRANK MOSSBERG CO.
ATTLEBORO, MASS., U. S. A.

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Humboldt Specialties for Ford Cars

Biggest—Brightest and Best Sellers

The Humboldt line embodies all essential items to make the equipment of Ford cars *complete;* it consists of *fifty* of the best selling specialties made. *Quick and certain* profits are assured to the enterprising dealers who stock them. Hundreds of jobbers recognize the superiority of *Humboldt design, workmanship and finish.*

Prompt Deliveries Liberal Discounts

SEND FOR CATALOG AND DEALERS' DISCOUNT

REAR TIRE HOLDER WITH LOCKING BASE
For Ford Cars

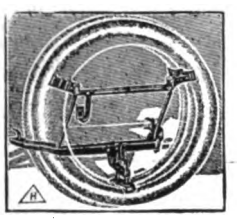
Fastens to the rear frame in an easily accessible manner, and the license bracket is clamped around the two supporting arms. The locking base is another notable feature making the tires secure against theft. The tires are carried clear of the exhaust. Strongly built from malleable iron and steel, finished baked ebony enamel. Suitable for one or two tires. Packed complete with straps.



No. 1287 ..... Price, $4.50

REAR TIRE HOLDER TO FIT DEMOUNTABLE RIMS
For Ford Cars

Designed for carrying one or two tires on demountable rims. The tires are rigidly held in position without the use of straps or other troublesome attachment and can be locked to prevent theft by simply passing a padlock around the two adjusting lever screws. Constructed from malleable iron and steel. Finished in baked ebony enamel.



No. 1286 ..... Price, $7.50

COMBINATION CRANK HOLDER LOCK AND LICENSE BRACKET
For Ford Cars

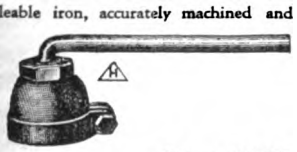


Attached to front spring clips and fitted with a folding prong which holds the crank in a vertical position. Eliminates swinging and rattle. Eye loop permits locking the crank by means of a padlock. The front license number is also attached to this bracket. Made of malleable iron, finished in baked ebony enamel.

No. 250 ..... Price, $0.90

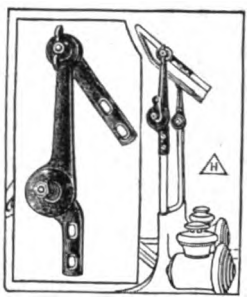
ADJUSTABLE WHEEL PULLER
For Ford Cars

Made of malleable iron, accurately machined and finished in our baked ebony enamel. Has an adjustment clamp feature which prevents stripping of threads.



No. 390 ..... Price, $0.75

VENTILATING WIND SHIELD ATTACHMENT
For Ford Cars

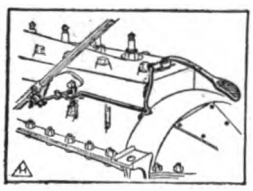


Designed to replace the hinges originally supplied on a Ford wind shield, converting it into a rain vision and ventilating shield, providing safety and comfort in all kinds of weather. Easily and quickly applied by the use of screw driver only. No holes to be bored or other changes necessary. Finished in baked ebony enamel.

No. 1500 ..... Set, $2.50

FOOT ACCELERATOR
For Ford Cars

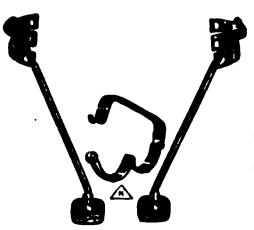
The best, neatest and most easily attached accelerator on the market. Applied within 20 minutes without boring holes or otherwise marring the car. Permits a perfect foot control, independent of steering wheel control. Finished in baked ebony enamel.



No. 71 ..... Price, $1.00

RUNNING BOARD TIRE HOLDER TO FIT DEMOUNTABLE RIMS
For Ford Cars

Holds one or two tires up to 4" plain and 3½" mounted on demountable rims. Fastens to the running board by means of 4 bolts to each arm. The arm castings are hinged to fit snugly around tires. A hinged locking base is supplied to prevent theft of tires. Made of heavy malleable iron and steel throughout. Handsomely finished in baked ebony enamel. Supplied complete with straps, but without padlock.



No. 1281 ..... Price, $3.00

ADJUSTABLE WHEEL PULLER
For Ford Cars

Identical in general construction, finish and workmanship as our No. 390 wheel puller, with the exception that it is supplied with a set screw instead of a lever handle.



No. 391 ..... Price, $0.50

PRESSED STEEL LINED BRAKE SHOES
For Ford Cars

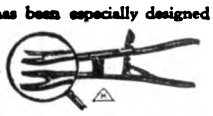


Decidedly different from the usual lined brake shoes for Fords, being made of steel throughout. Are therefore indestructible and will last as long as the car. Provides a thorough efficient brake, being lined with extra quality wire woven asbestos brake lining. Packed in carton, including springs.

No. 1260 ..... Per Pair, $2.00

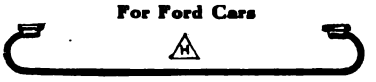
SPECIAL VALVE LIFTER
For Ford Cars

While this valve lifter has been especially designed to perfectly fit on Ford valves, however it will also fit a large majority of other makes of cars. Made of malleable iron and finished in baked ebony enamel.



No. 172 ..... Price, $0.60

SOLID FOLDING ROBE RAIL
For Ford Cars



Practical robe rail for Ford and other cars. The rail is 7-16" solid rod. Finished in baked ebony enamel. Total length 30".

No. 1284 ..... Price, $0.50

ADJUSTABLE REAR AXLE TRUSS
For Ford Cars



A superior axle truss, furnished with a hexagon turn buckle, allowing any desired adjustment. Can be attached in 15 minutes without removing wheels, by use of a wrench. The end clamps are fastened to the rear axle near the hubs. Finished in baked ebony enamel.

No. 37 ..... Price, $1.30

HEAVY DUTY HUB CAPS
For Ford Cars

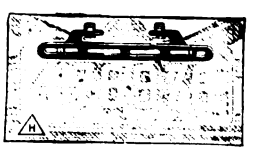
Made from solid casting, accurately machined, and finished in baked ebony enamel. Superior to thin brass shell caps.



No. 150 ..... Price, $0.40

FRONT LICENSE BRACKET
For Ford Cars

Designed to fasten under the front spring clip nuts. Made in one piece and cannot become loosened by vibration. Constructed of malleable iron, finished in baked ebony enamel.



No. 251 ..... Price, $0.35

HUMBOLDT PRODUCTS

Tire Holders, Axle Trusses, Robe Rails, Foot Rests, Wrenches, License Brackets, Vulcanizers, Anti-Rattlers, Cutouts, Foot Accelerators, Wind Shield Ventilators, Oil Gauges, Brake Shoes, Wheel Pullers, Valve Lifters, Valves, Springs, Etc.

DEALERS NOTE

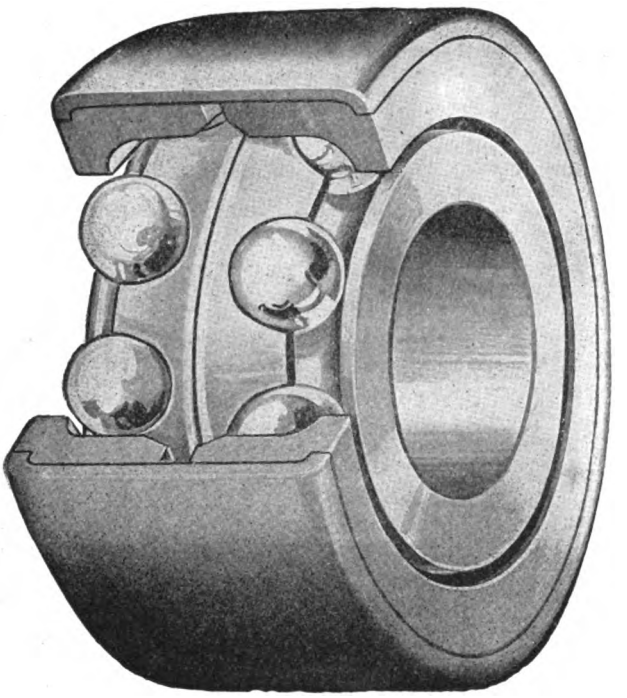
Humboldt Products offer an excellent opportunity to increase your sales.

Every article we manufacture is a fast seiler.

Write to us or your jobber, for dealers' proposition.

Humboldt Machine & Stamping Co., 83-10th Street, Long Island City, N. Y.

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An Ideal Realized

In 1913 our General Manager insisted that, if we only make five ball bearings a year, those five should be the best ball bearings in the world.

Our officials and employees have been so instilled with this determination to attain super excellence, that we now create *the* quality ball bearing—unequalled in accuracy and unsurpassed in refinement, design, material and finish.

Our present great quantity production of guaranteed ball bearings is the result of a quality preference by leading builders of automobiles and machinery.

Helpful literature and free engineering service at your disposal.

THE NEW DEPARTURE MFG. CO.
Bristol, Conn.

Western Branch: Ford Bldg., Detroit
Distributors in all principal cities.

NEW DEPARTURE BALL BEARINGS



"Micro Piston Rings Give Me More for My Money than Anything Else Ever Put in My Car."

Give Micros a chance, and your bad carbon troubles and waste of oil and gas will vanish.

Micro Rings keep the cylinders tight, even after bad leakage with plain rings, and by so doing also help to keep valves tight and plugs clean.

If you want plenty of power out of an old motor, with less maintenance expense and annoyance, Micro Rings will show improvements that you can't afford to miss.

The outer ring seals the opening in the inner ring, and equal expansion against the cylinder wall in all directions produces perfect contact at every part. There is no break in the continuity of the bearing surface or pressure tightness, either while the rings are new or when they get old, and Micro Rings never break in fitting.



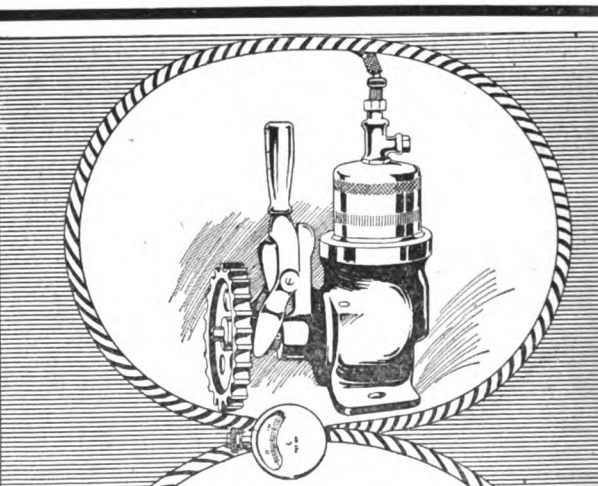
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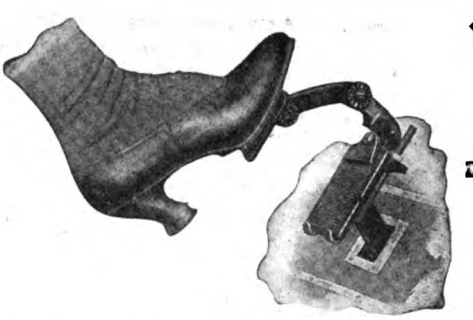
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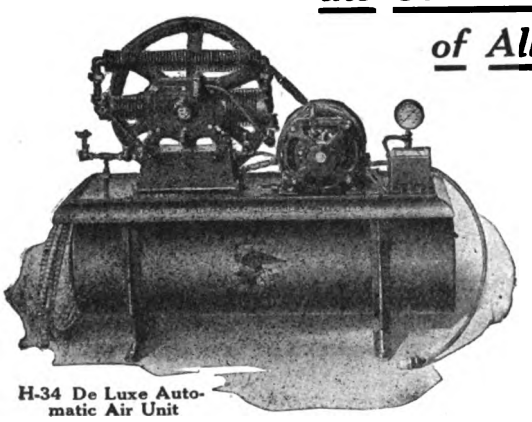
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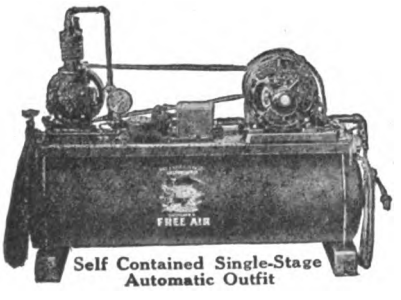
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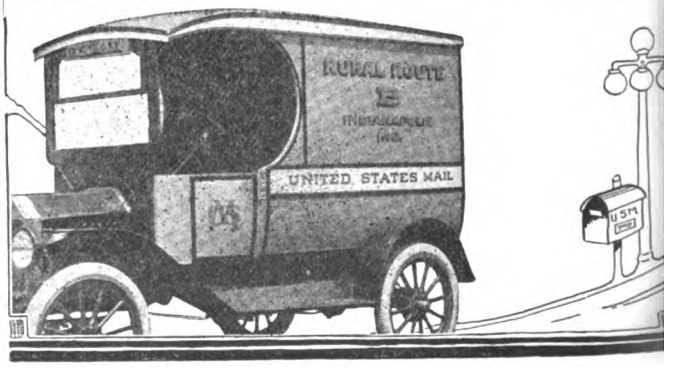
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One dealer says: "The automobile owner is generally a pretty keen buyer and he can see in a minute, that strong, sturdy

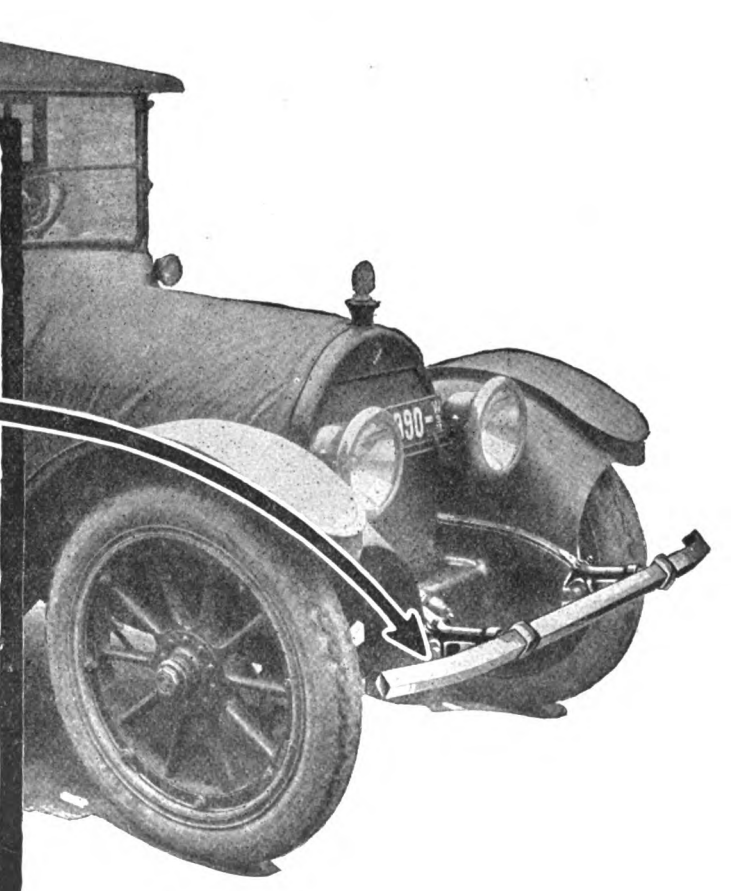
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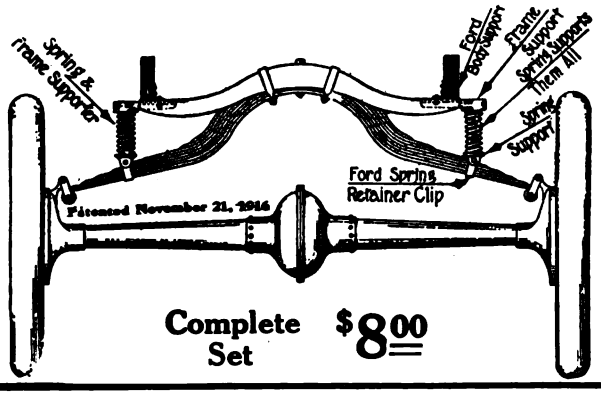
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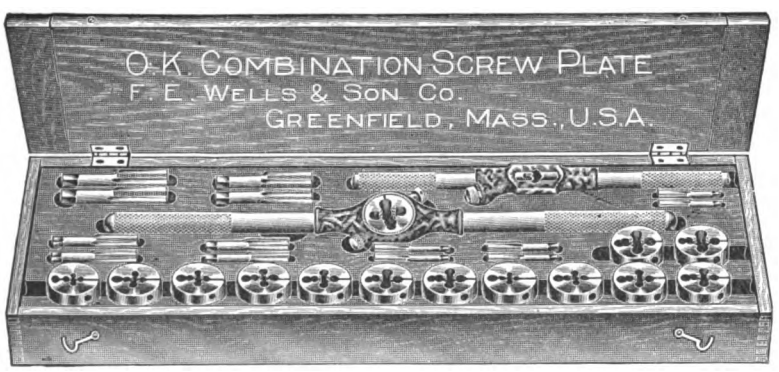
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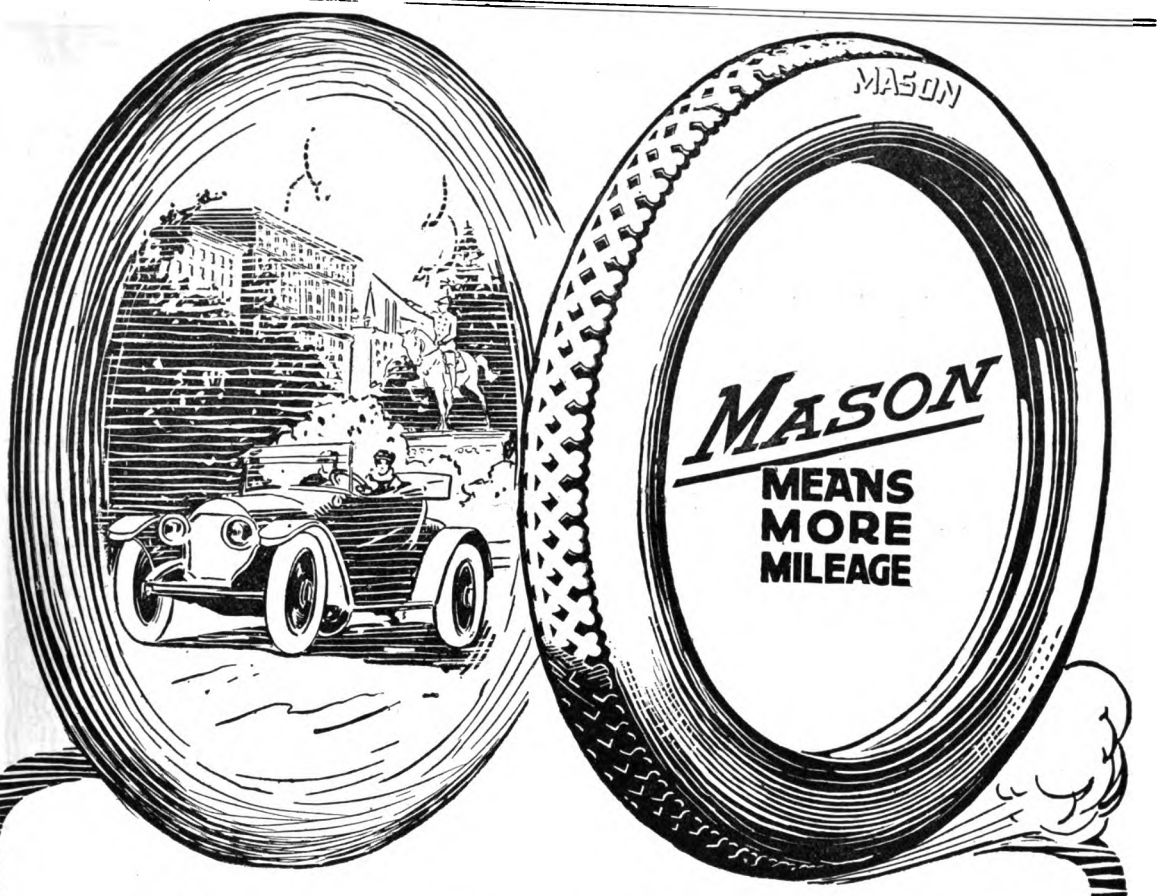
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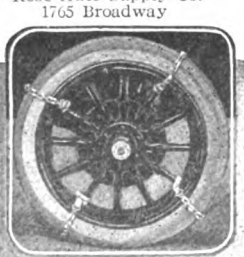
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A JOURNAL OF PRACTICAL MOTORING

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VOL. XXIII, No. 4. NEW YORK, JUNE, 1917. PRICE { 10c PER COPY / $1.00 PER YEAR

BATTERY RECHARGING.

The Construction and Winding of Dynamos and the Conditions of Running.

BY SYDNEY F. WALKER, M. E.

No. 2.

The dynamo employed for motor car lighting and for train lighting, is with one exception that known as the shunt wound continuous current machine, sometimes called the shunt wound direct current machine. The special feature of the machine is, the coils which carry the current that is to create the magnetism in the space in which the armature of the machine revolves, are connected, as what electrical engineers call a "shunt" to the armature coils themselves. Fig. 6 is a sectional drawing, of a dynamo such as is employed for motor car lighting. The drawing only shows sections of the iron portions of the machine. As will be seen, there is a containing cylinder which is sometimes made in the form of a rectangular sectioned box; and it carries on its inside two lugs of iron, pointing radially inwards, where a cylinder is employed, and the equivalent where a rectangular section is employed. There are usually only two of these lugs, fixed right opposite to each other, but a few makers prefer to have four, as shown in Fig. 7. The lugs are usually rectangular in section, and they are the cores of the field electro magnets of the dynamo. When an electric current passes through the coils of wire with which the cores are wrapped, as shown in Fig. 8, the whole system shown in Fig. 6 becomes electro magnetic; one of the cores becomes a north seeking magnet, and the other a south seeking magnet; and what Faraday called lines of force pass from the north seeking core, across the space shown between it and the cylinder shown in the middle of Fig. 6;

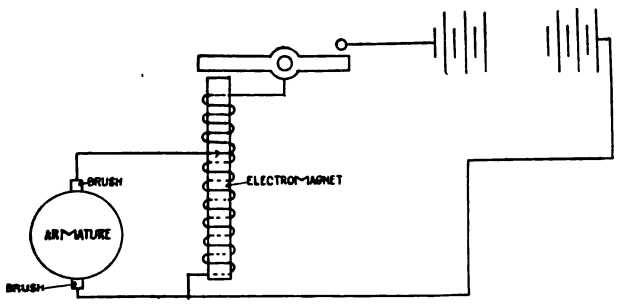


Fig. 4—Diagram showing arrangement of dynamo cut in and out, and accumulator.

they divide between the two halves of the cylinder; it is the armature core; then pass across the other space, it is an air space, to the south seeking core; and they then divide between the two halves, the two sides of the containing cylinder, and find their way back to the north seeking core. As mentioned above, the iron cylinder shown in the middle of the drawing represents the armature core; it is also wrapped with wire coils, as explained below, and when it is revolved in the space provided for it, between the north and south seeking cores, electric pressures are created in its wire coils, which are led out, through the commutator and brushes shown in Fig. 9, to the accumulator, the lamps and wire coils that are coiled round the north and south cores. Where four cores are used, those opposite each other are both either north seeking or south seeking, so that they alternate round the containing cylinder; N. S., N. S.

The electrical pressure that is created in the coils

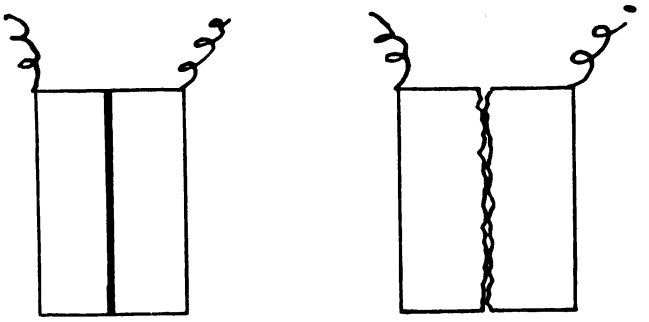


Fig. 5—Diagrammatic sketches showing how two surfaces of switch contacts should press against each other, and how they sometimes are worn by sparking.

on the armature depends directly upon the number of lines of force passing into the armature core, from the field magnet poles, and passing out again to the other field magnet poles; and also upon the number of turns of wire on the armature, and the speed at which it is driven. A certain pressure is created between the brushes; and it is this pressure which causes the current to flow through the field magnet coils. Anything which increases or decreases pressure between the brushes, increases or decreases the strength of the current flowing through the field magnet coils, and with it the number of lines of force passing through the armature. The pressure at the brushes is less to the extent of the charge which the resistance of the armature coils makes for the passage of the current flowing through them. Whenever an electric current passes through a conductor, it flows in obedience to an electrical pressure existing between the ends of the conductor, and the charge is made on that pressure for the passage of the current through the conductor, due to the necessity of the pressure overcoming the resistance of the conductor. The charge in this case varies with the strength of the current flowing through the armature coils; that is the reason for the peculiar characteristic curve of the shunt wound dynamo. When no current is passing into the outer circuit; in this case the accumulator and the lamps, the only current passing through the armature coils is that required for the field magnets, and this being a small proportion of the total current furnished by the dynamo, the fall in pressure is not great; the pressure forcing current through the field magnet coils, and creating lines of force in the armature core, is at its highest for a

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given speed. In designing a shunt wound dynamo for any given work, such as the charging of the accumulator of a motor car, and furnishing current for the lamps of the car, provision is made that the pressure at the brushes shall be sufficient to drive the necessary current through the field magnet coils to give the required number of lines of force that will create in its turn, the pressure in the armature coils. But it must be understood, the calculations for a dynamo to do this work are necessarily made, on the supposition that a certain speed is maintained. If, as in the case of a motor car, the speed

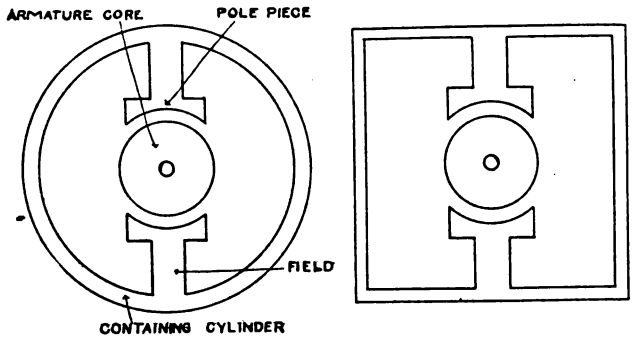


Fig. 6—Diagrammatic sketches showing sections of a two-pole dynamo with pole pieces and armature core, and with a cylindrical containing vessel, and a rectangular one.

increases above that for which the calculation is made, the pressure at the brushes is increased owing to the increased speed, and the pressure at the brushes being higher, a more powerful current passes through the field magnet coils, increasing the number of lines of force, so that the increase in the pressure at the brushes, and at the terminals of the accumulator and lamps, rises and falls in a compound ratio, with the rise and fall of speed.

The variation in the pressure at the brushes of a shunt wound dynamo, with variation of the current flowing in the outer circuit, necessarily depends upon the resistance of the armature. Taking the case of a motor car lighting outfit, in which the charging current for the accumulator is 10 amperes, if the resistance of the armature was 1 ohm, the pressure at the brushes would be reduced by 10 volts, when the accumulator current was flowing, while if the resistance is only 0.1 ohm, the pressure is only reduced by 1 volt. It should be mentioned here, that the fall in pressure at the brushes of a shunt wound dynamo, also increases at a compound ratio, as the strength of the current flowing in the outer circuit increases; there is a fall in pressure due to the increased charge upon the initial pressure for the passage of the increased current, and there is a fall in the initial pressure due to the fall in pressure at the brushes. Where shunt wound machines are used for large work, the armature resistance is made as low as the designer is allowed to, as low as the sum allotted to the construction of the machine will enable him to. A low resistance armature means a larger armature than a high resistance one. With the small machines used in motor car work, they are very small indeed, and as usual they bring special problems for solution in consequence of their size; it is not possible to allow of comparatively low resistance, neither the space nor the limiting cost will admit of it; but this brings in its train an easier solution of the problem than would otherwise be possible, if the whole conditions are carefully studied. Fig. 10 shows curves of shunt wound machines.

In addition to the variation in the pressure at the brushes due to the charge for the passage of the current through the armature resistance, there is another factor which has to be taken into account, viz., the saturation, as electrical engineers term it, of the iron cores of the field magnets. The lines of force referred to above, which Faraday conceived as passing everywhere where magnetic phenomena existed, are governed, as to their number, by what is called the "reluctance" of the magnetic circuit. There is in every dynamo, a magnetic circuit corresponding in many respects to the electric circuit. The number of lines of force in the magnetic circuit depends directly on what may be termed the magnetic pressure. It corresponds very fairly to the electric pressure in an electric circuit, and inversely on the magnetic reluctance, which corresponds very fairly with the electric resistance of an electric circuit. The magnetic pressure which is termed the magneto motive force by electrical engineers, is measured by the product of the current flowing in the field magnet coils, and the number of times it flows round them; that is to say, upon the number of turns in the coil, and the strength of the current in amperes. If a given machine, for instance, has 1,000 turns of wire on its field magnet coils, and the exciting current flowing through them is 1 ampere, the number of ampere turns, the magneto motive force, or magnetic pressure will be 1,000. The reluctance of the magnetic circuit follows very much the same laws as the resistance of the electric circuit; it varies directly as the length of the path covered by the lines of force, and inversely on its cross section. Modern dynamos are much more efficient than those of the early days of electric lighting, partly because the path of the lines of force is shorter, and has a larger cross section. In the dynamo outlined in Fig. 6, the path for the lines of force is very much shorter than it would have been in the machine for the same output made just after the master patents expired. To reduce the magnetic reluctance also, the armature is embraced

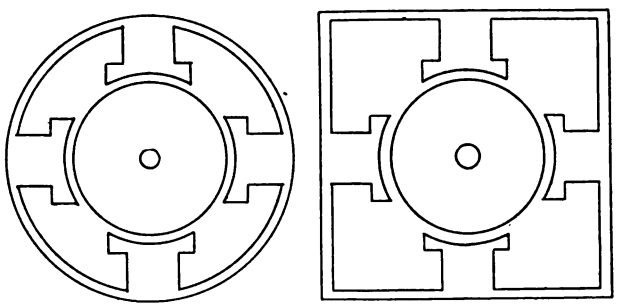


Fig. 7—Sectional diagram of a four pole dynamo with cylindrical and rectangular containing vessel.

for a large portion of its surface, by the two crescent shaped pole pieces shown in Fig. 6. The magnetic reluctance of the dynamo outlined in Fig. 7 is less, for a given output, than that in Fig. 6 because again the path of the lines of force is shorter. As with the electric circuit also the resistance or reluctance of the magnetic circuit depends upon the substance through which the lines of force are passing. For practical purposes, there are only iron and its alloys and a few other substances. There is a small difference between the relative reluctances of some other substances, but it is not great compared with

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the difference between the reluctance of every one of them, and that of iron or steel. Air has the highest reluctance of any substance upon which measurements have been made. It is 1,460 times that of wrought iron; that is why the air space between the poles of the field magnets and the armature is made as small as possible in the direction in which the lines of force pass, and of as large a sectional area as possible; these two are accomplished by running the armature close to the field

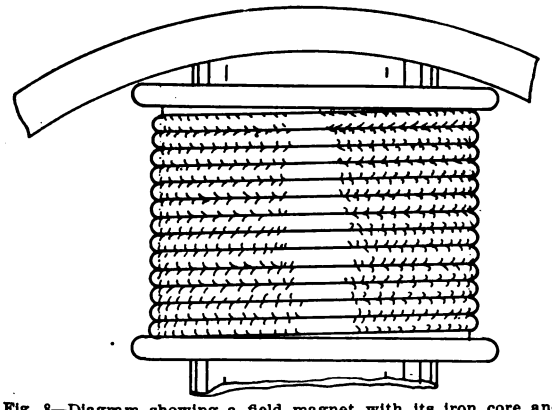


Fig. 8—Diagram showing a field magnet with its iron core and the wires coiled round it, and a portion of the containing cylinder. The wire is shown large for clearness.

magnet poles. But the number of lines of force that can be created in any dynamo system is subject to the number that can be accommodated by the iron or steel portion of the machine.

When a bar of iron or steel is magnetized, by causing a current of electricity to flow through the coils surrounding it, it responds very quickly at first; that is to say, if the magnetic pressure, the number of ampere turns, is gradually increased from zero upwards, the number of lines of force produced in the bar rise very rapidly for a certain portion of the experiment till a certain figure is reached, and after that they rise more slowly and finally it refuses to take any more, to produce any more lines, no matter how much the magnetic pressure may be increased. Fig. 11 shows what are called magnetization curves of different qualities of iron, and of a special kind of magnetic steel that has been produced within the last twenty years, especially for the construction of dynamos. Horizontal distances are magnetic pressures; ampere turns per lineal inch of the bar that is being magnetized; vertical distances are the number of lines of force produced per square inch of the bar. It will be noticed that there is a great difference between the number of lines of force created in a bar of gray cast iron for a given magnetic pressure, and a similar bar of wrought iron; while a bar of the magnetic steel referred to takes a still higher degree of magnetization, allows a still larger number of lines of force to be created in it than wrought iron.

It will be noted that between zero and a magnetic pressure of 10 ampere turns the increase in the number of lines of force of both wrought iron and steel is very rapid. It rises, in the case of steel, to 60,000 lines per square inch, and in wrought iron to about 44,000, while with gray cast iron it is only about 9,000. With a magnetic pressure of 20 ampere turns, steel has 85,000 lines of force per square inch, wrought iron about 74,000 and gray cast iron 24,000; with 30 ampere turns, steel has risen to 97,000, wrought iron to 85,000, and gray cast iron to 34,000. As will be seen, the rapidity of the increase in the number of lines of force is already checked. Following the curve it will be noted that at 70 ampere turns, steel has risen to 108,000 lines, it rises to 109,000 with 80 ampere turns, and very slowly indeed beyond, wrought iron and gray cast iron following on similar lines, though the number of lines of force created in them is always smaller than in steel, gray cast iron being very much smaller. If the magnetic pressure is still further increased, it is found that no further increase of lines of force is obtained; the steel and iron are stated to be saturated.

For shunt wound dynamos that are used in electricity generating stations, the iron or steel is excited to about the horizontal portion of the curve, and the same thing rules for the small dynamos that are used for motor car lighting. This matter of the saturation of the iron leads to important results in connection with the regulation of the pressure furnished by the dynamo. It will be remembered that when the speed of the dynamo is increased, the pressure at the brushes is increased. When the iron or steel cores are saturated, the increased pressure at the brushes due to the increased speed, though it forces an increased current through the field magnet coils, cannot produce an increase in the lines of force, and therefore the rise of pressure at the brushes is less than it would be if the lines of force were increased, and it may be even reduced, owing to the increased charge for the passage of the increased current through the resistance of the armature coils, the increased current being due to the increased speed. And so, the present writer makes out, that a carefully designed shunt wound machine may be self-regulating, within practical limits, owing to the working of the law mentioned above.

Conditions of Running.

When the conditions of running are examined, in view of what has been stated above, the difficulties of maintaining the pressure at the terminals of the accumulator may be found to be not as difficult as

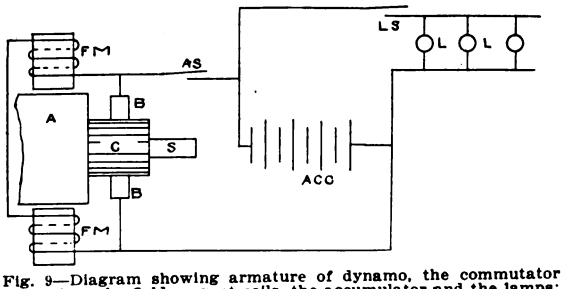


Fig. 9—Diagram showing armature of dynamo, the commutator and brushes, the field magnet coils, the accumulator and the lamps; this diagram shows the connections between the dynamo and the other apparatus. A is the armature, C is the commutator, BB are the brushes, S is the axle, FMFM are the field magnets, AS is the automatic switch, ACC is the accumulator, LS is the lamp switch, and LL are the lamps.

they seemed at first sight. Taking a 12 volt service, the accumulator will require a charging current of 15 volts pressure, and it may require a pressure of 16.5 volts; but neither of these pressures should be required for the major portion of the time the car is running providing that a little forethought is used. As explained at the beginning of the article, the charging pressure required for the lead accu-

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mulator is in the neighborhood of 2.2 volts per cell, say 13 volts for a 6 cell battery, for a large portion of the period of charge; it is only when the charge is nearly complete that the charging pressure is required to rise, first gradually, and then rather sharply to 2.5 volts per cell, and at the finish 2.75 volts per cell. Most cars, the writer takes it, will have a certain speed at which the major portion of

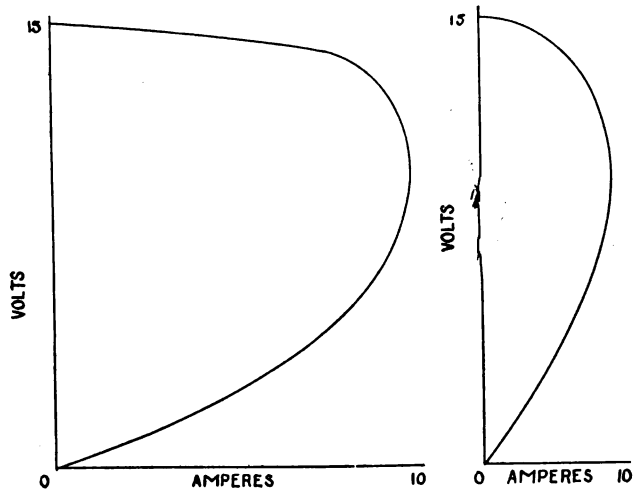


Fig. 10—Characteristic curves of different types of shunt wound dynamos. The vertical heights represent the volts, when the current shown by the horizontal distance from the point O is passing. It will be noted that the fall of pressure in the left-hand curve is very gradual, it is what would be called a flat curve; a shunt wound dynamo with that curve would show a very small difference in the pressure, until the current got fairly large. In the right-hand curve it will be noted that the pressure falls very rapidly as the current increases. The effect is rather exaggerated in this case to show the operation and the possibility of constructing a machine without any other regulating device, to meet the requirements of motor car work.

the running is done; and he suggests that, if this speed is made to correspond with that at which the charging pressure will be 2.2 volts per cell, things should work fairly satisfactorily, without the assistance of the complicated apparatus that has been introduced to keep the pressure down when the speed rises. It goes without saying that the less complication there is about a motor car electric lighting outfit the better; and that simplicity would be economically bought, even at the cost of a moderately large increase in the bill for upkeep of the accumulator.

Assume that the regular running speed, when the road is clear, is 20 miles an hour; possibly in America you will be able to exceed this; let the driving arrangements and the design of the dynamo be such that it furnishes a pressure of 13 volts for a 12 volt set, or 6.5 volts for a 6 volt set, when the car is running at that speed; when it is crawling through town traffic, the battery will be disconnected and will only be losing a certain amount of current by leakage, except when the lamps are alight, and when it is used to furnish current for the horn. When the automatic switch cuts in, the dynamo will take up the charging, and will furnish the pressure of 13 volts as before, any loss which the accumulator has incurred being made up during the next run. If the amount of current taken from the accumulator is less than that put into it, after allowing for charges for conversion—these are fairly heavy—the back pressure of the accumulator will commence to rise after a time to 2.5 volts, and later to 2.7 volts per cell, if the charging current is able to maintain that pressure. Now, assuming that the dynamo was delivering the proper charging current at 2.2 volts per cell, up to the time when the back pressure increased. If the dynamo is properly constructed, the increased back pressure will cut off a portion of the current that has hitherto been flowing through the accumulator and through the armature coils, with the result, as explained above, that the pressure at the brushes will rise, due to the smaller charge for the passage of the current through the armature, and the increased pressure at the brushes will cause a rise in the number of lines of force and a further increase of pressure. If the dynamo has been designed so that it can receive an increased number of lines of force, the charging pressure will increase at a compound ratio, and the charging current should be maintained. It is a question of calculation in the design of the dynamo, followed as usual by careful tests of sample machines.

If the motor runs at a higher speed than that for which the dynamo has been constructed, say when putting on a spurt for some special purpose, if the design of the dynamo is correct, if the quantity of iron or steel in the field magnet cores and armature cores are correct, the increased pressure at the brushes and therefore at the accumulator terminals should be again reduced, and it may be reduced sufficiently to ensure that no harm is done to the accumulator. If the speed of the motor increases, say, from 20 to 25 miles an hour, the effect upon the accumulators of only a small period during which the charging current has its pressure proportionately increased, may be very serious, but if the dynamo has been designed on the lines mentioned above, the first effect of the increase of speed will be an attempted increase of pressure that the dynamo may not be able to accomplish. The increased pressure would cause an increased strength of current to flow through the accumulator, and

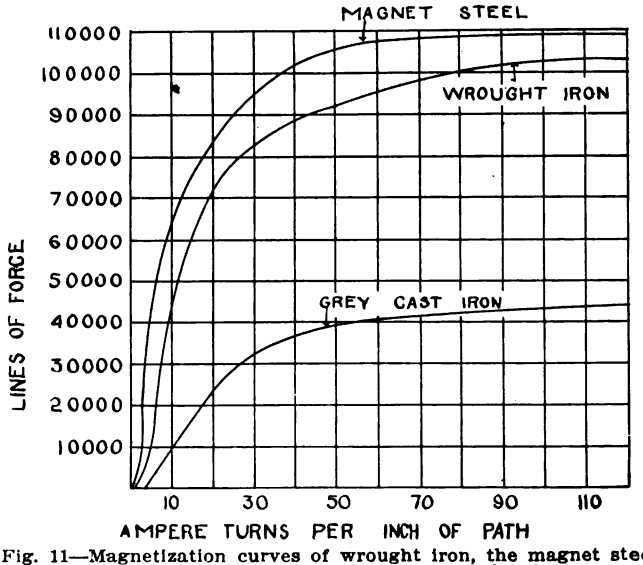


Fig. 11—Magnetization curves of wrought iron, the magnet steel that has been introduced since the advent of the dynamo and gray cast iron. Vertical distances represent the number of lines of force per square inch of the sectional area of the metal, horizontal distances represent the ampere turns, the magnetic pressures per inch of length of the bar.

through the armature coils, but this would increase the charge for the passage of the current through the resistance of the armature coil and lower the pressure, providing that the cores of the field magnets and armature were saturated when the machine was running at 20 miles an hour. Presumably spurts to 25 miles an hour or more would only be occasional, and for a short time; if 25 miles or 30

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miles is to be the usual running speed, the dynamo would be constructed to furnish its 13 volts, or 6.5 volts at that speed. British manufacturers find that their machines are so self-regulating in this respect that when 6 volt sets have been connected to 12 volt dynamos, made on the above lines, no harm has resulted; the machines have furnished only the required 6.5 volts.

It has been found in practice also, that when an accumulator is "floating," as it is termed, on the circuit of the dynamo, giving and taking as required, it works best, and demands the smallest amount of repairs. All sorts of things happen in the matter of speed when a motor is running; there will be times when the speed is lowered below that which gives the charging pressure, but not to that at which the cut-out would operate; the accumulator would then be discharging, but as these occasions are of small duration, or should be, it soon picks up again when the proper charging speed is again reached.

(To be continued.)

SECOND-HAND CARS.

Conditions Succinctly Stated as to How They May Safely Be Purchased.

From Mrs. A. Sherman Hitchcock, Rhode Island. —Now is the time to buy a second-hand motor car. Many women who would like a car but cannot afford the particular make they prefer or pick out as suitable for their use, hesitate when it comes to purchasing the same make after it has seen considerable use and has been turned in on a new model by an over-fastidious owner. As a matter of fact, the greatest value for the least money may be obtained by picking up a car with a standard name on it which has become old, needs a coat of paint or something of that sort, so that the previous owner preferred to trade it in on a newer model.

It is always best to obtain an expert's opinion before finally buying, unless you have already had sufficient experience to discriminate positively between a mechanism which has been fairly worn and one which has been torn about by bad driving and neglect. Where the assistance of an unbiased expert can be called in, the purchaser may have an easy mind; in default of this a resume of some of the chief points on which you should satisfy yourself may prove useful.

In looking at a second-hand car previous to purchase, you should be governed by the following points: The reputation of the manufacturer. The reputation of the seller. The age of the car and mileage covered. The guarantee accompanying it or lack of the same. The general appearance of the mechanical parts, not the paint. The running qualities as shown in a demonstration. The price as compared with the original price.

I consider that the name of the manufacturer is worth more than any other one thing. When a car bearing a certain name has been made for several years and sold with success, it is a safe assertion that this car is as well made as is possible at the selling price. For this reason that name has a double value on a second-hand car, whether purchased from the original owner, the manufacturer or his representative, or a dealer in second-hand cars. Next in order comes the seller's reputation. The present situation has brought about the establishment of many firms doing this kind of business exclusively, that is, buying up, restoring and selling all makes, sizes and types of old motor cars. These may be classed as good, bad or indifferent. Always buy from the first-named. In the case of dealers in cars of other make than the second-hand car offered for sale, the reputation of the firm for fair dealing should be given proper weight.

The influence of mileage covered by the car, the less distance it has been run, other things being equal, the better purchase it is. As to age, the older the car the more carefully it should be inspected and examined. It is obvious that a five-year-old car has seen more and harder service, possibly in the hands of two, three or more owners, than the car which is but one or two years old. Obviously, also, the price will vary with the age and mileage, so you must balance what you are able to pay against these two quantities as offered in the car under consideration.

The matter of guarantees is self-explanatory. If the car is good enough to permit the maker giving a guarantee upon it, it is good enough to buy without, paradoxical as that may sound. The best makers all give guarantees now and the majority of reputable dealers give them on rebuilt second-hand cars.

In general appearance, the prospective buyer should not be misled by a coat of paint or the lack of it. Of all the things that go to make up a motor car, paint is the cheapest, most easily obtainable and most easily applied. What should be looked for in this connection is broken or bent fenders or fender irons, cracked or loose spokes, missing bolts, nuts or rivets, the lack of lamps, searchlights, top, windshield, hub or radiator caps, cracks in the woodwork, and similar important things.

Unless the car is very old, say, six or eight years, and the price ridiculously low, as, say, $50 or such a matter, the buyer should insist on a good demonstration. If the car is in running condition and the owner or dealer really desires to sell it on its merits, there will be no discussion as to this trial trip. The purchaser should insist upon a few things in this test ride.

Particular attention should be paid as to how the car starts. It should start smoothly and without any perceptible jar. A very slow speed will bring out the bad conditions of the motor bearings and joints as well as those of the transmission. A very high speed will also tell through the medium of noise made or lack of it, whether the principal bearings are in good shape. You should insist on a very quick change from the very slow speed to a medium pace and a very quick change from the very high speed to a slower one. These quick changes of speed will bring out bearing conditions and wear through the medium of knocks and pounds, as nothing else will.

Insist upon a hill-climbing test, to show, in connection with the speed test, the power and flexibility of the motor. The brakes should also be tested and should be sufficient to bring the car to a stop and hold it on a hill, both forward and backward. Since the safety and even the lives of the passengers are at times dependent on the brakes, it is imperative to see that the brakes are in good condition or to be assured, if they are not, that relining will make them absolutely safe.

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After a good stiff run of a few miles, the motor should be examined and should evince no sign of overheating. That is, the water should not boil. If the motor continues to run after the spark is thrown off, it is a proof that the cylinders have become carbonized. This, however, is a matter that is easily remedied, as the carbon can be removed. Much may be gained by noting the general quietness and ease of operation of the car.

If the car has been bought at the right price it will in many cases probably pay to have it overhauled. This should be done by a branch of the factory manufacturing the car, or their selling agent, who is absolutely reliable. Get an estimate on what this job will cost.

Tires are a very important consideration and have a large bearing upon the price of the car, as their replacement is a heavy item in expenditure. So an essential point to be considered in connection with buying a used car is the general condition of the tires. Nothing is more annoying than to start the season with a set of old tires and patched tubes which are constantly giving out and causing trouble.

If the general condition of the car is good and the tires are in poor condition, this can easily be overcome by recovering at a cost according to the size, and providing the fabric has not been worn, they would be in good condition to start the season. The best place to send tires to be recovered is back to the manufacturer who made them.

When you have examined a likely car, it is well to make an estimate, and a fairly liberal one, for any adjustments and replacements which may be thought necessary, and this amount should be added to the purchase price of the car.

In the case of the motor and other mechanism, only a practical and well-trained mechanic would be capable of discriminating between fair wear and misusage, but the points I have mentioned should be considered before the final selection is made. There are motor owners who make a practice of changing their car every year. Others run successfully the same car for three or four years. I know personally that in many cases exceptional bargains are picked up in second-hand cars, but the one essential thing to know is when to buy, when not to buy, and to buy at the right price.

GARAGE AND REPAIR WORK.

Steam Engine Power and How It Should Be Selected and Installed.

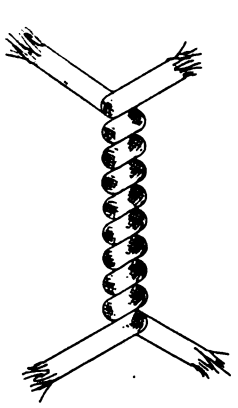
No. 2.

From J. F. Springer, New York.—Some considerable reasons may influence particular repair shops to prefer steam to other sources of power. One such reason might be the cheapness of coal in the neighborhood where the shop is situated. However, it should be borne in mind that the cost of fuel is only one item connected with the generator of power.

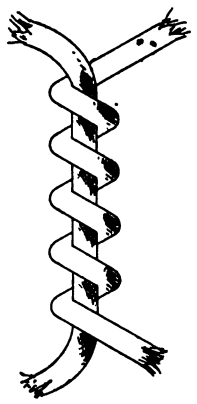
We will assume that all questions have been weighed and that it has been decided to use steam. A boiler is, of course, a necessity. As the fire will be associated with the boiler, a location must be chosen which will be a safe one. It may be advisable to consult the insurance people upon this point, as it would be very awkward to get the boiler installed and then to find that insurance would be expensive or perhaps that insurance would not be possible. Let it be remembered, however, that the engine does not necessarily have to be located at the same spot as the boiler, although in a small plant it will be found convenient to have them close together. If there is any considerable distance between the two, then the steam pipe connecting them should ordinarily be protected by the use of 85 per cent. magnesia. In fact, it will be well to cover the boiler itself with the same material. The object in view in covering pipe and boiler is two-fold, (1) to avoid the serious loss of heat that would otherwise occur, and (2) to avoid communicating heat to woodwork and other combustible material nearby and to the surrounding atmosphere.

Boiler Covering.

Eighty-five per cent. magnesia is a heat insulator. It consists of 85 per cent. (or more) of carbonate of magnesium and the balance of asbestos fiber. While asbestos is itself a good material for the purpose, it is not so good as the carbonate of magnesium. It is necessary, however, to use some such material with the magnesia in order to make it hold together. The total covering should ordinarily be at least 1½ inches thick on pipe and on boiler. It will be convenient to cover the pipe with one or more layers wrapped around and secured in place. The material may be thick or thin—the point to bear in mind is to have 1½ inches of thickness when you are through. The boiler may be covered with strips placed side by side and held in place by suitable wires. It will often be convenient to put 1 inch of the thickness on in this way and then to finish by a ½-inch coating of the magnesia in the form of a



The Proper Way.

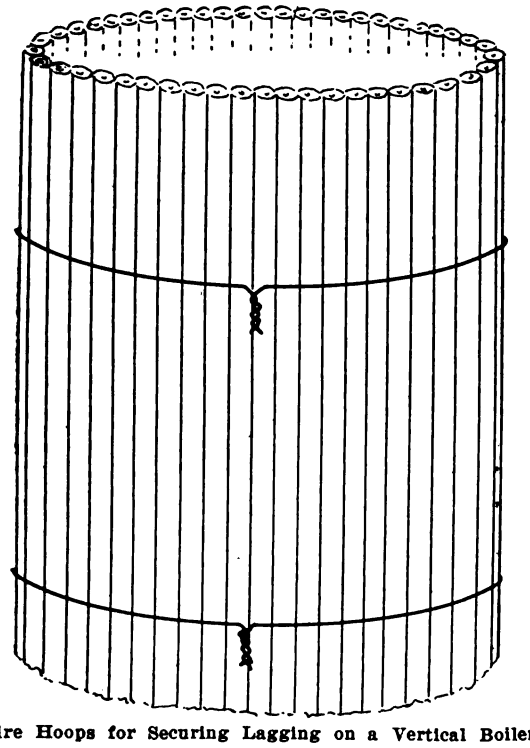


Improper Way of Twisting Wire.

cement or plaster. This plaster will be found convenient, too, when the pipe has to be covered at a bend or some other irregularity. In case you are recommended to buy corrugated sheets of the insulating material, especially for the pipe, do not be alarmed by the fact that when this comparatively thin material is wrapped round and round upon itself there will be a good deal of dead-air space. Such space is all right. In fact, carbonate of magnesium itself in the form of blocks is really nearly all air space. The magnesia really occupies less than 10 per cent. of the space apparently taken up. Dead-air spaces are understood to be splendid heat insulators. So do not be afraid of them. In wiring on the strips on the boiler, draw the wires up good and tight. A good way to do is to put the wires on in several pieces—each piece being a kind of hoop. The hoops may be first arranged simply tight enough to keep

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the strips of magnesia from slipping. The joint, however, where the two ends of each hoop are twisted together should be quite strong. In order to make it so, make sure that both wires are twisted. It is not a good job when the one wire is simply twisted about the other. After all the hoops are on, we may go ahead with the tightening. We select a place on a hoop a little distance away from



Wire Hoops for Securing Lagging on a Vertical Boiler.

the joint and run a steel rod underneath the wire. We may now twist this rod round and round in such way as to make a short loop. We then twist the loop in such way as to make its two wires twist each around the other. After the hoop has in this manner been drawn up tight we bend the loop over flat against the layer of covering. When the ½-inch coat of mortar is now put on, it will cover up the loops and make a presentable job. Metal bands may be put on at the finish for both the pipe and the boiler.

In selecting a steam equipment, we should usually get an engine a little more than equal to the demand for power at the moment. This makes it possible to add a new machine in the shop or to push the work there a little more heavily when some extra demand is made. Then get a boiler that is distinctly more than equal to the engine. For example, it is in effect recommended by competent authority to use, say, an 8-horse-power boiler for the case where one of 6-horse-power could be made to do the work. It will do the work better than the smaller one and with greater economy. In short, get an engine bigger than the work in sight and then get a boiler bigger yet.

Types of Steam Engines.

The simplest of all types of ordinary steam engines is the plain slide-valve machine. A representative stationary unit of this type will have a long bed of cast iron resting on the concrete or other foundation block. At one end are two bearing boxes in which is carried the engine shaft. This shaft is transversely arranged, and will have mounted on its two ends two fly-wheels, one on each end. The engine shaft is really a crank shaft. At the other end of the bed is arranged the cylinder. In it is a piston which moves back and forth horizontally. The piston has attached to it a piston rod which moves in a straight horizontal line. A piece called the cross-head is secured to the other end of the piston rod. The cross-head slides to and fro in suitable guides. As the steam forces the piston in the cylinder to shift back and forth, the result is an equal and similar movement of the piston rod and consequently of the cross-head in its guides. So far, we have nothing but a to and fro motion in a horizontal straight line. These movements should nevertheless be very perfect. It is this back and forth movement that gives to the ordinary apparatus the name of reciprocating engine.

We must get rotary motion in order to drive a line shaft. This is accomplished by using a connecting rod. This rod is pivoted at one end to the cross-head by the cross-head pin or wrist pin, and at the other end to the crank shaft by the crank pin. The crank pin may be one solid piece of metal with the crank shaft.

The two fly wheels instead of one are for the purpose of even running. Counterweights are secured to the crank to balance the weight of the crank, crank pin and part of the weight of the connecting rod. They also promote even running.

The cross-head should fit snugly in its guides. It should move easily back and forth in them with no tendency to bend the piston rod. Arrangements providing correctly for these things promote evenness of running.

A solid foundation block and an engine set on it so as to have the piston and cross-head guides absolutely horizontal and the axis of the shaft also exactly horizontal will tend to even, correct running. The matter of correctly setting the engine on the block is so important that it may be well to be still more specific. It is not the bottom of the bed that we want horizontal. Pay no attention to it. When the bed is let down to within, say ¾ inch of the top to the concrete of the block, this occurring before the cement mortar is put on, we block it up with pieces of bar steel plate. Now we must do the blocking-up in such way as to get the engine exactly right. We lay a level across the two bearing boxes and make sure that we have the bottoms of these boxes in a line that is exactly horizontal. As we may have trouble in using the level with its flat bottom for this purpose, we may interpose a short length of accurate line shafting. We lay the shafting in the boxes and then place the level on top of the shafting. Instead, we may put the crank shaft in place and test this shaft with the level. We must also test the cross-head guides (or some other part) in order to see whether the bed is exactly level longitudinally. Do not rest, if there is the slightest thing wrong when leveling lengthwise and crosswise. The cement mortar that is put in place after we are through blocking-up is to secure the engine in the position we leave it when we finish blocking.

The size of an engine is not expressed by its weight or the room it takes up, but by the diameter of the cylinder and the length of movement of the piston or cross-head. For example, an engine having an 8-inch cylinder and an 11-inch stroke is called an 8"x11" engine.

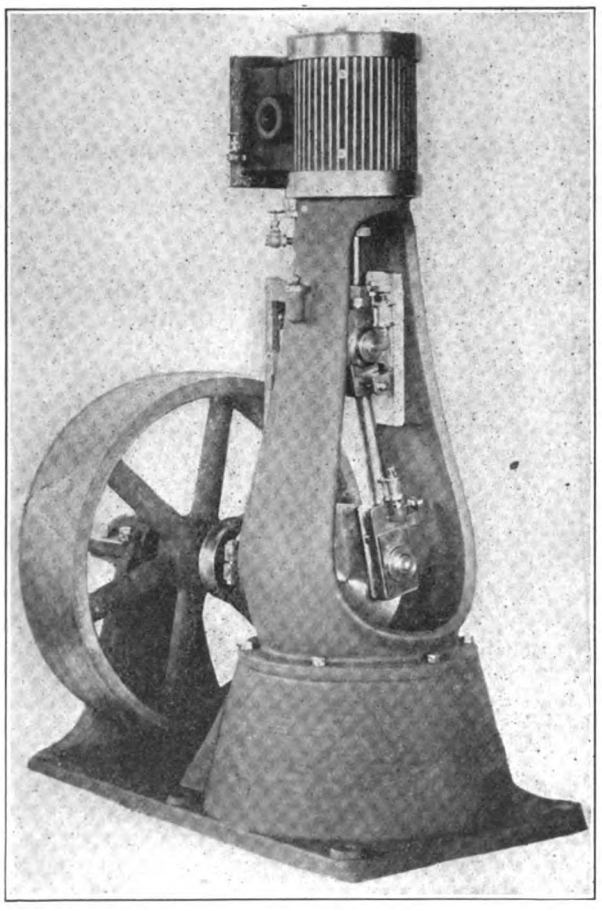
It is recommended that one should not economize

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on the accessory appliances for a steam plant. That is, we "should have a good pump, a good ejector, a good heater, an extra steam gauge, an extra fusible plug ready to put in, a flue expander and a beader." There should be a good outfit for cleaning the boiler. As to lubrication, it will be best to use the lubricants that have been found the most suitable. Do this regardless of the price of the lubricant—of course, within reason—resting assured that it is good economy to protect expensive parts by good lubricants. Besides, lubrication difficulties may result in a shut down, which may turn out to be quite an expense.

Setting the Boiler.

It is very important to have the boiler set right. Here it is not a question of the exactly horizontal



Usual Type of Vertical Steam Engine.

and the exactly vertical, but a question of providing proper arrangements for the burning of the coal. Ordinarily, it will be best to have a big space. The reason is largely as follows. It is important, not to say necessary, that the combustion of the coal be complete before the boiler surface is reached by the flames. It takes time and space for the gases which come from bituminous coal to go through the burning operation. They have to get mixed with the air and have to reach a considerable temperature. These two thing are accomplished largely as the gases move towards the boiler. If the distance is too short, there will be too little time or too little space for the purpose. After any unburnt gases have once struck against the boiler, we cannot expect them to unite—the boiler chills them too much. It is wise, then, not to have the bed of coals too close up to the boiler. Too short a space between coal and boiler seems to have been, and still seems to be, a pretty common error.

Sometimes in running the fire for the boiler, a good deal of trouble arises because of clinkers. If clinker troubles occur in the power plant of the repair shop, it may be well to experiment a little. First, try mixing the coal with a little sand. Do the mixing before the coal is put on the fire. If this improves matters, increase the amount of sand and you may perhaps cure the trouble altogether. If the sand does not help, then try oyster shells or lime. If shells are used, break them up first. In either case, do the mixing before putting coal into the boiler furnace. One kind of coal will require sand; another will require lime or a substitute. The easiest thing to do is to try one and if need be the other.

(To be continued.)

AMONG INDIANA GARAGES.

Too Much "Free Air" and the Pernicious Racing Engine Practice.

BY JAMES F. HOBART, M. E.

"Free Air" is not always what it is cracked up to be and a number of garage owners are finding fault with the manner in which the air and its appliances, hose, etc., are treated by patrons who avail themselves of it. One man said he had to provide new hose about every two months. Another brought in that some of his free customers were never particular about turning off the air after they had used all they wanted, left the valve open a bit and he was at considerable expense to pump up air for filling the sky instead of tires.

Recently I came across a man who had evidently worked the free air business down to a pretty fine point. He said that air was a pretty hard thing to hold in pipes as air would find its way through a minute opening which steam or water would not even notice. He testified that he had been to considerable expense for compressed air to supply pipe leaks, losses of air from cracks in the hose where careless patrons had kinked the rubber tubing and broken it.

This man finally threw away the air pipe line and put in the device shown by Fig. 1. By the use of this device, patrons who wanted free air had to work a little bit for it and were not so careless about leaving hose underfoot or on the ground for wheels of automobiles to run over.

The apparatus was quite simple, consisting of a low truck A, mounted upon four heavy casters, B, B, B, and upon the truck was mounted a welded tank C which was fitted with an inlet pipe and valve D, to which was attached a union E, the other half of which may be found attached at Q, to the outlet pipe of an air pump shown by Fig. 2. The tank is fastened to the truck by means of two strap rods F, F, and is tightened fast thereto by means of eye bolts which screw fast underneath the truck. At G a pressure gauge is located and a safety valve is placed at H, both these being connected with the same pipe, and by means of a T, with the tank at I.

To protect the pressure gauge and the safety valve, a broad metal band is arched over the tank, as shown at J. This piece of metal is about ¼ inch thick and about 4 inches wide. This band is fastened to the truck at K. A handle is attached at L, by

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means of which the truck may be moved around at will, the casters will permit the truck to turn at will in any direction and it may be turned around in its own length.

At M is inserted a nipple and valve by means of which the air may be drawn off at will as required for filling a tire. A short length of hose, N, is fitted at O, with the usual connection for tire-filling and when a customer desires a little air, he comes into the shop, trundles the cylinder out to his car, fills as many tires as he wishes, and goes away rejoicing, provided he has not presumed upon the generosity of the garage man and tried to get something for nothing by taking more air than his tires really need.

The garage man has protected himself against this kind of hoggishness in a very effectual manner by keeping the tank charged to about 250 pounds per square inch. Then, if the customer chooses to take more air than is necessary simply because he is getting it for nothing, he will quite likely hear his tire, particularly if it be an old one, go out with a "pop," which tells everybody around just what has happened.

By exercising a little care, a tire may be filled just right from a tank which has been charged with 250 pounds pressure, or even with 500 or 1,000 pounds to the square inch. If the filler will feel of the tires half as often as he does when pumping up by hand, he need never burst a tire when filling from a tank charged with air under a pressure of 250 pounds per square inch. But, when a man has enough air in a tire, and lets in more, just because the air is free, he is very apt to get his "come-uppance" when doing it with the 250 pound pressure.

The garage man told the writer of one chap who came along and proceeded to hog air to the extent of blowing up a tire with a resounding "bang" which knocked a whole lot of dust off the floor beams overhead. And, not satisfied with that, the

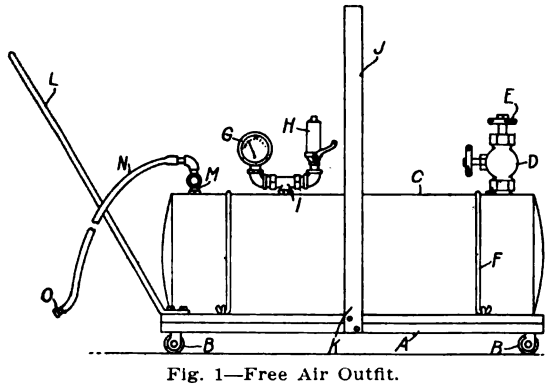


Fig. 1—Free Air Outfit.

same man at once proceeded to fill another tire, hogged the air again in spite of the lesson he had just received, and "bang" went the second tire! The man began to "tumble" to the racket, right then and there, and got so mad that he would not let the garage man fix up his tires, but went off upon two flat wheels to a neighboring garage and there had the two tires fixed up.

"It's all right," said the garage man. "If he hogs my air and bursts a tire, I will get my commission on it all right, whether I repair the break or he gets it done down the road, for you see, it's this way: The chap next to me, on either side, has put in an air tank just like mine and if an air hog takes too much air, blows up a tire and gets so sore that he wont have it repaired there, but comes to me or to the third man down in the other direction, why then I get the benefit. The chap where this man is doubtless going will gain the profit of repairing the two tires that air hog just blew up in this shop, and so it goes, we get the fellows who suffer in the other shops and it comes out about even in the end.

"I find," continued the garage man, "that it costs far less to maintain this tank arrangement than it does to operate a fixed tank with a pipe line and hose to the sidewalk. To be sure, there are some car

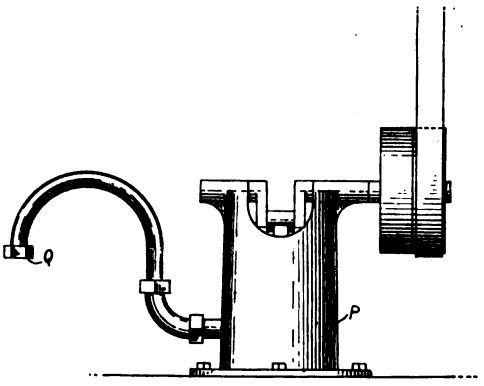


Fig. 2—Belt Driven Air Pump.

drivers who are too lazy to come in and push the truck out to the car,, but I can get along without the custom of such people and do not miss their trade.

"Most of my regular patrons appreciate my position and are glad to push the truck alongside. They also are decent about using the air. They realize that they can get air at any time and are careful about filling their tires and never have a blow-out from too much pressure. No, it's only the free air hogs who suffer from the heavy tank pressure, and as I regard all such customers as lawful game for their own cupidity, I have never the least qualm of conscience about letting them blow their tires sky-high if they choose to do so. There is the pressure gauge on the tank. They can see what air pressure is inside, and govern themselves accordingly, or let their tires 'go bang!' just as they choose."

The tank shown by Fig. 1 has welded seams. There are no rivets or solder to leak. The side seam was evidently welded by the oxy-acetylene process and the heads were put in by the same process. The head, which is visible in Fig. 1, is curved outward to a radius equal to the diameter of the tank. The other head, the one which is not visible, is made to the same curvature, but is placed the other side out, the curvature extending into the tank. The flange of this head is pressed into the tank about a half inch beyond the end of the tank and there welded fast. Evidently there is no leakage from this tank save what there may be around the three pipes which have been screwed into the shell, through reinforcing pads, which in turn have been securely welded to the shell of the tank. Should the three pipes also be welded in place, there could be no leakage save through the valves to which the pipes were attached. The garage man advised the writer that upon the only occasion he had ever tried the experiment—once when he was absent for two months—the pressure gauge had shown a loss of only five pounds pressure during that time, the tank being

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left fully charged to 250 pounds and the gauge registering 245 pounds upon his return after eight weeks' absence in hospital. Therefore, it is evident that a welded air tank, well piped, is pretty safe against air-loss by leakage.

Charging the Air-Cylinder.

The air pump, by means of which the cylinder was charged, was a small, single vertical belt driven affair which, as shown by Fig. 2, was securely fastened to the floor of the garage, as indicated at P. The air outlet, as shown, was piped so as to give a vertical outlet to which was attached a "goose-neck" which terminated with half a screwed union, Q, the other half of the union being located at E, Fig. 1, on top of the air tank.

When the air in the tank needed replenishing, the truck was trundled to the air pump and the portions of the union brought vertically even with each other. There was enough elasticity in the goose-neck to permit the union being screwed together, valve D was opened, and the tank was ready for charging.

The power equipment in this garage or repair shop was quite simple and evidently fully ample for shop needs. A shaft about 12 feet long was hung to the overhead floor timbers. A gasoline engine placed in a corner was belted to the shaft, and arranged along its length were pulleys for belts to the air pump on the floor beneath, also to drive an emery grinder, and a good drilling machine. The shop did not possess a lathe, but it did have a most excellent arbor or mandrel press, a massive affair, operated by a hand lever, and capable of pressing on and off any gear or other friction held device used in an automobile. The owner of the garage told the writer that he intended putting in a lathe, a shaper and a milling machine as soon as possible to do so, but that when he started the shop, he could afford only one tool besides the grinding wheel, so he chose the mandrel press and had never been sorry that he did so. It certainly is a great comfort to be able to slide gears on and off without the least danger of breaking or battering either gear or its shaft by hammer blows. He testified that he would not care to do automobile repair work without a good mandrel press—and the writer is sure that he is quite right therein.

Racing the Engine.

Probably not until "the fools are all dead" will some automobile drivers learn that to race the engine unnecessarily is wasteful both of gasoline and of engine life. Running an engine at full speed, idle, with the transmission disconnected at the clutch, has a very different effect upon the engine mechanism than when running at full speed pulling a load. The idle running is far harder upon the bearings, the pistons and the connections.

Still, many drivers seem to think it either necessary, or "smart" to often let the engine run at full speed for a minute or two before shutting down, or when starting up. Sometimes I hear engines racing when seemingly there can be no possible reason for it. Some drivers seem to have the idea that an engine will start better if, upon stopping, the engine be run at full speed for a minute or so and then stopped by cutting off the spark. This is a fallacy, which can only result in excessive wear of and strain upon engine parts. It was probably originated, this idea was, during the early days of automobile engines, when they were not as perfect as at present and did not always draw in gasoline charges at slow speeds, hence the fashion of racing the engine for a few revolutions just before cutting off the spark.

Probably, reasoning like Pat when ordered to take a teaspoonful of medicine each hour, and reasoning that "if a little will do me good, a lot will do me more good," he proceeded to take all the medicine in heroic doses in three hours, consequently requiring the assistance of the medicine man and a stomach pump in order to continue existence upon the earth plane. It is well, just before cutting off the spark, to stop the engine, to run it at regular touring speed for a revolution or two, just to be sure that there is a good supply of gasoline coming along. But, as for running the engine fast or racing it, just before stopping, is destructive and only causes an engine to go bad long before its time.

Bad Starting Up.

The habit of spinning or racing the engine just after starting up is also bad and equally destructive to engine parts when compared with the racing just before shutting down. If anything, the racing at starting is a little the worse of the two, for then the engine parts are often cold and the strain is worse than when the engine is hot.

I recently heard a garage man rebuke an engine driver for racing the engine when starting up. "I don't want the young men to get into such a beastly habit," he told the engine racer. "For it is foolish, useless and destructive and I intend to do all I can to prevent young drivers from acquiring it."

The driver who was thus rebuked took the matter in good part. "Why," said he, "I never realized that it did any harm, and always supposed it was the correct thing to speed up an engine just before shutting down, and again when starting up. But if it harms my engine, you can just bet that I'm going to cut it right out." And the garage man told me that in similar manner he had cured engine racing in a number of drivers.

One cause of engine racing at starting is that drivers will open the throttle for starting much further than is necessary and the engine begins to race almost immediately and continues to race until the driver can get to the wheel and cut off the excess of speed. This racing is just as bad as any, and there is no need of opening the throttle to a further extent than will give the engine a good easy speed after it starts. Lots of drivers start thus and their engines never race. One garage man showed me a throttle control which he had attached, which came through the bottom of the radiator and he could shut off as soon as the engine started without waiting to get to the wheel.

Injunction and Damages.

McQuay-Norris Mfg. Company of St. Louis, Mo., makers of Leak-Proof piston rings, were granted an injunction against Albertson & Company of Sioux City, Iowa, with damages, by Judge Reed of the United States District Court at Sioux City on May 29. Judge Reed sustained the copyright of McQuay-Norris Mfg. Company covering their book, "Dimensions of Piston Rings," and held that a book of piston ring sizes published by Albertson & Company was an infringement of it.

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THE SUPPLY OF MOTOR FUEL

Claims That Cracking Processes Will Furnish Enough for Years to Come.

"The market value of synthetic gasoline produced by cracking in the United States during 1917 will be sufficient to supply the navy with ten superdreadnoughts. In other words, one-fifth of the 3,000,000,000 gallons to be produced will be made by cracking," said Walter F. Rittman in a paper read before the recent meeting of the American Chemical Society at Kansas City.

"By July 1 of the present year there will be in operation in the United States 4,000,000 automobiles. Financial men, in considering the investment value of motor stocks, have for several years been dwelling upon the saturation point, but, despite this consideration, the demand for machines still keeps well ahead of the forty per cent. average yearly increase of past years. When the saturation point will be reached nobody knows. Responsible and successful automobile men maintain that the present increase in rate of production will keep up for years, and that after the present high prices of materials the price of cars can be so reduced that every family having an income over $1,000 may own a car.

"On this basis the United States will have in the neighborhood of 10,000,000 automobiles—two and one-half times the present number. Assuming an annual life of five years per machine, 10,000,000 cars means an annual replacement number equal to 2,000,000; i. e., our present rate of production. When one questions the correctness of the opinion of the automobile man who suggests the above figures the answer is made that every prediction which the automobile man has heretofore made has been too conservative. An important consideration is the greatly increasing number of motor trucks necessary to replace the shortage in horses. As to the influence on this industry of the United States' entrance into the European war time will tell.

A Leading Industry.

"Only the steel, lumber and clothing industries exceed the automobile business in importance today. Detroit, the center of this new industry, has risen as a manufacturing center from sixteenth place in 1900 to sixth place in 1914. In the United States over five hundred factories are today engaged in making different types of automobiles, and new companies of varying stability are announced each week. As a side light, it is interesting to observe the approximate annual upkeep involved in America's automobile bill, which is as follows:—Gasoline, $500,000,000; tires, $500,000,000; accessories, $300,000,000; garage hire, $150,000,000; repairs, $150,000,000.

"The number of automobiles in use in this country on January 1, and for the period of the last fourteen years, with estimate for 1918, is as follows:

Year.	Number of Cars.	Year.	Number of Cars.
1905	85,000	1914	1,253,875
1910	400,000	1915	1,754,570
1911	600,000	1916	2,225,000
1912	677,000	1917	3,250,000
1913	1,010,483	1918	4,750,000

"However, gasoline requirements are not limited to the above automobiles, but in addition tremendous quantities are exported, are used in motor boats, motorcycles, farm engines, chemical manufacture, cleaning establishments, &c. The requirements per machine per annum vary with different users, some using on an average of less than a gallon a day, whereas the public vehicle often uses as high as ten gallons a day. Statistics would indicate that the average consumption per car per annum approaches five hundred gallons.

Fuel Problem Important.

"Of the various problems confronting the automobile industry the motor fuel problem of the future has loomed up as the most important, but it would seem that this problem will, temporarily at least, be solved. Much discussion and attention is paid to the use of gasoline substitutes, such as alcohol, benzol, gasoline from natural gas, electricity, &c. All of these materials are very valuable sources of power, and the extent of their use is entirely a question of quantity produced and price. Alcohol is commercial when gasoline exceeds thirty-five cents a gallon. The price, however, is based on ante-war prices, as every one realizes that the present price of alcohol makes it prohibitive. Benzol, when mixed with gasoline, makes a superior type of motor fuel, and here again it is entirely a question of the supply available.

The figures of the best informed persons in this field indicate a supply of benzol and light oils available equal to 100,000,000 gallons, which, it is observed, will fulfill less than ten per cent of our motor fuel requirements, even though none of the benzol and similar materials were used for explosives and other chemical purposes.

"Casing head gasoline (gasoline from natural gas) is an item of considerable importance because it is so volatile and has such wide explosive limits that it can be blended with naphthas and thereby make available for motor use materials which were not available. The production of this material has been as follows, but this production, it may be remarked, will hardly supply more than one-tenth of our fuel requirements:—

	Gallons.		Gallons.
1911	7,425,839	1915	65,364,665
1912	12,081,179	1916	125,000,000
1913	24,060,817	1917	200,000,000
1914	42,652,632		

Steamer a Help.

"Much is heard of the kerosene carburetor, and the Patent Office holds thousands of carburetor patents. Professor Lucke, of Columbia University, rightly believes that in the development of a commercial kerosene carburetor, it will not be a new invention, but a matter of design utilizing parts from various patents or designs already developed that will solve the problem. Practically no consideration has been paid to what is perhaps the most important factor militating against the use of kerosene, i. e., the question of explosive limits. This will be discussed later. The carburetors already invented surely embody all possible principles, so it would seem that from this time forward the problem is one of a design wherein ideas from different carburetors are brought together in a new form. A partial way out of the difficulty may be reversion to the steam type of automobile, in which heavier oil is used to generate the steam.

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"The increase in the crude oil production of the United States during a period corresponding to the automobile figures previously given is shown as follows, in barrels of forty-two gallons:—

1905	134,717,580	1913	248,446,230
1910	209,557,248	1914	265,762,535
1911	220,449,391	1915	281,104,104
1912	222,935,044	1916	292,300,000

"The production of gasoline, also in barrels of forty-two gallons, has been:—

1904	6,920,000	1914	34,915,000
1909	12,900,000	1915	41,600,000
1916	54,760,000	1917	*70,000,000

*Estimated.

Increasing Supply.

"From these figures it will be observed that during the period from 1910 to 1917, when the number of automobiles increased eightfold, crude oil production grew but a little over one-third, and gasoline production increased four times, an order of magnitude comparable with the growth in production of automobiles. This increased production of gasoline from a relatively constant quantity of crude oil is obviously the result, first, of taking a larger portion of motor fuel from the crude oil and calling it gasoline, and, second, of producing gasoline from heavier oils by cracking.

"The question naturally arises as to how much further into crude oil the petroleum man can cut in order to increase the supply of motor fuel. We have all observed the Baume gravity of gasoline decrease from the seventies to the fifties, which means an increase in the specific gravity from 0.700 to 0.778. But practical motor men today believe that with the present automobile carburetor and engine gasoline containing heavier portions of the crude oil below 50 degrees Baume does not work efficiently.

"Scientific explanation of the fact can be found in a consideration of the explosive limits of various hydrocarbons. For every mixture of hydrocarbons and air, as is produced in the carburetor, there is a proportion below which the mixture contains too small a percentage of hydrocarbons to explode. Between these two limits is the desired range in which the proper explosive mixture is formed. For instance, a mixture of natural gas and air containing below 5 per cent. of gas will not explode; also a mixture containing more than 11.5 per cent. of gas will not explode. Hence the explosive limits for mixtures of natural gas and air are between 5 per cent. and 11.5 per cent. of gas. Similarly, the explosive limits for mixtures of gasoline vapor and air lie approximately between 1 and 4-10 per cent. and 6 per cent. of gasoline vapor.

Carburetor Present Problem.

"When the size and weight of petroleum molecules increase, the boiling point is raised. In other words, the higher the molecular weight the heavier and less volatile is the material. Furthermore, as the volatility of these hydrocarbons decreases the limits for their explosive mixtures with air, below which nothing happens and above which there is a burning rather than an explosion, come closer and closer together.

"Consequently, as we go from lighter petroleum products, such as gasoline, to heavier petroleum products, such as kerosene, and up to materials boiling above 400 degrees, Fahrenheit, the range for explosive mixtures of air and heavy hydrocarbon vapors becomes more and more narrow, until a point is reached where there is a great difficulty in adjusting the mechanical parts of the carburetor so that they deliver the proper explosive mixture. For example, suppose a mixture of five per cent. hydrocarbon vapor and ninety-five per cent. of air is the only possible explosive mixture for the vapors of a certain substance, how difficult, if not impossible, it would be to adjust a carburetor to deliver accurately and continuously that exact mixture.

"The result then is that when this heavy material, with narrow explosive limits, is used for fuel there is slow burning rather than explosion, and only a part of the combustion occurs in the cylinder where it can be utilized. Therefore, it is questionable whether an efficient carburetor for heavy kerosene can be devised.

Cracking Is Solution.

"Other suggested solutions of the motor fuel problem involve the use of oil derived from coal, shale, peat and lignite. These will be immensely important sources of liquid fuel in the more remote future. Passing over the large supply of light oil possible from coal now burned without coking, which may amount to as much as a billion gallons of fuel per annum, there are immense shale deposits in America containing a volume of oil many times greater than that now known. Here the problem of obtaining motor spirits from the oil will arise again, and the solution of it, as all our present problem, will necessitate cracking processes.

"Then, as now, the demand for motor spirits will run ahead of the supply obtainable by straight distillation, and the logical solution of our present motor fuel problem will be the logical solution in future problems. The fundamental proposition is that when the demand for gasoline doubles or trebles, while the amount of petroleum remains nearly constant, we must make more gasoline from a given volume of crude oil. The best evidence that this proposition furnishes the answer to our problem is the fact that cracking processes are now solving the problem. In other words, since twenty per cent. of our gasoline is now being made by cracking, the price of gasoline would of necessity be much higher without this increased supply.

"The chemical phenomena involved in the cracking of heavy oils into lower boiling oils have been discussed in considerable detail in Bulletin No. 114, United States Bureau of Mines. Broadly speaking, and without consideration of relative merits, cracking processes may be classed under the five heads:

Supply Is Assured.

"(a) Liquid condition processes wherein oil is cracked as a liquid.

"(b) Gaseous condition processes wherein oil is cracked as a gas.

"(c) Processes wherein cracking is aided through the use of catalyzers.

"(d) Processes wherein the oil is mixed with steam, hydrogen or other materials.

"(e) Combustions of the above four methods.

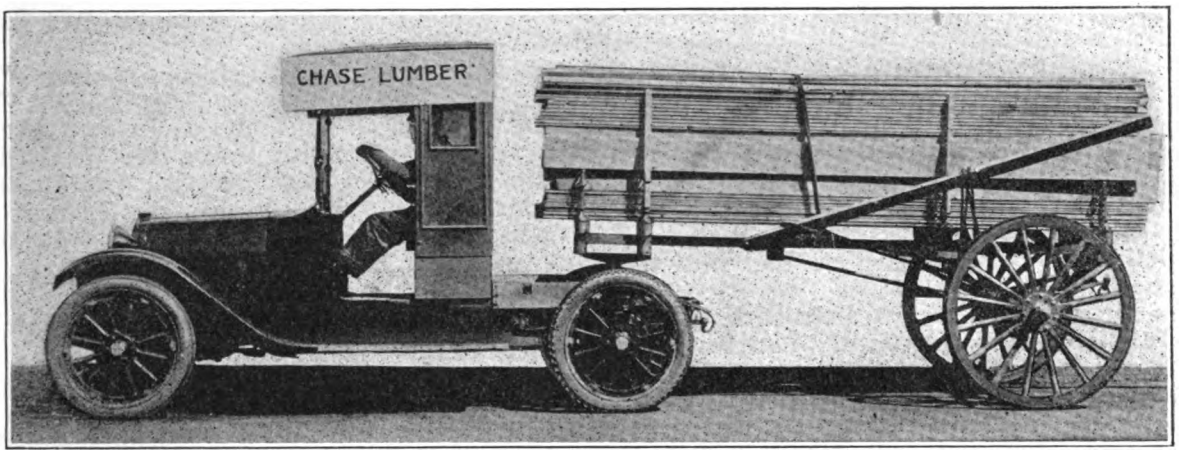
"The object of the present paper is not to discuss the technical nor the research side of cracking, but to indicate how real is this industrial operation today. During the present year, 1917, approximately 600,000,000 gallons of cracked gasoline is being produced in the United States. It is estimated by competent authorities that the production of cracked

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gasoline in 1918 will be 1,000,000,000 gallons, and that by 1920 more gasoline will be produced by cracking than by all other methods. Many persons have been disappointed because cracking processes have not reduced the price of gasoline materially, but they have failed to consider their tremendous benefit in keeping the price of gasoline from going to ten cents a gallon higher. Seven thousand automobiles a day require a cumulative supply of motor fuels. Our crude oil production is not increasing. Kerosene carburetors, as yet, are not a factor. The entire load is falling on the shoulders of cracked gasoline, and cracked gasoline promises to make light of its load."

From Car to Tractor.

The illustration shows a Dodge Brothers 1915 touring car transformed into a tractor by having the tonneau removed, a cab placed on the frame for the driver, and coupled with a Martin Rocking Fifth Wheel to a lumber wagon. This outfit is used by the C. P. Chase Lumber Company, Springfield, Mass. The load weighs 5,500 lbs., showing that the small car has a wonderful capacity as a tractor. If the hundreds of thousands of used cars which are cluttering up the garages of the country were put in service as tractors, using the present horse-drawn wagons, they would release the horses for the farms, where there is dire need of them at this time.



Easily Attached Tractor.

The Emerson Motors Company.

Charged with conspiring to use the mails to defraud the public, the Emerson Motors Company, Inc., its officers and directors and three subsidiaries have been indicted by the Federal Grand Jury in New York City.

The company advertised that it would furnish the public a fine car at $395. Stock was sold on the representation that a net profit of $69 a car could be realized. It was alleged that orders for 60,000 cars had already been received.

It is charged both in the bankruptcy petition and the indictment that the Emerson concern was simply a stock-selling scheme and never intended to build motor cars. More than $1,500,000 is said to have been realized on sales of the stock, and not more than $100,000 can be realized on the plant and office at Kingston, N. Y.

The counsel for the creditors say:

"The promoters got the stock for 17 cents a share and sold it to the public as high as $7 a share."

The parent company was organized in Delaware in 1916 and was authorized to issue at $10 par $3,000,000 in preferred stock and $7,000,000 in common. On August 15, 1916, the company issued a statement claiming to have $190,239 in bank. More than 252,000 shares of stock had been subscribed.

OBSOLETE CARS.

Different Firms Handling Parts of Cars Now No Longer Made.

Abbott—Jos. C. Gorey & Co., N. Y. City; Puritan Mach. Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Acme—Puritan Machine Company, Detroit, Mich.

Aerocar—Auto Parts Co., Chicago, Ill.

Alco—Alco Service Co., Phila., Pa.; American Locomotive Co., Providence, R. I.; International Motor Co., N. Y. City; Puritan Machine Co., Detroit Mich.; Rand & Chandler, Los Angeles, Calif.; Pacific Motor Car Exchange, 221 W. 53rd St., N. Y. City.

Alden-Sampson—Standard Motor Parts Co., Newcastle, Ind.

Allen-Kingston—New Departure Mfg. Co., Bristol, Conn.

Allis-Chalmers—Puritan Machine Co., Detroit, Mich.

Alpena—Puritan Machine Co., Detroit, Mich.

American—American Motors Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.; Burt Motor Car Co., Los Angeles, Calif.; Levene Motor Co., Phila., Pa.; Longaker Co., Inc., Brooklyn, N. Y.; Puritan Machine Co., Detroit, Mich.; Maxwell Bros., Auto Salvage Co., St. Louis, Mo.

American Mors—St. Louis Car Co., St. Louis, Mo.

American Truck—Auto Parts Co., Chicago, Ill.; Pacific Motor Car Exchange.

American Voiturette—Standard Motor Parts Co., Newcastle, Ind.

Amplex—Jos. Gorey & Co., New York City; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Anchor—Anchor Buggy Co., Cincinnati.

Anhut—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Ardsley—Ardsley Motor Car Co., Yonkers, N. Y.

Argo—Puritan Machine Co., Detroit, Mich.

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Atlantic—Puritan Machine Co., Detroit, Mich.

Atlas—Auto Parts & Repair Co., Springfield, Mass.; Jos. C. Gorey & Co., New York City; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange, 221 W. 53rd St., New York City.

Autocar—Autocar Co., Ardmore, Pa.

Autocrat Defender—Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Babcock—Babcock Mfrs. Supply Co., Watertown, N. Y.; Puritan Machine Co., Detroit, Mich.

Badger—Puritan Machine Co., Detroit, Mich.; Schultz & Harder, Columbus, Wis.

Barnes—Auto Parts Mfg. Co., Detroit, Mich.; Puritan Machine Co., Detroit, Mich.

Benham—Puritan Machine Co., Detroit, Mich.

Bergdoll—Louis J. Bergdoll Co., Philadelphia, Pa.; Jos. C. Gorey & Co., N. Y. City; Levene Motor Co., Philadelphia, Pa.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Berkshire—E. B. Belcher, Cambridge, Mass.; Berkshire Motor Co., Pittsfield, Mass.; Puritan Machine Co., Detroit, Mich.

Berliet—American Locomotive Co., Providence, R. I.

Bessemer—Robt. M. Cutting Co., Chicago, Ill.

Black Crow—Black Mfg. Co., Chicago, Ill.; Crow Motor Car Co., Elkhart, Ind.

Blomstrom—Puritan Machine Co., Detroit, Mich.

Borland—Puritan Machine Co., Detroit, Mich.

Briggs-Detroiter—Puritan Machine Co., Detroit, Mich.

Brintell—Puritan Machine Co., Detroit, Mich.

Browniekar—Hinsdale Electrical Supply Co., Hinsdale, Ill.

Broc (Electric)—Puritan Machine Co., Detroit, Mich.

Brodesser—Puritan Machine Co., Detroit, Mich.

Brush—Dayton Auto Parts Co., New York City; Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.; Southern Welding Co., Waco, Tex.

California—California Auto Co., Los Angeles, Calif.; Puritan Machine Co., Detroit, Mich.

Cameron—Cameron Mfg. Co., New Haven, Conn.

Carhartt—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Car Nation—Auto Parts Co., Chicago, Ill.; Car Nation Motor Car Co., Detroit, Mich.; K. C. Auto Parts Co., Kansas City, Mo.; Puritan Machine Co., Detroit, Mich.

Cartercar—Puritan Machine Co., Detroit, Mich.; Maxwell Bros., Auto Salvage Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Carthage—Puritan Machine Co., Detroit, Mich.

Cavac—Puritan Machine Co., Detroit, Mich.

Century—Puritan Machine Co., Detroit, Mich.

Chadwick—Chadwick Engineering Co., Chester, Pa.

Chief—Chief Motor Co., Detroit, Mich.

Cino—Haberer & Co., Cincinnati, O.

Cinco—Puritan Machine Co., Detroit, Mich.

Clark—American Motors Parts Co., Indianapolis, Ind.; Clark Auto Co., Atlanta, Ga.; Clark Motor Car Co., Shelbyville, Ind.; Mercury Mfg. Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Clark-Carter—Robt. M. Cutting, Chicago, Ill.; Cutting Motor Car Co., Waterloo, Ia.; L. C. Erbes, 2654 W. University Ave., St. Paul, Minn.; Puritan Machine Co., Detroit, Mich.; Dauch Mfg. Co., Sandusky, O.

Cleveland—Elyria Belting & Machinery Co., Elyria, O.; Garford Motor Truck Co., Lima, O.; Western Motor Car Co., Cleveland, O.; Pacific Motor Car Exchange Co., 221 W. 53rd St., New York City.

Coates Goshen—Coates Goshen Auto Co., Goshen, N. Y.; Miller Car Co., Goshen, N. Y.

Colby—A. O. Smith, Milwaukee, Wis.

Colburn—Colburn Automobile Co., Denver, Colo.; Erickson & Stalnaker, Denver, Colo.; Puritan Machine Co., Detroit, Mich.

Colley—Puritan Machine Co., Detroit, Mich.

Columbia—Columbia Auto Repair Co., Hartford, Conn.; Standard Motor Parts Co., Newcastle, Ind.; Pacific Motor Car Exchange, 221 W. 53rd St., New York City.

Columbus (Electric)—New Columbus Buggy Co., Columbus, O.

Connersville—Puritan Machine Co., Detroit, Mich.

Continental—Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., New York City.

Corbin—Corbin Motor Vehicle Co., New Britain, Conn.

Corbitt—Puritan Machine Co., Detroit, Mich.

Correja—Jos. C. Gorey & Co., New York City.

Courier—Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.

Courier-Clermont — Standard Motor Parts Co., Newcastle, Ind.

Crescent—Northway Auto Parts & Sales Co., Cincinnati, O.; Puritan Machine Co., Detroit, Mich.

Craig Toledo—A. W. Colter, Toledo, O.

Cricket—Puritan Machine Co., Detroit, Mich.

Crow—Black Mfg. Co., Chicago, Ill.; Crow Motor Car Co., Elkhart, Ind.; Puritan Machine Co., Detroit, Mich.

Croxton—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Croxton-Keeton—K. C. Auto Parts Co., Kansas City, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., New York City.

Cutting—Harris Bros. Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Dart—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Dayton—Puritan Machine Co., Detroit, Mich.

Dearborn-Detroit—Huron Motor Car Co., Dearborn, Mich.

Deal—Auto Parts Co., Chicago, Ill.

Deere-Clarke—Levene Motor Co., Philadelphia, Pa.

De Luxe—Puritan Machine Co., Detroit, Mich.

De Mot—Puritan Machine Co., Detroit, Mich.

Deschaum—Puritan Machine Co., Detroit, Mich.

De Tamble—American Motors Parts Co., Indianapolis, Ind.; De Tamble Motor Co., Anderson, Ind.; Puritan Machine Co., Detroit, Mich.; Southern Welding Co., Waco, Tex.

Detroit-Chatum—Puritan Machine Co., Detroit, Mich.

Dragon—Philadelphia Machine Works, Philadelphia, Pa.

Duer—Chicago Coach & Carriage Co., Chicago, Ill.

Durocar—Puritan Machine Co., Detroit, Mich.

Eclipse—Frank Toepfer's Sons, Milwaukee, Wis.

Economy—Auto Salvage Co., Inc., Kansas City, Mo.

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Edwards—Edwards Motor Car Co., Long Island City, N. Y.; Puritan Machine Co., Detroit, Mich; Willys-Overland, Inc., Toledo, O.

Elk—Puritan Machine Co., Detroit, Mich.

Elmore—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.; Pacific Motor Car Exchange Co., 221 W. 53rd St., New York City.

E. M. F.—Chadwick Engineering Works, Pottstown, Pa.; Studebaker Motor Parts Co., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Everett—Standard Motor Parts Co., Newcastle, Ind.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Everitt—Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.

Ewing—L. E. Ewing, Cleveland, O.; Jos. C. Gorey & Co., N. Y. City; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange, 221 W. 53rd St., N. Y. City.

F. A. L.—Auto Parts Co., Chicago, Ill.; K. C. Auto Parts Co., Kansas City, Mo.; Puritan Machine Co., Detroit, Mich.

Fawick—Waukesha Motor Co., Waukesha, Wis.

Findlay—L. E. Ewing, Cleveland, O.

Firestone Columbus—New Columbus Buggy Co., Columbus, O.; Puritan Machine Co., Detroit, Mich.; Auto Salvage Co., Inc., Kansas City, Mo.

Flanders—Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.; Studebaker Corp. of America, Detroit, Mich.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Auto Salvage Co., Inc., Kansas City, Mo.

Fuller—Jackson Automobile Co., Jackson, Mich.

Gaeth—Gaeth Motor Car Co., Cleveland, O.

Garford—Elyria Belting & Mchy. Co., Elyria, O.; Garford Motor Truck Co., Lima, O.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

G. J. G.—Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Grabowski—Jos. C. Gorey & Co., N. Y. City; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Gramm—Garford Motor Truck Co., Lima, O.; Puritan Machine Co., Detroit, Mich.

Gramm-Logan—Garford Motor Truck Co., Lima, Ohio.

Gleason—Bauer Mch. Wks., Kansas City, Mo.

Great Smith—Bauer Mch. Wks., Kansas City, Mo.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Great Western—Great Western Auto Co., Peru, Ind.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Green Dragon—Auto Salvage Co., Inc., Kansas City, Mo.

Grout—Puritan Machine Co., Detroit, Mich.; Red Arrow Auto Co., Orange, Mass.

Hart-Kraft—Petrie & Morganthall, Greencastle, Pa.; Quincy Engine Co., Chambersburg, Pa.

Havers—Gillette Motors Co., Mishawaka, Ind.

Henderson—American Motor Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.; Buda Co., Harvey, Ill.; Henderson Motor Car Co., Detroit, Mich.; Puritan Machine Co., Detroit, Mich.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Henry—Jos. C. Gorey & Co., N. Y. City; Muskegon Auto Co., Muskegon, Mich.; Puritan Machine Co., Detroit, Mich.; A. O. Smith, Milwaukee, Wis.

Herreshoff—American Motor Parts Co., Indianapolis, Ind.; Jos. C. Gorey & Co., N. Y. City; Levene Motor Co., Phila., Pa.; Puritan Machine Co., Detroit, Mich.

Hewitt—International Motor Co., N. Y. City; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Halladay—Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Holsman—Mercury Mfg. Co., Chicago, Ill.

Houpt—New Departure Mfg. Co., Bristol, Conn.

Imperial—Imperial Automobile Co., Detroit, Mich.

Indiana—Puritan Machine Co., Detroit, Mich.

Jenkins—Puritan Machine Co., Detroit, Mich.

Jewell—Croxton Motor Car Co., Washington, Pa.

Johnson—Johnson Service Co., Milwaukee, Wis.

Keeton—Auto Parts Co., Chicago, Ill.; Car Nation Motor Car Co., Detroit, Mich.; Keeton Motor Car Co., Detroit, Mich.; Puritan Machine Co., Detroit, Mich.

Kelly Springfield—Puritan Machine Co., Detroit, Mich.

Kelsey—Auto Parts & Repair Co., Springfield, Mass.; Kelsey Motor Co., Hartford, Conn.
Conn.

Kermath—Puritan Machine Co., Detroit, Mich.

Kline—Puritan Machine Co., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.

Knox—Alco Service Co., Phila., Pa.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Komet—Keith Bros., Elkhart, Ind.

Krall—Puritan Machine Co., Detroit, Mich.

Krit—Auto Parts Co., Chicago, Ill.; Krit Motor Car Co., Detroit, Mich.; Puritan Machine Co., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.; Motor Corporation, 1309 Race St., Phila., Pa.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Lansden—Lansden Co., Inc., Brooklyn, N. Y.

Lewis—American Motor Parts Co., Indianapolis, Ind.

Lexon—Puritan Machine Co., Detroit, Mich.

Lion—American Motor Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.; K. C. Auto Parts Co., Kansas City, Mo.; Levene Motor Co., Phila., Pa.; Lion Motor Parts Co., Phila., Pa.; Puritan Machine Co., Detroit, Mich.

Little Four—Chevrolet Motor Co., Flint, Mich.

Little Six—Puritan Machine Co., Detroit, Mich.

Logan—Garford Motor Truck Co., Lima, O.; Gramm Motor Truck Co., Lima, O.

Lozier (old)—Phila. Machine Works, Phila., Pa.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

L. P. C.—American Motor Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.

McIntire—Puritan Machine Co., Detroit, Mich.

Marathon—Marathon Service Co., Nashville, Tenn.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Marion—American Motor Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.; K. C. Auto Parts

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Co., Kansas City, Mo.; V. A. Longaker Co., Indianapolis, Ind.; Marion Auto Service Co., N. Y. City; Puritan Machine Co., Detroit, Mich.; Stutz Motor Car Co., 2450 Mich. Ave., Chicago, Ill.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Automobile Mechanics Corp., 221 W. 53rd St., N. Y. City.

Marron—Puritan Machine Co., Detroit, Mich.

Marquette—Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Marvel—Puritan Machine Co., Detroit, Mich.

Mason—L. C. Erbes, 2654 W. University Ave., St. Paul, Minn.; Puritan Machine Co., Detroit, Mich.

Mather—Puritan Machine Co., Detroit, Mich.

Matheson—Frank F. Matheson Co., Wilkesbarre, Pa.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Maxwell-Briscoe — Standard Motor Parts Co., Newcastle, Ind.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Maxwell (old)—Auto Gear & Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Maytag—Mason Motor Car Co., Detroit, Mich.; Puritan Machine Co., Detroit, Mich.

Merchant—Puritan Machine Co., Detroit, Mich.

Meteor—Meteor Motor Car Co., Piqua, O.

Michigan—Auto Parts Co., Chicago, Ill.; Dauch Mfg. Co., Sandusky, O.; Jos. C. Gorey & Co., N. Y. City; K. C. Auto Parts Co., Kansas City, Mo.; Michigan Motor Car Co., Detroit, Mich.; Philadelphia Machine Works, Phila., Pa.; Puritan Machine Co., Detroit, Mich.

Middleby—H. Goldberg, 1420 So. 8th St., Phila., Pa.; A. J. Levengood, 153 No. 4th St., Reading, Pa.; Puritan Machine Co., Detroit, Mich.

Midland—Auto Parts Co., Chicago, Ill.; K. C. Auto Parts Co., Kansas City, Mo.; Levene Motor Co., Phila., Pa.; Midland Motor Co., Phila., Pa.; Puritan Machine Co., Detroit, Mich.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Mier—Mier Carriage & Buggy Co., Ligonier, Ind.

Miller—Puritan Machine Co., Detroit, Mich.

Milwaukee—Harris Bros. Co., Chicago, Ill.

Monarch—Puritan Machine Co., Detroit, Mich.

Mora—Jos. C. Gorey & Co., N. Y. City; Phila. Machine Works, Phila., Pa.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Moyer—Puritan Machine Works, Detroit, Mich.

Nance—Jos. C. Gorey & Co., N. Y. City.

Northern—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Northwestern — Puritan Machine Co., Detroit, Mich.

Nyberg—American Motor Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.; Levene Motor Co., Phila., Pa.; V. A. Longaker Co., Indianapolis, Ind.; Puritan Machine Co., Detroit, Mich.

Ohio—Northway Auto Parts & Sales Co., Cincinnati, O.; Puritan Machine Co., Detroit, Mich.; A. O. Smith, Milwaukee, Wis.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Oliver—Oliver Motor Truck Co., Detroit, Mich.; Puritan Machine Co., Detroit, Mich.

Omaha—Puritan Machine Co., Detroit, Mich.

Orient—Metz Co., Waltham, Mass.

Orson—Drenco Mch. Co., N. Y. City; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Oswald—Auto Salvage Co., Inc., Kansas City, Mo.

Overholt—A. O. Smith, Milwaukee, Wis.

Owen—Puritan Machine Co., Detroit, Mich.

Packers—Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Palmer-Singer — Drenco Mch. Co., N. Y. City; Puritan Machine Co., Detroit, Mich.; Singer Motor Co., New York City; A. O. Smith, Milwaukee, Wis.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Panhard—L. Babel, 371 E. 29th St., Chicago, Ill.; Pacific Motor Car Exchange Co., Detroit, Mich.

Parry—Pathfinder Co., Indianapolis, Ind.; Auto Parts Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Paulding—Anchor Motor Car Co., St. Louis, Mo.

Peabody—Puritan Machine Co., Detroit, Mich.

Penn—Buda Co., Harvey, Ill.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Pennsylvania — Buda Co., Harvey, Ill.; Central Auto Supply Co., Phila., Pa.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Peru—Puritan Machine Co., Detroit, Mich.

Petrel—Filer & Stowell, Milwaukee, Wis.

Pierce-Racine — J. I. Case Threshing Mch. Co., Racine, Wis.; Pierce Motor Co., Racine, Wis.; Puritan Machine Co., Detroit, Mich.

Pioneer—Pioneer Car Mfg. Co., Oklahoma City, Okla.

Pittsburgh—Chester Engineering Co., Chester, Pa.

Pope-Hartford—Boulevard Motor Co., Cambridge, Mass.; Hartford Motor Car Co., Hartford, Conn.; Puritan Machine Co., Detroit, Mich.; Walker & Barkman Mfg. Co., Hartford, Conn.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Pope-Toledo—Auto Salvage Parts Co., Chicago, Ill.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Salvage Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Pope-Tribune—Hartford Motor Car Co., Hartford, Conn.

Poss—Puritan Machine Co., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.

Pratt-Elkhart — Elkhart Carriage & Motor Car Co., Elkhart, Ind.

Premier—American Motor Parts Co., Indianapolis, Ind.

Pungs-Finch—Pungs-Finch Auto & Gas Engine Co., Detroit, Mich.

Queen—Auto Parts Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Randolph—Auto Parts Co., Chicago, Ill.; DeKalb Wagon Co., DeKalb, Ill.; Randolph Motor Truck Co., Flint, Mich.

Rainier—Garford Motor Truck Co., Lima, O.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Rapid — Puritan Machine Co., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.

Rayfield—Holmes Garage, Danville, Ill.

R. C. H.—Burt Motor Car Co., Los Angeles, Calif.;

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Jos. C. Gorey & Co., N. Y. City; Phila. Mch. Wks., Phila., Pa.; Puritan Mch. Co., Detroit, Mich.; R. C. H. Corp., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Reading—H. Goldberg, 1420 So. 8th St., Philadelphia, Pa.

Reed—American Motor Parts Co., Indianapolis, Ind.

Reliable-Dayton — Puritan Machine Co., Detroit, Mich.

Reliance—Puritan Machine Co., Detroit, Mich.

Republic—Republic Motor Car Co., Youngstown, O.

Rickette—Ricketts Auto Works, Detroit, Mich.

Rider-Lewis—American Motor Parts Co., Indianapolis, Ind.; Auto Parts Co., Chicago, Ill.; Levene Motor Co., Phila., Pa.; V. A. Longaker Co., Indianapolis, Ind.; Puritan Machine Co., Detroit, Mich.

Royal Tourist—Puritan Machine Co., Detroit, Mich.; Royal Tourist Co., 72nd St. and St. Clair Ave., Cleveland, O.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Sampson—Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Schacht—General Auto Repair Co., Cincinnati, O.; Puritan Machine Co., Detroit, Mich.

Scripps Booth Cycle Car—Puritan Machine Co., Detroit, Mich.

Selden—Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

S. G. V.—Drenco Machine Co., N. Y. City; New Jersey Machinery Co., Newark, N. J.

Sibley—Sibley Motor Car Co., Detroit, Mich.

Sommer—Sommer Motor Co., Detroit, Mich.

Southern—Southern Auto & Equipment Co., Atlanta, Ga.

Spaulding—Puritan Machine Co., Detroit, Mich.

Speedwell—Green Engineering Co., Dayton, O.; Puritan Machine Co., Detroit, Mich.

Springfield—R. Hass Elec. & Mfg. Co., Springfield, Ill.

Standard Six—Puritan Machine Co., Detroit, Mich.; St. Louis Car Co., St. Louis, Mo.

Star—Mier Carriage & Buggy Co., Ligonier, Ind.

Staver—Puritan Machine Co., Detroit, Mich.; A. O. Smith, Milwaukee, Wis.; Auto Parts Co., St. Louis, Mo.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Sterling—Louis J. Bergdoll, Phila., Pa.

Stevens-Duryea—Walk Hill Garage, Mattapan, Mass.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Stoddard-Dayton—Dayton Auto Parts Co., N. Y. City; Puritan Machine Co., Detroit, Mich.; Standard Motor Parts Co., Newcastle, Ind.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Suburban—Puritan Machine Co., Detroit, Mich.

Sultan—General Auto Repair Co., Cincinnati, O.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Thomas—W. H. Johns, 908 W. Pico St., Los Angeles, Calif.; Puritan Machine Co., Detroit, Mich.; J. Rosenfeld, 521 6th St., S. Boston, Mass.; E. R. Thomas Motor Car Co., Buffalo, N. Y.; Auto Parts Co., St. Louis, Mo.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.; Southern Welding Co., Waco, Tex.

Tincher—Chicago Coach & Carriage Co., Chicago, Ill.

Tourine—Jos. C. Gorey & Co., N. Y. City.

Tourist—Burt Motor Car Co., Los Angeles, Calif.

Traveler—Traveler Automobile Co., Evansville, Ind.

Twombly—Driggs-Seabury Ordnance Co., Sharon, Pa.

Trumbull—Levene Motor Co., Phila., Pa.

Van—L. C. Erbes, 2654 W. University Ave., St. Paul, Minn.

Van Dyke—Puritan Machine Co., Detroit, Mich.

Victor Thomas Detroit—Anchor Motor Car Co., St. Louis, Mo.; Puritan Machine Co., Detroit, Mich.; Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Wagenhalls—Riverside Machinery Depot, Detroit.

Wahl—Barley Mfg. Co., Streator, Ill.; Harris Bros. Co., Chicago, Ill.; Puritan Machine Co., Detroit, Mich.

Waltham Orient—Metz Co., Waltham, Mass.

Warren—Jos. C. Gorey & Co., N. Y. City; Puritan Machine Co., Detroit, Mich.; Auto Parts Co., St. Louis, Mo.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Washington—Puritan Machine Co., Detroit, Mich.

Waverly (electric)—V. A. Longaker, Indianapolis, Ind.

Wayne—Puritan Machine Co., Detroit, Mich.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Welch-Detroit — Puritan Machine Co., Detroit, Mich.; Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Welch-Marquette—Oldsmobile Co., Chicago, Ill.

Welch-Pontiac—Puritan Machine Co., Detroit, Mich.

Whiting—Chevrolet Motor Co., Flint, Mich.; Puritan Machine Co., Detroit, Mich.

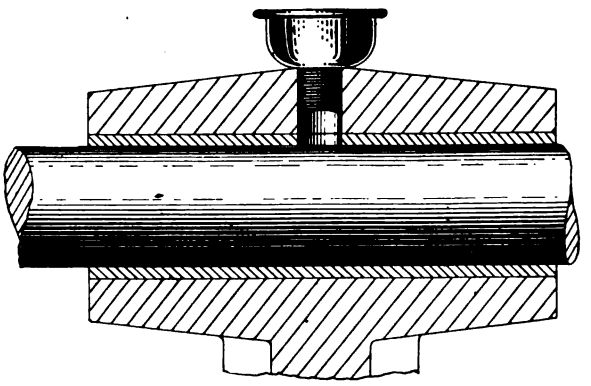
Woodworth—Puritan Machine Co., Detroit, Mich.

Yale—Brown-Lipe Gear Co., Syracuse, N. Y.

Zip—Bauer Machine Works, Kansas City, Mo.

Connecting Rod Oiler.

As a general rule the upper portion of the connecting rod on an automobile is lubricated by the oil splash in the crank case, but in many cases does



not work satisfactorily, especially on an engine where the bushings are burned out, caused by inefficient oiling. The attachment illustrated has been

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tried with good returns. Bore a hole in the upper part of the bearing and tap, then screw in a small oil cup, as shown, and it will be found that a constant supply of oil will stay in the bearing using this device.

HOT WEATHER DRIVING

It Calls for Increased Precautions and Care of Tires and Motor.

From H. C. Brokaw, Principal West Side Y. M. C. A., New York, Automobile School:—There are quite a number of points which should be borne in mind by auto owners with the coming of hot weather, if the most efficient service is to be had from the car.

One of the secretaries of the branch called me up excitedly a few days ago to ask why a seemingly good tire should blow out after a short run. A few minutes later another secretary put the same inquiry with variations. That is, he had a tire which was rather old, but it had been inflated for two weeks and had been running every day since inflation when it tested 80 lbs. pressure.

The first named secretary had been invited by a friend to take a ride. He watched the tires inflated and all other bits of preparedness, and saw that nothing was overlooked, and settled down for a fine ride. The blowout came about five miles away.

The trouble with both was that they had not taken into account the fact that summer is at hand. Experienced drivers know that in hot weather it is not possible to drive their cars with so high a pressure on the tires as they have in winter.

Considerable heat is generated by rolling a tire over the ground. This heat expands the air in the tire and increases the pressure. In the winter this heat is absorbed to a large extent by the cold atmosphere and the cold and wet pavements and therefore the pressure does not vary so much. In the summer the roads are very hot, the air temperature is high and the heat generated by friction is not carried off to any appreciable extent.

On a trip last summer I noticed that the car was riding harder than usual and a test of the pressure on the tires developed the fact that it was above normal. To find out just what the difference in pressure was, we tested it before leaving the garage next morning. We found after rolling about forty miles at an average speed of thirty miles an hour, that the pressure had increased about twelve pounds.

I know that several of the tire manufacturers instruct users not to carry less pressure on the tires in hot weather, saying that the increased pressure due to heat is not sufficient to materially affect their make. This is probably true for new tires, or for about two-thirds of their guaranteed life, but if the tire has been weakened, through having been run under inflated, or from fabric deterioration through cuts in the tread, then I believe there is danger from the increase in pressure due to heat.

More tires are damaged by under inflation than by over inflation, because the former breaks down the side walls through running flat in practically every case, while the over inflation causes a blowout only when the tire is weak at some point. It would be good practice, however on hot summer days, to leave the garage with the tire pressure about ten pounds less than that specified by the manufacturer as being correct for his make. Any driver ought to test out his tires after running at a good clip on a hot day and find out just what they do. A little patience would enable him to understand how much his tires heat up and he could regulate the pressure accordingly.

There are some other hot weather points which it might be well to keep in mind if one would get the best results from the car. One of these is the care of the carburetor. It will be found usually that not quite so much gasoline is required as in cold weather, and therefore the dash adjustment may be carried a little nearer the lean, or air, side. This not only saves gasoline, but increases the power of the motor.

It will be found also that in most cases the hot air stove of the carburetor may be dispensed with or adjusted. Usually provision is made on the hot air stoves for allowing some cold air to enter, or to take cold air entirely. Where the carburetor is water-jacketed, there usually is a valve that may be closed to prevent the flow of hot water. Experiment will determine whether it is advisable to cut out the heat entirely on the individual carburetor, since all are not benefited by the change.

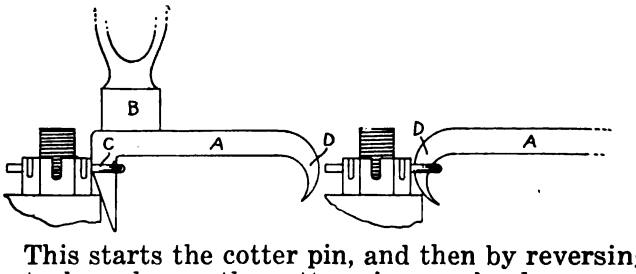
If the fan has been disconnected, or the radiator covered up, these things will be corrected, of course, when hot weather comes along. The engine naturally runs hotter in the summer time, the water vaporizes faster and occasionally boils away, so that it is necessary to inspect the radiator more frequently to see that the water is not running low.

Likewise the water in the storage battery will evaporate more quickly and where it has been necessary to replenish it once in two weeks in the winter, it will need to be done every week in hot weather. This is not entirely due to evaporation from heat, but is accounted for in part by the fact that the engine starts easier and therefore less current is used for starting, and there is more daylight and the lamps are used less. Therefore the battery is more often in a fully charged condition and the charging current causes more gas than usual. This is caused by chemcial action which decomposes the water, the hydrogen and oxygen gases passing off through the vent holes; the water escapes from this cause as gas instead of vapor.

In hot weather city streets are generally sprinkled regularly and the country roads are oiled some time during the season. The novice going behind a street sprinkler or reaching an oiled stretch of road, should exercise particular care to prevent skidding, as he would be unlikely to realize the danger unless he has experienced it once.

Cotter Pin Remover.

An easy way of removing cotter pins is shown in the illustration. Make a tool, A, of some hard metal. Insert it as shown and tap it lightly with a hammer,



B. This starts the cotter pin, and then by reversing the tool as shown, the cotter pin may be drawn out by means of the hook, D.

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LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Happens Too Often.—A car entered the town of Hollidaysburg, Pa., not long ago at a high rate of speed. It got beyond the control of the driver, dashed into tree and the four occupants were hurled out, two to their death. The affair was simply a Sunday evening's ride for "pleasure."

Blowout of a Rear Tire.—At Sharon, Pa., a car was being driven at about 45 miles an hour when a rear tire blew out. This hurled the occupants out, and one was killed and four seriously injured. When a car is being driven at 45 miles an hour a tire is liable to blow at any instant and it requires a good combination of road surface and expert driving to avoid overturning.

Three Persons Killed.—A man stopped the car he was driving at Mansfield, O., to allow a freight train to pass, but failed to note the approach of a passenger train from another direction. The car was smashed and three persons were killed.

Charge That the Driver Was Drunk.—On Staten Island, N. Y., five men were hurt and may die as a result of a car having been run into a telegraph pole while going at high speed. The driver is charged with drunkenness. The machine was smashed.

Two Young Women Die in a Wreck.—A party of young women were driving a car in Clarksville, Miss., when they suddenly came upon a bridge at right angles to the road. This disconcerted the driver who suddenly threw on the emergency brake. The car overturned and all the occupants were pinned underneath. Two accomplished and attractive young women were killed and all somewhat injured.

Whirled to Death.—At Newton, N. J., a man was whirled to death on an automobile wheel, a local doctor stating that he must have died after the first dozen revolutions. He probably got his foot caught in the spokes in some way unknown. The supposition is that he became confused while crossing the street and made an awkward movement to avoid being struck, inopportunely thrusting his foot between the revolving spokes. The car driver did not hear the victim's cries as he banged along like a flail, but put on more speed as his attention was attracted by the shouts and gestures of passers-by.

Driver Fell Asleep.—In Fitchburg, Mass., an automobile was wrecked by being driven into a stone wall. The driver frankly admitted that he fell asleep. He said he has been driving a great deal during the last few days and has had very little sleep. He was overcome with sleep very suddenly for he did not feel it creeping upon him, and the time that elapsed between his looking at the speedometer and his crash into the wall could not have been two minutes.

Three Killed and Four Injured.—Near Harrisburg, Pa., three were killed and four injured when a car skidded and ran wild. The machine struck a small concrete guard at the side of the road, plunged sideise into a telegraph pole and then into a concrete ridge and still continued a short distance up the road. The two women who were in the back seat were crushed and thrown from the machine. The entire rear end of the machine was demolished and torn from the body.

Three Lives Blotted Out.—At Allentown, Pa., a car struck a mud puddle, skidded and overturned. Three of the four occupants were killed, and it took the only one left 20 minutes to extricate himself from the car and go for help. The men were returning from "an anniversary of a cafe."

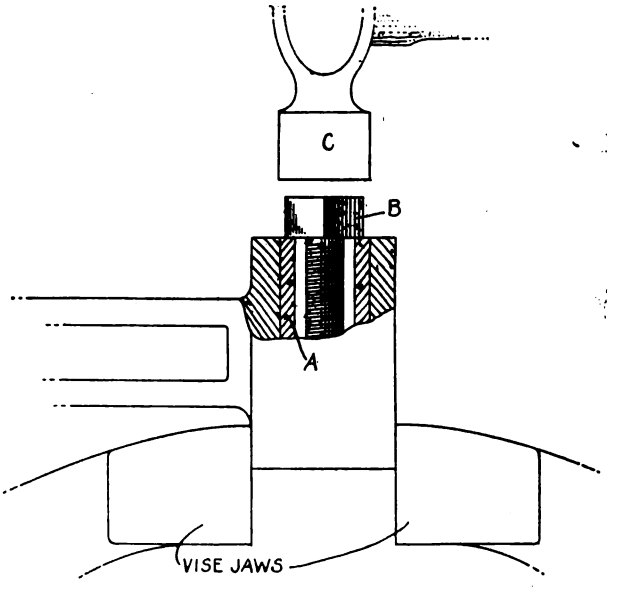
Probably a Case of Remorse.—A young man was driving a car in which was his friend when he lost control and the car overturned pinning the passenger beneath it. The driver reported the accident and then suddenly vanished. It is not even known whether or not he was injured in the accident, and inquiries have been made at all the hospitals near by, on the supposition that he had gone to one of them for medical attention. His disappearance is not understood by either his relatives and both families are apprehensive regarding his safety.

Car Falls Into a River.—A sharp bend in the road near Moline, Ill., caused a car travelling at a rapid rate to leave the road and go over a high embankment into the Mississippi river. One person was killed and four badly hurt. The car turned twice over and pinned its victims beneath it.

Crashes Into a Railing.—In New York City a car crashed into the front fence of a house, breaking the front wheel and the mudguard. Five persons had been run down by the reckless driver who attempted to run away when he found the injury he had done. He was caught by a policeman.

Ford Car Spindle Bushings.

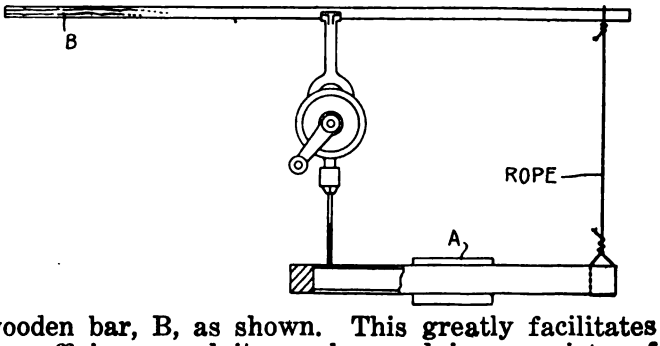
A method of removing Ford car spindle bushings,



A, is to place a 3/8-inch crank bolt, B, in the bushing and tap lightly with a hammer, C, as shown in the illustration.

A Hand Drill Device.

To secure an increased pressure when using a hand drill on a steel wheel, A, bear down on a



wooden bar, B, as shown. This greatly facilitates the efficiency and it can be used in a variety of cases.

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Automobile Dealer and Repairer

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Member of the Associated Business Papers.

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A. A. HILL, Editor

F. R. WHITTEN, Advertising Manager

F. M. DAMPMAN, Eastern Representative — H. F. LUDINGTON, Western Representative

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK JUNE, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THE LAW OF PRICES.

The city of Detroit, Mich., is reported to be waxing strong and flourishing like the proverbial "green bay tree," its growth being due to its automobile manufacturing business. Nor does the phenomenally high wages paid there seem to put a damper upon its prosperity, contrary to the usual claims of pseudo-economists who would like to have it appear that high wages are a hindrance rather than a spur to prosperity, although all they have to do to prove they are wrong is to find out the wages paid in the more prosperous and in the more destitute countries of the world.

Now that so many male workers are being taken from ordinary industries and transferred to the work of war, their places are being filled by women and with far better results than would be generally imagined. This naturally brings up the old and trite remark that when "women do the same work as men they should have the same pay as men." And so they should and would if conditions were such that women could sell their labor at their own figure, or at all events, as near their own figure as owners of merchandise sell their goods; or even if they were sufficiently forehanded to withhold selling their labor until some employer were obliged to pay their price for it.

But the conditions of the purchase and sale of labor have never been fully understood, or perhaps acknowledged, for it is not difficult to understand them. The remark is often made, for illustration, that women school teachers should be paid the same as men for similar service, and so they should of course, if they could get it. The writer of this would be glad to see hard working and competent editors getting as much as third rate prize fighters or ordinary outfield players on league base ball teams, but alas and alack, this is not the case. He would like to see a country minister get as good salary as a bartender at any of the Broadway lobster palaces. He would rejoice to know that the washer woman who faithfully scrubs clothes were paid as well as, say, the inefficient public stenographer at the hotels.

In fine, he would be glad to see that all were rewarded according to their efforts and not according to the rate of pay in open market, for that would indeed be in accord with exact justice and not with either normal or abnormal conditions. Take the case of the present high prices for most commodities. Owners of such commodities are undoubtedly making unduly large profits upon them. They exact such profits simply because the demand far exceeds the supply. No matter what the need of the purchaser, he must pay possibly twice as much as it costs to produce them.

It is this condition that leads to the discussion, pro and con, of government control of prices as relates to food and other commodities. But if the owner of food products has no moral right to exact more than they are worth simply because the supply is less than the demand, and it is advisable that the governments should step in and fix the prices he must ask for them, why not fix prices upon all commodities upon which exorbitant prices are charged simply because the demand is greater than the supply? It is true that it is perhaps more important than in the case of anything else that people purchase the food they eat—their very life—at a fair price; and next in importance is that those who have labor to sell—the only commodity they own—should get a fair price for it. But having begun this government price fixing, and the overturning of the great natural law of supply and demand, why should we not have all prices fixed for us?

This would undoubtedly be objectionable to workers who, as we understand, are getting $12 a day in Detroit for trimming automobile bodies, but it would be quite satisfactory to their employers. It would be objectionable to employers who can buy labor at absolutely their own figure, but would be hailed with delight by their workers. So likewise women who according to that same law of supply and demand are obliged to work for less wages than men when doing the same kind and amount of work would be glad to have some legal mandate in force compelling the same pay for women as for men. But whether or not government control of prices is favored depends very much upon "whose ox is gored." Those who have something to sell would be glad to have government price-fixing to the extent that nothing should be sold below a certain figure, and those who have something to buy want prices fixed to the extent that nothing should be sold above a certain figure. Yet the principle is the same in the one case as in the other.

Of course, price-fixing is a transgression of the great natural law of supply and demand, which in our opinion should never be violated except as a temporary and pressing expedient to correct a most abnormal situation. It is far better to change supply and change demand than to over-ride them

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In the case of producers of food and of manufactured products the corrective has always been to raise less—produce less—and in some instances to destroy that already produced in order to secure a fair price for the balance. Labor has a far wiser and more just way to correct the evil of over-supply; it simply advocates a reduction of the hours of work, believing, and justly, that leisure is better than enforced idleness. Of course, without let or hindrance, this would be carried too far, just as it has been in Russia, where half-blinded workers suddenly impressed by their own power and with a keen sense of their own past wrongs, have simply made idiots of themselves. They have got the rope in their own hands, and now they are disposed to hang themselves with it. So likewise, owners of commodities in this country in many cases are not satisfied to charge a fair profit on the increased demand and decreased supply of the products they own, but raise the price beyond reason and justice, and even where such products do not stand them at higher prices.

We are quite well aware that the foregoing solves nothing and "gets nowhere," but if it serves to set people to thinking in the right direction it will aid in the correct solution of pressing problems such as have never before confronted civilization.

STREET CROSSING DANGERS.

Much discussion is going on as to how to remedy the congestion and delays at the street crossings of the great thoroughfares in New York City. There is but one practical way to eliminate this evil, and that is to put foot passenger viaducts over the streets not only at crowded crossings, but between street intersections where the traffic is heavy. These might be wide enough for six persons to walk abreast over each crossing where the congestion is greatest, and perhaps of sufficient width for four persons to walk abreast midway between crosswalks. These would provide ample means for crossing the streets without disturbing or delaying vehicle traffic in the slightest. Of course, the ascent and descent on such crossings would be objectionable to the aged and infirm, but so likewise at present is the necessity for hurry and the danger of crossing the streets at grade.

As for the comparative time consumed in crossing the street at grade and by way of an overhead bridge, the blocking of traffic at intervals is far more disadvantageous and time consuming. The cost of such bridges need not be heavy, and in these times of fast moving automobiles and commercial cars, the street vehicle traffic could afford to bear the expense of construction and maintenance and still be gainers. The holding up of vehicles at so many crossings in the city at present consumes more valuable time than that required for the entire trip otherwise.

In addition to this, the saving in police traffic duty would be much. The police force of New York City has never before been so efficient and satisfactory as it is today, but if many of the traffic members of the force could be transferred to regular duty conditions would be still better.

Vehicle accidents are increasing according to official reports, but they might be much reduced if pedestrian traffic were confined to the sidewalks and bridges, thus relieving automobiles and other vehicles from a most vexatious responsibility.

These street viaducts must surely be adopted sooner or later. Why not put them in over the main thoroughfares at once?

ELEMENTS OF TAXATION.

The war tax should be the same on one article of use as on another. If automobiles are to be taxed, all other vehicles should be taxed at the same rate. And if vehicles are to be taxed, so should other articles of necessity or convenience. This making meat of one thing, fish of another and fowl of a third, is both unwise and unjust.

Not that as far as we have learned there has been any objection to the tax on automobiles on the part of their owners. Those who own and use automobiles are as a rule up-to-date and progressive, and they are thus naturally willing to contribute their share of the expense necessary to secure the quick and successful conclusion of this war. Indeed, this is the apparent general feeling. But there is naturally an aversion to a levy of a certain per cent. of tax upon this thing, a less tax on another and perhaps a still greater tax on another. A man may be able to own an automobile and barely able to own it; it may be about all he owns in the world and vitally essential to the support of his family. Another man may be well off in this world's goods and yet not own one. Is it reasonable or just to penalize the car owner for getting his living the way he does, or to reward some one else for not owning a car?

After all has been done and said, there is no better method of imposing taxes than that laid down by Adam Smith, namely: "Equality, certainty, convenience and economy." As further elucidated by Mill and others, "equality of taxation means equality of sacrifice," although it is generally admitted that this standard cannot be fully realized. The other three conditions of course refer to tax collection.

Although it must be freely admitted that our lawmakers naturally find it difficult to suit everybody in the imposition of these war taxes, they seem to have thrown the settled convictions of political economists to the four winds of heaven, so to speak.

THE LIBERTY BONDS.

For those who are not fully conversant with the facts in relation to Liberty Loan Bonds, it may be stated that the first issue of $2,000,000,000 is to bear date of June 15, 1917, and are to run 30 years, unless the government exercises its right to pay them 15 years after date. They bear interest at 3½ per cent. per annum, and the interest is payable semi-annually on the 15th day of December and the 15th day of June each year.

These bonds are nontaxable. If your city, county and State taxes are three mills on the dollar, a not unusual tax, these bonds are equivalent to ordinary corporate bonds or other investments bearing 6½ per cent. In addition, no Federal tax which war conditions may later make necessary will affect them. The only tax these bonds are subject to is the inheritance tax, which applies to all property of all kinds.

There are two kinds of these bonds. Bearer bonds are to be issued in denominations of $50, $100, $500 and $1,000. These are made payable to bearer, have interest coupons attached which are detached by the holder when the interest installments they represent are due, and can be cashed at any bank the same

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as a United States Treasury note. Registered bonds are registered as to both principal and interest, in denominations of $100, $500, $1,000, $5,000, $10,000, $50,000 and $100,000; checks for the amount of interest due will be mailed out semi-annually to the holders of these registered bonds.

A special advantage no other bonds, National, State, municipal or corporate, have is that if the United States during the continuance of this war shall issue other bonds at a higher rate of interest, the holders of these Liberty bonds have the right to exchange their bonds for bonds bearing the higher rate of interest, dollar for dollar.

Blank forms of application for the purchase of these bonds can be obtained from the Treasury Department, any Federal Reserve Bank, any National, State or private bank, any express office, and any post office in the United States. Any bank or postmaster will aid applicant in filling out his blank and the other acts necessary to obtain these bonds.

It is predicted by those best able to form an opinion, that these bonds will soon be selling at a premium. We know of no other United States bond issue in the past bearing similar interest and of the same character, that has not sold at a premium before maturity.

Of course, the outcome of this war cannot be doubted for an instant, and it should not be necessary to urge in the slightest the purchase of such bonds by those who can afford to do so.

WOMEN.

No better evidence need be had that a woman may not only be able to drive and handle an automobile as well as a man, but that she can safely be depended upon to judge a good car, either new or second-hand, than the article by Mrs. A. Sherman Hitchcock which will be found on another page. Incidentally, it may be remarked, it also reveals the fact that the fair sex knows how to write comprehensively on this subject without using a single superfluous word or a word that does not clearly express the right meaning. Mrs. Hitchcock is one of the pioneer drivers and car owners of the country. That women may well be proud of her goes without saying, and as no improvement or merit in either sex can possibly be confined to that sex alone, the male sex should be equally proud to know that her talents as an automobile expert are of the highest. By the way, and along something like the same line, who can estimate the exalted and effective part woman has taken in this world war? She has abundantly proved that she can do much that no one ever dreamed she could do that men have always before done, and in personal sacrifice and heroic deeds many noble things that men have no bent or inclination to do. Surely, it is time for those who have always been opposed to women taking an active share in government to revise their opinions.

PRICE AND VALUE.

With the enormous rise in the price of almost everything that goes into the making of an automobile, it is little short of amazing that manufacturers have not more generally raised their prices. Under the present conditions and prices the profits must be far less than two years ago. As a rule those who have things of any sort to sell are ready to seize upon any plausible excuse for raising prices, and automobile manufacturers are thus most commendable exceptions. We believe they will be compelled before long to raise prices to a marked degree and that intending purchasers should not hold off any longer than necessary.

In the case of most things of necessity or convenience prices have been raised beyond all reason. The grocer raises the price of tea and coffee on the ground of "the war tax," when such a tax has not yet been levied. The tailor pays $2 more for the cloth of a suit of clothes and immediately raises the price $10 to the consumer. The shoe dealer has raised prices beyond all sense or reason, in some cases as much as 100 per cent. The cigar dealer pays $1.50 more per thousand for cigars—an increase in cost of about one-seventh of a cent each—and immediately raises the price one or two cents each to the consumer. Thus have prices been raised unnecessarily all along the line with the exception of the automobile which really has not been advanced in price as much as the situation warrants.

Price conditions that now prevail well deserve the consideration and study of those who are interested or vitally concerned in economics and trade. They show how quickly price and value part company when demand and supply are so unequal, and how utterly untrue it is that the cost of production has as much influence upon prices as demand and supply inequality.

THE IMPORTANCE OF PUBLICITY.

One of the officials of the Olds Motor Works marvels at the fact that the vast army of hundreds of thousands of workers now employed in the automobile industry was secured without any apparent injury or reduction in the ranks of other industries. He says that "if through any miraculous circumstance the bottom should suddenly fall out of the automobile industry and its army of employees was forced to find employment elsewhere, it would create a most most serious situation and disrupt labor conditions generally."

This is all quite true and important. It leads up to a trend of thought that political economists and business men should not fail to grasp. Clearly, the reason why it has been so comparatively easy to obtain workers for this great automobile industry—foundrymen, engineers, machinists, textile workers, mechanics of all kinds, together with salesmen, clerks and common laborers—is because efficiency in production is constantly increasing and at a much faster rate than the natural increase in consumption. The best proof of this is the imperative necessity for advertising so that the market may be stimulated to consume as much as can be produced.

And not only is advertising the best means of stimulating the much needed consumption of products, but it is by far the cheapest and most economical means of doing this. It abundantly justifies its existence. Take away this practically only means of letting the public know of the new and useful things that may be had to supply their needs, and consumption would decrease at least one-half, while periodical literature would lose much of its interest and value.

Yet in spite of this fact some of our public men seem to be busily engaged in the advocation of belittling and hindering advertising, and thus doing all

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in their power to increase enforced idleness, close factories, and to impede the public welfare.

A BURSTED BUBBLE.

It appears that more than 15,000 persons put their savings into the defunct Emerson Motors Corporation expecting to receive 20 per cent. profit, their purchases amounting to something like $1,500,000, while the tangible assets are about $150,000. We received a good many letters from readers asking our advice as to making an investment in the stock of this corporation, but they were recommended not to do so. Neither did we accept the flamboyant advertising of the concern. The outcome was as we expected.

Those who are solicited to invest money in new enterprises, either to be or about to be, which are located so far away that it is inconvenient or impossible to make a thorough investigation into the character of the promoters and the truth of their claims, would do well to follow one of the old whist rules—"When in doubt, don't." Opportunities for investment with the probability of great returns are indeed rare in this day and generation. Any business enterprise that after full investigation gives evidence of large profits need not languish for want of capital, nor need any plausible project suffer from failure to get some one to investigate it. In all the great money centers there is plenty of capital awaiting profitable investment. But capital is invariably timid, and must be shown.

Not many years ago enterprises of real merit suffered from the inability of their promoters to secure the necessary capital to launch them. The telephone was a case in point and many others might be cited. But that was before the days of big massed capital and a ready means of enlisting investment.

A WORD OF CAUTION.

Our readers are warned against organizations of various kinds which have sprung up in different parts of the country, often calling themselves clubs, with a small yearly sum as dues—perhaps $3 or $5 or $10—which pretend that they can save car owners considerable money on the purchase of various automobile accessories and supplies, including gasoline. One of these organizations, we understand, was stopped by a fraud order from the Post Office Department not so very long ago. We advise our readers to fight shy of every concern of this kind that appeals to them for money in the shape of dues.

Four Valve Cylinders.

A reader asks what is the advantage of more valves than two in the cylinders. In reply it may be stated that many are enthusiastic as to the idea of having four valves in the head of a cylinder. The claims are made that with four valves in a cylinder they can be made small and thus are much more easily handled when it comes to grinding. The springs are lighter and the valves run much longer without requiring attention. If combined with a detachable head one has an exceedingly accessible engine, the head can be machined all over inside, and an overhaul of the valves, besides being required at less frequent intervals, can be carried out under almost ideal conditions on the bench and altogether apart from the engine itself.

SOME SHORT CUTS.

Pointers the Garage and Repair Man May Find Convenient.

From J. N. Bagley, Nebraska.—Hardly a day passes but the wide awake mechanic will find some short cut method of doing a piece of work or to make a special tool for a special job. Many times these tools can be made of otherwise useless scraps and when it is finished the outlay consists of nothing but a little time. In many instances the tool made will excel one that can be purchased for the same work. There is a saying that necessity is the mother of invention, and it is more true than ever at this day and age of the world.

If every mechanic who has some little kink would send it to some trade journal it would be appreciated, of course, and the readers would profit greatly by it. I happened to call upon a brother mechanic one day not long ago and he made a little device for a special difficult job that he had to do and I asked him why he did not send a sketch and description to the trade journals so that others who were engaged in the

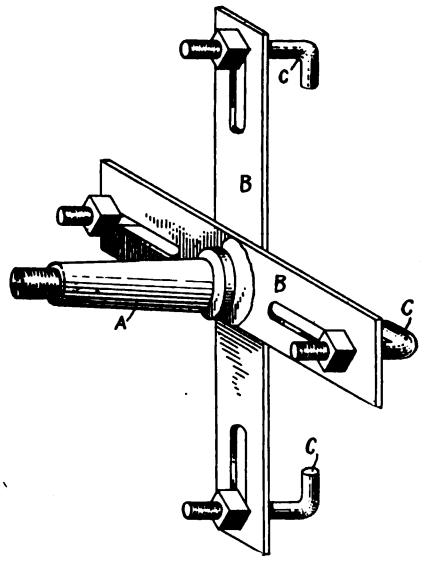


Fig. 1.

same line of work, could profit by it. His answer was something like this: "If they want to find out let them do like I have, figure it out for themselves." Now, this did not appeal to me as the right sort of spirit, so I asked him: "Do you take any trade journals?" "Yes", he replied, "many of them." "Do you get a great many useful kinks out of them as you read them from time to time?" "I sure do", was the reply. "All right; do you consider it fair that other mechanics contribute for your good when you do not feel that you should give your ideas in return? Isn't it a matter of fact that many of their short cut methods are just as good as yours and you are getting the good of them?" He stopped for a moment and fingered a small greasy six-inch Crescent wrench, finally remarking: "I guess you are correct; I'll just send in some of my shop helps for it is no more than right."

Any amount of good can be exchanged in this manner. I do not see a single man who does not take a great interest in shop kinks. In fact they are the first things they turn to after getting the magazine, but many of them are too busy to take the time to contribute. Take time, boys, and help to make the

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trade journals better for the masses. The editor is striving to get a paper that will do the reader the most good and a co-operation of the interested readers will help him greatly to attain his desired end.

There are a number of instances where the dealer is called to the country to get a car with a broken axle. In this instance it is necessary to have some sort of device with which to handle the car. In many cases the dealer has a device which he has purchased for the purpose and then again there are a number who have nothing to use for work of this sort. The little device shown in Fig. 1, will answer very well for towing light cars and can be made by any one having a little ingenuity and a few tools. Take a spindle from some old car and make a cross as shown at B, each of the arms having a slot in it to allow of adjustment of the lugs C. The lugs should be made so that when the nut is tightened on the back side they will grip the outer flange of the housing. The wheel may be slipped onto the spindle and the car towed in very nicely. A wheel can be used with the outfit and there is no risk to run in the wheel from some other car fitting. The wheel can be supplied with an old tire that has practically no value and will make towing easy.

In Fig. 2 we have a very useful device which can be made from scraps picked up from time to time around most of the shops about the country. It is not necessary to enter into any lengthy article

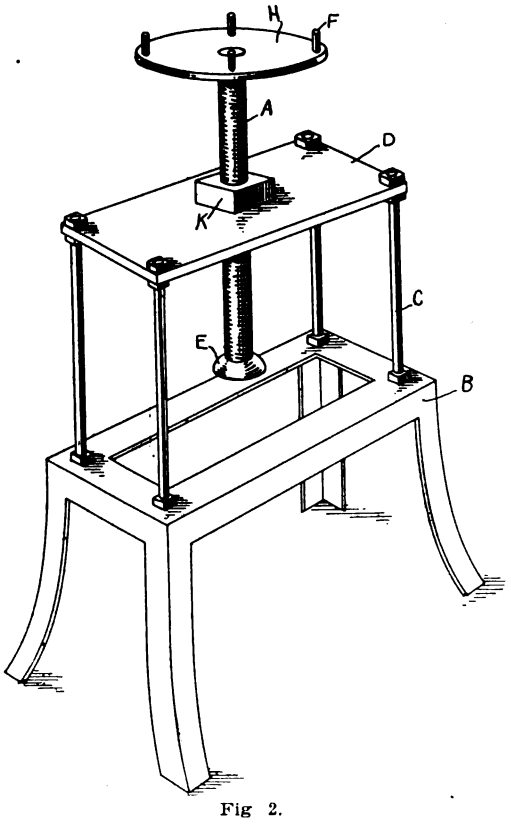


Fig 2.

giving the uses of a press, for at this stage of the repair business every man knows the value of it in the shop. The one shown in the drawing is made from scraps and answers very well. The base B is a stand from an old discarded cream separator which can be picked up nearly every day. The wheel H at the top and the screw A at the top are parts of an old cider mill. The rods C, supporting plate D, carrying the screw, are made of ¾ inch rods and made secure to both top and bottom with double nuts, that is, one on either side of the plate. To permit of a heavy enough plate being at the top to handle the screw, the block of metal K is placed at the top with a large hole in it, in case there is no way to cut the thread for the screw. Now place

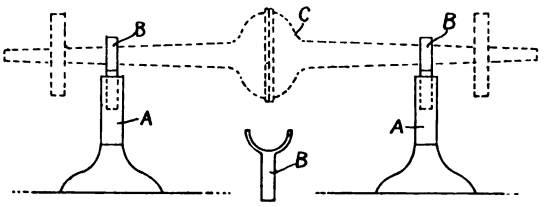


Fig. 3.

the screw A in position and with melted babbitt, run it into the opening. This will answer very well for the threaded passage for the screw, and when it becomes worn sufficiently to cause trouble, it can be replaced with a new babbitt in a few minutes. In most instances for light work the wheel A at the top can be turned with the hands, but in case the work is heavier and requires more pressure than can be applied in this manner, a bar can be slipped between the lugs F and sufficient pressure applied to get the desired results. It is a very good plan to lace some sort of swivel arrangement at the end of the screw at E, to prevent the end of the screw from turning on the shaft or the work being handled.

In Fig. 3 we have a very simple device which is made from old parts about the shop—discarded housings from the rear axle, as shown at A. Make a couple of U-shaped yokes that will slip down into the housings as shown at B, and the device is ready for use. This comes very handy for supporting rear assemblies while taking them down and putting up, as shown by supported assembly C. I have also found that this same device can be used to a very good advantage for placing shafting out of the way. As the lengths of shaft grows shorter the stands can be moved closer together to accommodate shorter pieces.

A Good Word for Two-Cycle Motors.

From Charles E. Duryea, Pennsylvania.—J. F. Springer's remarks on the type of engine contain the usually accepted facts all right, but some of the statements made without explanation leave the wrong impression in the mind of the man who does not know. The usual 2-cycle engine is used for boats where full power is demanded from start to stop. Running at full power a 2-cycle usually sends some of the fuel over the deflector and out into the exhaust unburned. This is of course wasteful But for shop and auto use the engine should not be so small as to be worked at full power except when an occasional emergency demands. A steep hill or deep mud or grinding and wood sawing at the same time, for example. At part power no fuel gets away and since the 2-cycle uses constant compression, it is more economical than the 4-cycle which is notoriously wasteful at low compression (part power). The 2-cycle cools better because it holds the hot gases for a less proportion of the time and so can be run hotter. It gets more internal cooling which saves heat. It has far less friction and so saves fuel on this account.

That it is slightly more sensitive is true. An engine builder only last week told me that he did not

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like a ball bearing crank shaft to a 4-cycle engine because it made it run so free that the carburetor had to be beautifully regulated or it would not idle well. This is one complaint with a 2-cycle. It can be remedied by adding a load of some kind or cutting out the feed to one or more of the cylinders.

Back firing is likely with large transfer passages and lean economic mixtures, but it is easily stopped by proper screens. Too often the 2-cycle has been made hastily, but with equally good workmanship it is a better engine than the 4-cycle for usual auto and stationary work. Its design cannot be bad, for it depends on design rather than on added parts for the desired result.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2159 He Wants to Know Much.

From S. C. Kauffman, Colorado.—As I am a subscriber to your magazine, I would like to ask a few questions through the same. We have a Royal, 35 H. P. car, manufactured by the Crow Motor Car Co. This spring we installed a Bosch high tension magneto and a Schebler model R carburetor, which helped it very much. Still I do not think we are getting the full benefit of the 35 H. P. The car has run about 15,000 miles and the valves have been ground recently. Why do we not get more power? Some people claim that only 10 per cent. of the actual power produced by the engine ever reaches the rear wheels for use. What is the reason that it is lost? I think it is due to friction. Others also claim that a counter balance crank shaft gives more power to rear wheels. How is it constructed? How does it tend to eliminate friction. Would a magneto and Prest-O-Lite system be more satisfactory and cheaper than a dynamo and storage battery for ignition and lighting purposes on a motorcycle which now uses dry cells for ignition and has no lights? If you can give me some information it will be appreciated.

Reply.—Lack of power may be due to so many causes that a volume would be necessary to cover them all. The apparent lack of power in your case may be caused by too high a gear. Cars are sometimes geared for high speed on level roads and, therefore, perform very poorly on hills. If your car rolls freely when pushed as compared with other cars, the trouble must be in the gear ratio or the engine. If in the engine it may be due to a late spark, poor carburetor adjustment, loss of compression through the valve caps or around the piston, too great a clearance between the valve stems and guides, incorrect timing of valves, insufficient lubrication, too much cooling or a hundred other different things. It is true that considerable power is lost in transmission from the engine to the rear wheels. Each bearing absorbs a small percentage. Wherever a gear is employed, power is lost and the universal joints take their share. The power lost in universal joints is tremendous if the shafts are driven at a very great angle. Proper lubrication will minimize friction but will not entirely overcome these losses. A counterbalanced crank shaft reduces friction in the bearings and in that way causes less loss of power. In the ordinary crank shaft, the crank pins, part of the crank arm and the large end of the connecting rod cause considerable strain on the main bearings of the crank shaft when revolving at high speed, because of centrifugal force. In counterbalancing, weights are placed on the opposite side of the crank shaft so as to give a pull of equal force to that exerted by the crank pin and connecting rod bearing, in the opposite direction, thus causing no strain on the main bearings and reducing friction. Sometimes these counterweights are made part of the crank shaft and in other instances they are bolted on. The Prest-O-Lite system, with a magneto for ignition, probably could be installed at less expense, but a dynamo and storage battery might be found more convenient.

2160 Vacuum Feed Trouble.

From R. W. Smith, Idaho.—Kindly advise me in some early issue how I can overcome a difficulty with the vacum feed on a six cylinder car. When the car stops for some hours the gasoline drains from the vacuum feed back into the tank in the rear of the car. What causes it and how can it be remedied? I find it impossible to start the car until the vacuum tank is again filled.

Reply.—It is not possible for the gasoline to run back from the vacuum tank to the main tank with any vacuum system with which we are familiar. It is more likely that the line from the tank to the carburetor or the carburetor float valve leaks, allowing the gasoline to escape. If you have a vacuum system in which it is possible for the gasoline to feed back as you describe, it must be due to syphon action, and this trouble can be overcome by having the feed pipe lead into the top of the vacuum tank and not project down into the tank. The gasoline in the vacuum tank cannot drain out any lower than the lowest point at which this pipe enters the tank or projects into it. The only other way to remedy this difficulty is to install a light check valve in the gasoline feed line. If the vent in the main tank is clogged, there may be sufficient vacuum formed to draw the gasoline back, but this would also, no doubt, give trouble when running.

2161 Piston Ring Leak.

From F. E. Long, Idaho.—I have a Dodge car and in repairing it this Spring, I put one McQuay-Norris leak-proof ring on the top of each piston. Since I have put these rings on I have trouble with burning too much oil. I took the cylinder heads off and the chambers are full of oil. I use "Veed oil, medium." Please tell me what the trouble is in the next issue. Is it the oil or did I put the ring in

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the wrong place? I used the old rings just as I took them out. Please tell me my trouble and how to remedy same.

Reply.—We do not believe the trouble is with the oil and the position of the rings is all right. The cylinders are probably worn slightly oval and piston rings do not readily adapt themselves to this shape. The old rings, no doubt, had worn oval with the cylinders and kept fairly tight. Although you put the old rings back in the same slots, you probably did not get them in the same position as regards the ovals or you sprung them out of shape in removing them and, therefore, they leak. We would suggest having a shallow groove turned in each piston directly under the lower ring, with holes drilled through the piston wall, so that the piston ring will scrape down the oil from the cylinder wall, and pass it through the piston back to the crank case.

2162 **Magneto Change.**

From G. K. Barnum, Oregon.—Please tell me through the columns of your magazine if a Bosch D. A. 2 magneto, such as is used on the Metz 2 cylinder runabout, can be changed for a 4-cylinder ignition and where would be the best place to get parts for such a change. I do not know the address of the Bosch Magneto Co. or I could get the information from them.

Reply.—The Bosch magneto cannot be altered to supply a four cylinder engine as none of the parts of any of the four cylinder magnetos will fit this type. The Sweet-Drain Auto Co. of Eugene, Oregon, are the nearest Bosch representative. They may be able to make a satisfactory exchange for you.

2163 **Trouble With a 1914 Buick.**

From Peter Rauch, Wisconsin.—This is my first attempt at asking you a question as a subscriber to your magazine. My car is a Buick, model B 25, 1914, second-hand, and is causing a lot of trouble. In the spring of 1916 it worked fine, except for a little adjustment of the Marvel carburetor, and everything was O. K., but in the fall trouble started. Now, this spring I had the valves ground in good, and tappet rods adjusted so they all clear the valve stem. The timer was adjusted for 1/10,000 and 1/15,000 inch play; carburetor adjusted, carbon cleaned out and the car worked like a top, but the next trip it would miss on one and two cylinders—the first and third. We put some other plugs in these cylinders and then adjusted the carburetor again, but no adjustment was correct, it seemed, until finally the engine backfired and off she went on all four. It worked fine for about 150 miles and then a knock became noticeable in the car when on a hard pull, and retarding the spark did not help any. I took the machine to a garageman, who was supposed to have had seven years experience. He said the knock was in the timing gear, as oil was put in instead of grease, which leaked out. He put in some grease which helped some. Then he ground all the valves, adjusted the tappet rods and as the lights were dim, he cleaned all the brushes on the generator. The car worked all right for about 50 miles. Now the starter is just about dead and the lights will just burn very faintly and she misses badly on 1 or 2 cylinders. Today I took the car to this garage and the repairman put in new plugs and adjusted the carburetor, but still it wouldn't work, and he took out all the valves again to be ground and he claims the trouble is too much oil. If this is true would there not be more carbon? My idea is there must be something wrong in the electrical parts, which he does not understand, as he admits that he has not fixed many "Buicks" yet. I hope you can give me a clear answer, telling me what you think is the matter with the car.

Reply.—If by the "timer" you refer to the interrupter points, 1/50th of an inch gap would probably give better results than 1/10,000. It would be well to clean these points carefully with emery cloth or a very fine, thin file. If the back fire was in the muffler it is probable that the muffler was partially clogged and the back fire cleaned it out. It would be worth while to take the muffler apart and finish the job. As this is a 1914 car, it is quite likely that the battery is about worn out and unless you know that it is less than two years old, we would suggest that you have it taken apart and examined. Too much oil will not necessarily give much carbon deposit because the oil might get on the spark plug and interfere with ignition so that the oil is not burned.

2164 **Misfires in One Cylinder.**

From W. Schrader, Illinois.—The car on which the following questions are based is a Stoddard-Dayton, model 11-B, 30 H. P. It fires regularly when running idle or when running at a high speed, but will misfire in one cylinder at a common road speed, say from 12 to 20 miles per hour. The valves have been ground, the carburetor and magneto cleaned and adjusted to various points without results. The magneto is a Bosch Du 4, and the carburetor is water jacketed. After a short run the grease works out around the valve caps and spark plugs. Do you think the piston rings leak? Can this cause it to misfire? Or do you think a hot air tube to the carburetor would help? When the engine misfires there is a knock somewhere, although the connecting rod bearings are all right. What can we do to stop the oil from flying out of the crank case at the rear bearing next to the fly wheel. We put in a new washer of brown wrapping paper and shellac, but it does not help.

Reply.—The oil working out around the valve caps and spark plugs may also get on the spark plug points and cause misfiring. On the other hand, misfiring from some other cause would leave the oil unburned and it would work out as described. If the trouble is due to oil, it may readily be detected by noting if all cylinders fire when clean spark plugs are put in. It seems more likely, however, that the misfiring comes from loss of compression, probably through a leak around the piston rings, or possibly at the points where the oil works out. The compression may be tested by turning the engine over with the starting crank and noticing if all cylinders have an equal resistance. It is usually necessary, with the present grade of gasoline, to supply heat to the carburetor to secure even running in cold weather. To prevent oil from working out of the rear main bearing, it will be first necessary to fit the bearing properly and then cut oil grooves in it, extending from the inner edge to within a quarter of an inch of the outer edge, so that the oil will be collected and drained back into the crank case.

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2165 **Nitroglycerine.**

From R. B. Abronder, Texas.—I have been in quite an argument with a friend concerning the use of the so-called nitroglycerine in gasoline for automobile use. He contends that racing drivers, on the big speedways, do use a small quantity of nitroglycerine in their gas, as do also trick riders on motorcycle motordromes. I have never read of anything like this, and I say they don't use nitroglycerine, although they may dope up the gas in some way. Will you be good enough to give us light on this subject? Also please state at what speed a car has to move to stay on the Sheepshead Bay track.

Reply.—We have never heard of nitroglycerine being added to gasoline for use in an automobile. Racing drivers sometimes use small quantities of picric acid and ether, which they often term "dynamite" or "nitric." This may readily lead to the mistaken idea that nitroglycerine is used. It is not necessary for a car to move at all to stay on the inner edge of any part of the Shepshead Bay circuit. The banking at the turns is figured to permit a speed of about 120 miles per hour at the outer edge. It would be unsafe to drive a car on the outer edge at less than this speed.

2166 **That Ford Car Scraping Sound.**

From H. B. Smith, New York.—I think if R. A. Schell, Florida, will look at his pistons he will find one that rubs hard against the side wall, the top against the right side and the left against the bottom. The only remedy I know is over size piston. Please inform me if this is right.

Reply.—In our opinion over-size pistons would not be likely to overcome the trouble unless the cylinders are worn out of round, and then it would be necessary to have them rebored. Such a defect may have been due to some defect or wear of the connecting rod or its bearings, the connecting rod pin, the crank shaft or other part of the assembly.

2167 **Cannot Be Done.**

From William M. Watson, New Hampshire.—I have a Ford Model T car equipped wth a Bosch magneto. I wish to run electric lights from the original Ford magneto. How could this be wired with a New York headlight controller to have the dash and tail lights work together? What size and voltage bulbs should be used? Would these give a satisfactory light?

Reply.—The manufacturers of the New York Headlight Controller say that dash and tail lights cannot be used satisfactorily in connection with their device.

2168 **Battery Trouble.**

From G. H. Dueck, Canada.—I have a Willard six volt storage battery which was badly damaged by frost. It has stood about eight months in a discharged condition. Can it be brought to a condition so that it can be used again? One of the jars is cracked. Will it pay to buy a new jar and repair the battery? Can you tell me a firm where I can get a complete lead burning outfit?

Reply.—Whether or not this battery could be brought back to condition could be determined only by inspection, but in view of the fact that it has been discharged eight months and has a cracked jar, it would, no doubt, cost nearly as much to repair it as to purchase a new one. The following companies manufacture complete lead-burning outfits for battery work: Cox Brass Co., 1733 Broadway, New York; Oxweld Engineering Co., Newark, N. J.; Imperial Brass Manufacturing Co., 51 East 42nd St., New York.

2169 **An Unpleasant Noise.**

From A. W. Ingalls, Massachusetts.—I have a New Series, 1917 Chandler Chummy roadster, Maker's No. 36784. Have owned the car a month and bought it new. Ever since the first day I bought it, just as at present with mileage at 800 miles there has been a severe "back lash" and "slapping" noise under the car, apparently near the universal joint. The service stations in Lynn and Boston have taken the car down from differential to engine, made alterations, reassembled, and left the noise exactly as before. We have another Chandler car, also new, but minus this noise. The clutch is also apparently loose as it rattles badly when disengaged as the car comes to a stop. The "back lash" noise, however, is my main trouble, for it sounds continually at low speeds and especially over cobble stones, just as though the engine were skipping, which is not the case. I wanted to write for possible aid or information from any other Chandler owner. The Chandler Co. have not been able to explain the difficulty at this writing and it has certainly baffled all the local Chandler service stations.

Reply.—Very likely this noise is due to one of the rear wheels being loose on the axle shaft. This point might easily be overlooked because the sound would come, apparently, from the propeller shaft, some distance from the wheel. In this type of rear axle construction, the driving shaft is keyed to a flange which bolts to the wheel and forms part of the hub. To test for this trouble, put gear in first speed, remove hub cap, jack up one rear wheel, move it forcibly backward and forward, and observe if there is any play between the hub and the axle shaft. Repeat with the other rear wheel. Very close observation is often required to detect this play. Although the universal joints may be in good condition, they are likewise keyed on to the tapered ends of the propeller shaft, and these may be tested in the same manner, although the trouble is not so likely to be at these points. Another possible source of trouble is a loose fitting bolt through the torque rod, where it is fastened to the rear wheel. The clutch rattle sometimes is caused by worn or poorly fitting keys in the middle disc or high speed gear members that do not fit snugly. In either of these cases, the rattle would be most noticeable when coasting or applying the brake.

2170 **Loss of Power.**

From Edgar Weir, Virginia.—My car has been in use only about a year and yet it does not begin to run as well as when first put into commission. It has been run about 4,000 miles. It seems to have lost its power when going up hills and the engine knocks when going up a fair grade. What do you think is the trouble?

Reply.—In our opinion the engine should be cleaned of carbon, as it would be well to clean any car after it has covered about 5,000 miles, or even

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less. It probably overheats. The spark plugs are in good condition or it would have developed preignition. Clean out the carbon well and see what the result will be.

2171 **Clutch Shifting Trouble.**

From G. M. Buckmaster, Oklahoma.—We have a Hupp "20" that when the shifting gear are in neutral and the engine cranked it runs very easy, but upon disengaging the clutch for the purpose of putting the car in motion, it seems to stall the engine; that is, the engine must be speeded up considerably before disengaging the clutch, otherwise it will stop. Seems to take as much power to drive the engine with the clutch pushed out as it does to propel the car when it is engaged. Can this be remedied, and how?

Reply.—This car has an inverted U-shaped bronze piece that fits in a slot in the clutch and is operated by the clutch pedal when the clutch is released. If this is not kept well lubricated, especially when it has become worn, pressure on the clutch pedal working against the resistance of the clutch spring causes a decided braking effect on the motor until the clutch has become fully released. There may easily be sufficient friction to stall the engine. This trouble increases as the clutch yoke wears. Keeping the part well lubricated with graphite grease should overcome the trouble if the yoke is not too badly worn. If worn, it may be turned around so that the opposite face bears or a new one should be installed.

Too Much Tinkering.

From G. E. Peterson, South Dakota.—If 90 per cent. of the drivers of automobiles would throw away their tools, they would have less trouble. Many of them use them merely to "show off" and yet they would not know a broken crank shaft if they saw it. I judge after seeing some people drive a car that the fools are not all dead yet, but the automobile is getting some of them. I was coming from Sioux City, Iowa, last fall on a trial. We were making about thirty miles an hour. An automobile driven by a woman with two children in the car was running alongside of the train and at about the same speed. The car was running wild and the woman was pinning on her hat. I should not like to tell you what I thought of that woman, but you can make a pretty good guess. I have been driving a car for several years and never had a serious accident, but have had some narrow escapes.

Cure for a Generator Trouble.

From E. C. McCall, New Jersey.—A rather curious occurrence on a 1916 Hupmobile, model N, came to my notice the other day. For some reason the Bijur generator was not charging the battery, which was gradually becoming run down. The dash ammeter showed no current even when the engine was raced. The repairman seemed to think the ammeter was burnt out. We hooked in a Weston ammeter and found no current. There is a small field fuse under a cover on top of the generator. This was found to be burnt out. After putting in a new fuse the generator charged in great style, the dash ammeter showing a strong current. But a new difficulty presented itself, when the ignition switch was thrown to "on," a short circuit was shown by the ammeter needle swinging violently over to "discharge." With the lighting switch "on" and ignition "off" no short circuit was shown so that apparently the "short" was somewhere in the ignition circuit.

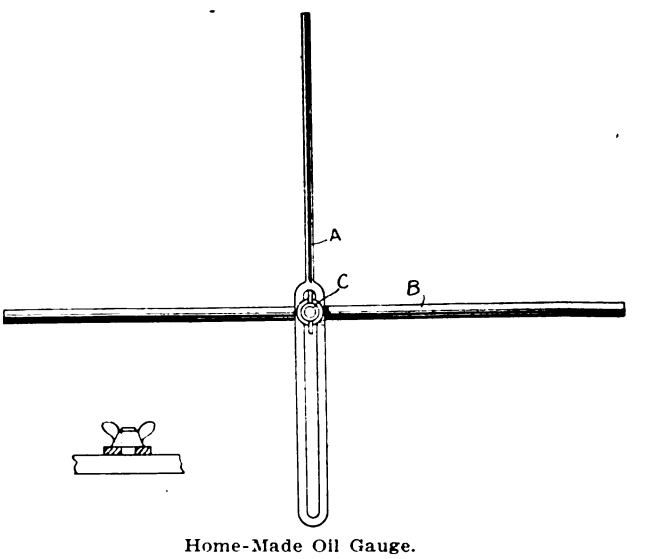
This model N is equipped with Atwater-Kent open circuit ignition and the only time the current should flow is during the hammerlike blow of the breaker points. Examining the points carefully, we found the trouble. The points had pitted in such a way that they did not separate properly, thus causing current to flow and showing "discharge" on the ammeter. Whether this caused the fuse to blow on the generator, I don't know. Filing and adjusting the points cured the trouble.

That Dodge Car Noise.

From E. C. McCall, New Jersey.—In the April number E. E. Carpenter, No. 2125, reports a strange noise in his Dodge car. Your reply states it may be the fluttering of the auxiliary air valve of the carburetor. As all Dodge cars, which I have seen, come equipped with a Stewart carburetor which has no auxiliary air valve, this could hardly be the reason. I found that a mysterious rattle or squeak in my Dodge car was caused by the muffler plates becoming loose. To remedy this, tighten up the nuts on the long rods which run through the muffler lengthwise. If the nuts are up to the end of the threaded part of the rods so that they cannot be tightened, insert washers or slip a larger nut over the rod to act as a spacer or washer between the regular nut and the end of the muffler.

For Over-Lubrication.

From E. C. McCall, New Jersey.—I have a 1916 Dodge touring car, equipped with an Eisemann magneto. This car has gone over 8,600 miles. Of late I have had trouble with rapid carbonizing of



Home-Made Oil Gauge.

the engine, having had to clean out or burn out the carbon every four or five hundred miles. I was using Havoline medium oil right along, but tried Mobiloil A. I got even worse results with this, so I took the car to a repairman who makes a specialty of Dodge repair work. He took down the crank case to find out how far the splashers or the connecting rod caps were dipping into the oi

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in the oil pan. This oil pan contains depressions, one under each rod, and there is a round hole at the upper end of each depression which acts as an overflow to keep the oil in the depression at a certain depth. By means of a simple home-made gauge (see sketch) he was able to measure how far the connecting rod caps dipped into the depressions. In my case he found that even the nuts on the connecting rod cap bolts were dipping into the oil at each revolution of the crank shaft, and throwing far too much oil up into the cylinders. He blamed the carbonizing on this. To remedy it he cut new holes in each depression below the regular holes, thus lowering the oil level in the depressions. He cut off the projections on the connecting rod caps and soldered on short pieces of copper tubing. These pieces were made slightly longer than the original projections so as to dip into the oil at the new low level.

I also had him install twelve American hammered piston rings. These are a one-piece ring, concentric. He also tightened up the main bearings and connecting rod bearings The job took one man 20 hours. Since then I've run the car 300 miles and am beginning to note a great improvement. The oil consumption is greatly cut down and the engine seems livelier.

The lower part A is slotted by means of screw C. A can be raised or lowered in relation to B. B is long enough to reach from one side of the oil pan to the other.

That Missing Front Cylinder.

From Leslie Nodle, Iowa.—In answer to Oscar Barnes, Wis., No. 2127, will say I had nearly the same trouble with a 1916 model Ford. I got it in December, 1916. I had to clean the plug after every run, so I put in a piston .0025 oversize (it was the first front cylinder) and it fit just fine. The car had run about 1,000 miles. It cost $1.35 complete with rings and pin. I hope this will help someone else. Since I have had no trouble at all.

Says Interlocks Pay.

From C. A. Pearson, Colorado.—In answer to 2082, will say from experience that it will not pay to use junk casings over good ones. I know it pays to use interlocks in casings that have been damaged through running with low pressure, bruised, punctured, etc. I have used them for years and have never worn one out yet.

The Stanley Steam Car.

The Stanley Motor Carriage Company of Massachusetts, with works at Newton, Mass., has been taken over by a new corporation of the same name, organized for the purpose, and incorporated under the laws of Delaware. Capitalization includes $2,500,000 of preferred stock and 100,000 shares of no par value common. None of this stock will be placed on the market for public sale. From the very first the Stanley business has been profitable and successful. In spite of the fact that advertising, publicity and aggressive merchandising methods were ignored, the output of the works at Newton increased gradually and Stanley cars have been produced in commercial quantities without intermission for almost twenty years. No effort has been made to get into quantity production in the modern sense, and the demand for the cars has always exceeded the supply.

The Stanley company has from the beginning held a firm conviction as to the superiority of steam power over the internal explosive engine, and the closest observation of the development of the latter during the last twenty years, nor even its very apparent popularity has not disturbed that conviction nor led them to make a change. The cars were well built and carefully made and record after record was smashed by stock cars both on the speedways and in the then popular hill climbs. Aside from the fact that the Stanley car burns kerosene and operates on steam, an interesting feature is the simplicity of operation and ease of control. One throttle lever under the steering wheel controls the car, and clutch, gears, gear shift and spark and gas controls are all eliminated.

This reorganization will have marked effect upon the general policy of the business. Immediate efforts will be made to increase the production. The factory capacity will be enlarged and further equipment installed, and it is announced that a strong modern merchandising effort will be put behind the product. Rumors that the Stanley company will bring out a cheap steam car are unfounded. The officers state that no changes in models or prices are under consideration.

THE COOLING FAN.

How to Make It Most Effective for Its Purpose.

From A. K. Schanze, before the Cleveland Section, S. A. E.—The cooling system of the internal combustion engine as now applied on a majority of pleasure cars, trucks and tractors normally divides itself into four main units. These are the water jacket around the motor, the circulating system, the radiator and the fan.

The order in which these have been named seems to be the order in their importance in the minds of most engineers, consciously or otherwise. It seems, at least, that this is about the historical order in which real scientific research and practical development took place on the cooling system today in use.

The author of this paper wishes to be recorded as being of the opinion that no order of relative importance can be assigned to these four subdivisions of the cooling system. They form a chain whose strength is only that of the weak link, and wherever there is a system in which one of the four parts falls below its proper standard of balance, there lies an imperfection in that system which should be remedied. Cooling systems give outward evidence of imperfections in two general ways, they overcool or they under-cool. Of the two the latter is far and away the more common.

Now, to take the discussion up in its parts, let us begin with the water jacket. Its functions, as we all realize, is to carry a quantity of water of such volume that it will take away from the cylinder walls only that heat that cannot be converted directly into mechanical energy, and the accumulation of which would be destructive to the material of which the cylinder is made. From such definition it would appear that, given the number of heat units generated, the mechanical work to be done, and the heat units in excess of the latter requirements, a water jacket would be a simple matter to

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design. Perhaps it is, but its simplicity is a secret in possession of a comparatively limited number of engineers. It has been the writer's experience, during the various fan tests, that he has conducted on cars of many different makes, to come across three or four apparently ideal water jacket designs. In the main, water jackets leave some room for improvement.

The mere solution of the problem of what volume of water a jacket must contain does not produce the answer to the problem. The distribution of the water layers around the cylinder walls may take on an aspect of even greater importance than the volume. Since ignition takes places in the top of the cylinder, the top is longest exposed to fire and becomes hottest. Modern engineering practice has placed the deepest layer of cooling water over the top of the cylinder, which is as it should be. However, the foundry practice in some cases seems to have interposed stiffening ribs or small columns on top of the cylinder. These act as retarders to the circulation with the result that steam pockets seem to be formed. This shows itself in some engines whose water jacket volumes are adequate, in the sudden jump in temperature that takes place when the motor stops.

It has come to the author's notice on several occasions in tests that, when the motor was stopped, the temperature recorded by a thermometer placed in the filler cap mounted from 200 to 220 degrees Fahr. After losing two thermometers through having them blown out of an improvised bushing in a hole in the filler cap and seeing a jet of steam shoot 20 feet into the air from a radiator that a moment before had not been near the boiling point we became cautious and observant. Thermometers lashed in place showed that temperatures went to 220 degrees Fahr. Repeated experiments over the same ground could lead only to the conclusion that the whole mass of water was not being raised through that range of temperature in 40 or 50 seconds, but some little patch on top of the cylinder was being converted to steam and the filler neck was being used as a steam dome faster than it could act as a relief through the overflow.

The Water Jacket.

Wherever a design of water jacket allows of such a condition, every effort should be made to get rid of it. The condition is dangerous to the mechanical structure of the machine from an economic standpoint and is dangerous to people working around a car. The mechanical danger lies essentially in the radiator, where the large areas and thin structures are not designed to carry pressure. Steam above 212 degrees means pressure, and there is no doubt that many a radiator manufacturer has been called upon to replace a leaky radiator that was really not defective in its own right. The danger to human beings lies in the possibility of a clogged overflow pipe, and an unsuspecting person taking a look into the filler neck at the psychological moment. The writer was witness to one such case about one year ago where a man had his face severely scalded.

The water layer, then, over the top of the cylinder should not only be calculated upon a basis of its total volume, but should also be so arranged that the circulating system will handle all of it at a uniform rate, and so that, when the circulating system ceases to function, by virtue of the stopping of the engine, the layer will have a thickness such as to afford sufficient reserve to absorb the heat that remains in the cylinder after the last explosion, and no more heat is being added.

Tests conducted by various authorities on internal combustion engines indicate that high compression contributes the largest percentage of total efficiency of the gas engine. High compression is always attended by the danger of pre-ignition unless the cooling system can overcome the tendency. If the cylinder walls are cool, the gas upon entering the cylinder on the suction stroke does not immediately expand and fill the cylinder and prevent the full calculated quantity entering. It tends to keep its density in accordance with the carburetor regulation and then gives the engine more nearly the capacity of which a gas engine is capable.

In order to prevent the overheating tendency immediately following shutting down an engine, it would seem necessary then to give the water jacket such volume and distribution as to enable it to absorb the last head accumulations, independent of the circulating system.

Jacket design therefore should be such as to allow liberal distribution of water and freedom of circulation. Between the pump system and the gravity system of circulation there is, at present, somewhat of a race for supremacy. The pump system frequently over-circulates, or tends to, while the gravity system under-circulates. Both faults are conducive to trouble. It would appear, then, that it might be well to select a pump speed designed to do its circulating within the limits of the radiator frictional resistance and then always run the pump at that one speed regardless of motor speed. The gravity system of circulation has been used with varying success. At best its impulse is feeble, due to the lack of head. On this account it succumbs readily to any abnormal frictional resistances that may result from solid matter in the water.

Best results in gravity circulation as applied to the heating of dwellings and other buildings are obtained with the horizontal runs comparatively short as compared with the head. The principle is identical in the automobile. The head pipe must always remain well submerged. This latter feature cannot be accomplished without the use of a reserve storage tank attached to the top of the radiator.

The practical development of the system is still in its infancy and it is out of the question to say at this date anything but words of encouragement to users of the system.

Radiators offer about the largest variety of selection in the automobile industry. The radiator whose heat transferring qualities are such as to give a uniform rise of temperature to all air passing through it regardless of the velocity of the air is an ideal radiator and it is not beyond our reach. Some are in existence that so closely approach this condition as to be considered perfect to all practical intents and purposes.

Air Passages Should Be Free.

For efficiency, not only is it necessary to have the air passages free from solder obstructions, but it is just as important that they be of a size and shape that will give a good smooth run to the air. The more air that can be passed through a radiator the more will be its cooling power. As a practical suggestion to car builders the writer offers that every

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purchaser be furnished a special card cautioning him to keep the exterior of the radiator clean as he possibly can. Much heating complaint would be avoided if radiators were kept clean. Tests go to prove that when a film of oil gathers enough road dust the radiator efficiency is reduced to about one-quarter normal.

The Fan.

Our last element in the discussion of the cooling system will be the fan. Altogether too little importance has been attached to this unit as is well illustrated by the fact that so few engineers know precisely how the relative values of different fans are determined. Researches made by some of the foremost radiator manufacturers have shown that cooling varies directly with the quantity of air passed through the radiator, when other conditions are reduced to the uniformity. It has, therefore, been the long time hope of many of the radiator manufacturers to see an improvement made in fans.

First and foremost, in the selection of a fan, should be considered the element of quality of air delivery. The ideal radiator, as has been stated, is the one that will give off its heat at such a rate that the air that passes out of it can absorb no further heat units. In combination with this radiator, the ideal fan is the one which will draw air through the radiator at such a high velocity that the air undergoes no measurable increase in temperature as it passes through. The fan is the only link in the chain that can be made of practically unlimited power without throwing the system out of balance. Incidentally, it may be remarked that fan manufacturers have the world still to conquer in that respect.

Fans of any one design increase their capacities in an approximate geometric progression with the increase in diameter. Best practice would therefore suggest the use of the largest diameter possible on any particular model of car. There are several distinct types of fans offered by the various manufacturers, classified for description as follows: rim fans, which are those whose periphery is bound by a circular rim; flat blade fans, which are usually of three or four flat blades built out from a central spider; curved blade fans, which are similar in construction to the flat blade fans except that the blades are curved somewhat after the manner of a garden trowel; and multiblade fans, which are of two or more arms, up to six, and in which each arm consists of two or more blades.

Flat blade fans are the most common in use at the present day. They are usually of the four blade type built up on a central spider. Their air delivering qualities are not good at low speeds, say, at a peripheral speed less than 5,000 feet per minute; hence they have to be run at very high speeds. High speed fans are noisy and consume a large amount of power.

The engineer, in making his selection of a fan, should take into serious consideration the amount of power necessary to handle maximum air velocities through the radiator. The author feels confident in making the statement that this phase of the question has been considered by very few engineers.

The summary of the whole situation is that, when the motor gets beyond a certain speed limit, such that the fan should begin to make from 4,000 r.p.m. up, the belt begins to slip, and once this condition has set in the fan becomes worse than useless for that particular set of conditions. A slipping belt does itself a lot of harm in addition to polishing the fan pulley so as to make the slip at normal speeds greater.

Wheel Puller and Arbor Press.

From E. A. Porter, Oregon.—I send a sketch of a home-made wheel puller that I use to pull off the hind wheels of my car, Fig. 1. A is a wood block

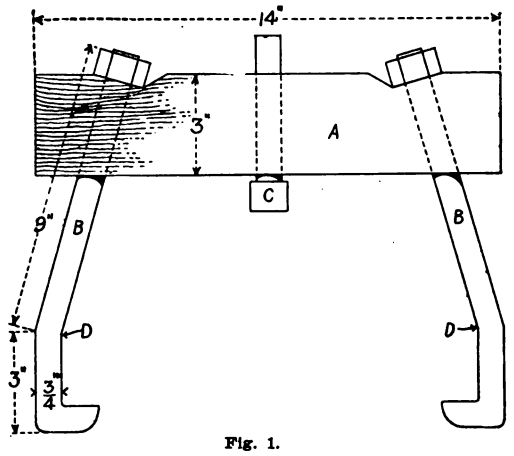


Fig. 1.

2½x3" by 14" long. B is made from ¾" round iron. C is a short piece of round iron to go against the end of the shaft. The hooks catch the edge of the brake drum. The bends in the draw arms as

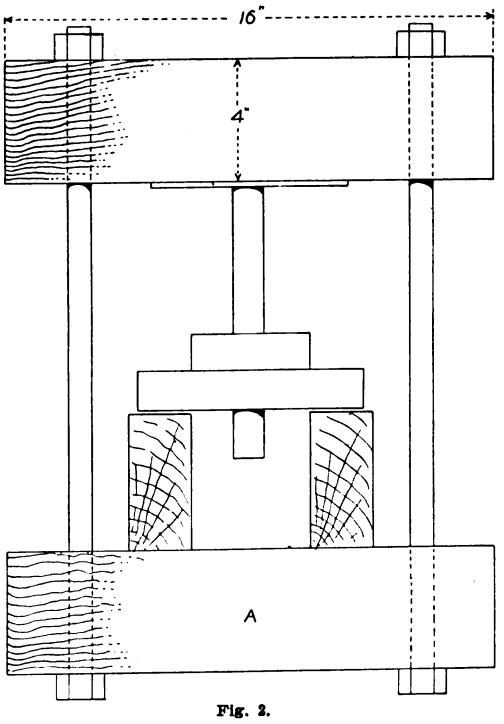


Fig. 2.

shown at D give them such a shape that they will not slip off. The block, A, is shown with a plunger through the center that can be struck with a hammer, but I use a plain oak block and strike on the

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back of the block. I have used two oak blocks 4" square and 16", with two long ¾" bolts for an arbor press, Fig. 2. The lower block, A, may be bolted to the top of the work bench, or if the top of the bench is made of a heavy oak plank, the plank itself will take the place of the block, and a hole can be bored in it for the shaft to pass through.

THE GASOLINE SITUATION.

Director of the United States Bureau of Mines on the Subject.

V. H. Manning to the Business Paper Editors.—I am glad to be permitted to share in the patriotic endeavors of the business publishers and to bring before you, and through your public agencies, to the country, one of the, at least to my mind, serious problems confronting the United States at this time. I refer to the production and consumption of petroleum and gasoline in the United States.

To us who have looked into the insides of this problem, the situation is serious and it is my purpose here to give you a few of the essential facts and allow you to draw your own conclusions as to the remedies that ought to be applied. I shall transgress from this just for a moment to give you all the preliminary thought that, generally as a nation, when it comes to our heritage of splendid natural resources, we are wasteful, apathetic and forgetful. We waste our natural resources with shameful prodigality; we are apathetic of the future. It has been said that we waste our resources like a sailor spends his money on shore leave for the first time in a year, but from what I have seen of our national sin of waste I think we slander the sailor. I preface my remarks with the above because I wish to imprint the thought that any remedy that can be applied to the petroleum and gasoline situation will come through conservation, which does not mean tying up but a wiser use of what we have.

I suppose that you all are more interested in the motor fuel or gasoline situation than in the general petroleum situation, no matter how much one depends upon the other, and I am inclined here to give you a few of the outstanding statistics which will show you the crux of the problem. In the year 1916 there were two million seven hundred and fifty thousand automobiles, or an increase over the year 1910 of two million three hundred and fifty thousand. The increased number of automobiles in 1916 used a billion more gallons of gasoline or 28,000,000 barrels more than the automobiles in 1910.

This increased use of gasoline for the increased number of automobiles alone represented a little more than half of the total output of gasoline in the country in 1916 for all purposes, the total production being about 54,000,000 barrels. And when you realize that the number of automobiles is increasing with each day, you can grasp what a tremendous problem is this feature alone.

The total gasoline engine horsepower built and sold in the United States in 1913, according to the Federal Trade Commission, was eleven million two hundred thousand, and in 1915 the output had a little more than doubled, the figures being twenty-two million five hundred thousand. Just think of it, an increase in gasoline horsepower of 100 per cent. in two years' time.

These figures indicate the increased use of gasoline power more clearly than those which cover only the automobiles, as these include all types of gasoline driven machines which have been developed and increased in use in a way no less surprising than that of the automobile itself.

The apparently unsolvable puzzle about this is that while we have been increasing our production of gasoline, the production of automobiles has increased 200 per cent. above the increase in gasoline production. These are the facts that we must face. Where is it going to end?

Statistics indicate that of the gasoline produced in the United States, between 55 per cent. and 60 per cent. is used in the automobiles of the country, 20 per cent. to 25 per cent. is exported; and the balance is used in stationary engines, in motor boats, tractors and for various purposes of minor importance.

As the highways of the country are improved, the commercial trucks, consuming large quantities of motor fuel, are becoming important means of transportation in many localities. The fishing fleets of our entire coasts have installed gasoline power to replace their original sailing equipment. These fleets, with the many pleasure craft, operated mostly in the summer months, when the production of gasoline is most heavily taxed, use large quantities of this convenient liquid fuel. There seems no reason to believe that the call for gasoline will in any way be reduced; in fact, a much larger demand seems imminent.

As the production of gasoline depends upon our supply of petroleum, let us look to the source and see what we find. Petroleum and its products have become essential to our very existence. Gasoline is a very important product, but there are many others. The operation of hydroelectric generators, of railway and trolley cars, of the machinery of the factories, of internal combustion engines, of our battleships and our merchant ships, in fact, of all machinery is made possible by the use of lubricating oils, and these come from petroleum. Petroleum lubricates the machinery of the nation from the handicraft of the watchmaker to the dreadnaught of the navy.

The industry has progressed since its beginning a little over half a century ago, when it was possible to store the entire production in tin cans and wooden barrels, to the present, when the annual quantity produced requires great steel, concrete and earthen reservoirs for its storage, great pipe lines for its transportation and fleets of specially constructed vessels for its exportation.

In discussing briefly the supply and demand for petroleum in this country for the last few years permit me to say that the stored reserve of petroleum is the most stabilizing influence in the industry. I wish also to bring out the fact that during the last few months our increased consumption has made it necessary to draw oil from this storage which has convinced many people that our present supply has reached a point where it may never again be sufficient to fill easily the demand placed upon it unless some radical steps are taken to conserve its use. One of these steps frequently mentioned, and one that is slowly dawning upon our consciousness is that the burning of crude petroleum under boilers for the generation of steam ought to be stopped. In this way large quantities of priceless by-product

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are being consumed with about the same abandon as an arson fiend destroys valuable property. I understand, however, that some of the western railroads that have been guilty of this practice are beginning to change their oil-burning locomotives to coal locomotives. One of their reasons in the past for burning oil in this manner was that it was then cheaper than coal, but this reason is fast disappearing.

In the year 1916 the marketed production of crude petroleum was, according to the estimate of the United States Geological Survey, two hundred and ninety-five million barrels. The stocks held by various pipe line and transportation companies at the end of January, 1916, according to various trade journals, amounted to approximately one hundred and seventy million barrels; at the end of 1916 the stocks amounted to one hundred and fifty million barrels, which represents a decline of twenty million barrels, even in the face of our greatest annual marketed production of two hundred and ninety-five million barrels.

If consumption of crude petroleum exceeds production, the difference must be drawn from storage. The question that naturally presents itself here is what of the future? During 1915 the normal consumption of crude petroleum was 12 per cent. greater than in 1914; and last year our consumption exceeded the 1915 consumption by 13 per cent. Estimating that the normal peace consumption for this year will increase at the same rate, or 13 per cent., our consumption for 1917 will exceed that for 1916 by about forty million barrels. This does not take into consideration the increased demand for petroleum and its products due to the entrance of this country into the war. Although this increased demand because of the war is difficult to estimate, obviously the increased use for various war purposes will greatly enlarge our consumption above the rate which prevailed during times of peace. The production of crude petroleum in this country during last year is thought to have reached high-water mark, and it is very likely that the production for 1917 will be smaller than it was last year. If the normal and war demands for petroleum can be filled, the difference between the estimated production and consumption during this year will amount to probably as much as sixty million barrels, an amount which must be drawn out of storage. With only about one hundred and fifty million barrels of crude petroleum in storage at the first of this year, and with the prospects of it becoming necessary to draw from that reserve probably sixty million barrels to fill that demand, it becomes more apparent that some radical steps must be taken to meet the situation.

It may be that as the shortage becomes more apparent the demand may lessen, but the calculations as given show the present tendency of our supply and demand and make it of the most importance to meet the situation with as little confusion as possible in our industrial life and without in any way hampering the outcome of the war. We should not pass over the situation with an optimistic statement that when the time comes new fields will be discovered, as has happened in the past, or that new methods will be found whereby this threatened shortage will be overcome. We should undertake to anticipate this problem as best we can, for we certainly will encounter it in the not distant future.

While the present increase in the number of pleasure cars may not continue, it is plain that the use of gasoline for power in many commercial fields has not yet fully developed and as this use widens it will more than overcome any falling off in the rate of consumption of gasoline in the cars used for personal purposes, if such falling off should occur.

The fact we must face is that the production of petroleum is not increasing as rapidly as the production and consumption of the gasoline. The petroleum in time will reach its maximum production and start to decline. What we are doing now is looking to more efficient methods of production from the oil sands, the production of more gasoline by the so-called cracking process, the extraction of vapors from natural gas, and the utilization of liquid fuels from other than petroleum bases.

More efficient methods of production are now being developed, such as the Smith-Dunn process for forcing oil from the sand by the use of air or gas under pressure.

The cracking of petroleum last year furnished 7½ per cent. of the total gasoline production and can be and is being developed and installed rapidly in most of the larger fields of the United States. Its possibilities are enormous.

The treatment of natural gas by compression, refrigeration and absorption produced sixty million gallons of gasoline of such low boiling point that it was mixed with equal parts of naphtha to form one hundred and twenty million gallons of good motor fuel. The compression and refrigeration process of extracting gasoline from natural gas, when first used, treated only gases containing three gallons or more of condensable vapors, but at the present time the development of the process and the increased price of the product make gas carrying one gallon profitable. The extraction of gasoline from gases containing less than one gallon and as small a quantity as one pint per 1,000 cubic feet is now being profitably carried on by the absorption process, which is well adapted to treating lean gases in large volumes. Another source of petroleum which will undoubtedly be developed in time is the shales containing considerable quantities of oil, but which, at present prices of crude oil, cannot be extracted commercially.

Substitutes for gasoline, such as the products of the distillation of coal, are being used at present in Europe for motor fuels, and may in time be used for that purpose in this country, as many by-product coke ovens are now being constructed.

In the periods of readjustment and in the development of latent resources, I am hopeful that the Bureau of Mines will play an important part. At present, besides endeavoring to meet the problems of today, the bureau is looking ahead and preparing to aid in solving the problems of tomorrow by investigating the possibilities of increasing the present production.

Automotive Electric Matters.

The first annual meeting of the Automotive Electric Association was held at the Homestead Hotel, Hot Springs, Va., May 17, 18 and 19. The attendance approximated forty from the following companies: Dayton Engineering Laboratories Co., Day-

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ton, O.; Dyneto Electric Corporation, Syracuse, N. Y.; Electric Auto Lite Company, Toledo, O.; The Leece-Neville Company, Cleveland, O.; North East Electric Company, Rochester, N. Y.; Remy Electric Company, Anderson, Ind.; The Robbins & Myers Company, Springfield, O.; Splitdorf Electric Company, Newark, N. J.; U. S. Light & Heat Company, Niagara Falls, N. Y.; Wagner Electric & Manufacturing Co., St. Louis, Mo.; Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

The objects of this association are to discuss subjects of interest and value to the industry in which its members are engaged, to advance and improve the industry by standardizing equipment and to standardize its application in co-operation with the Society of Automobile Engineers and the automobile manufacturers.

HUNTING TROUBLE.

Always Easy to Find Except in Case of the Automobile.

Ordinarily the fellow who starts to hunt trouble finds it quicker than he expected, but not so with the automobilist; when he starts to hunt trouble—in the car—it seems to be a very demon for eluding the searcher. Trouble will hide in a tiny piece of carbon lodged under a valve, or between spark plug points, in a wire that has jarred loose, in an interrupter point, a piston ring, a gas pipe—oh, in the most secret and insignificant place—in size—and just defy one to ferret it out. One learns that the insignificant things are really the most important at times.

Yet most of the troubles incident to the operation of a motor car may be located very quickly, if one will but go after them in a systematic way, and not wander aimlessly about the engine and other parts. The hardest thing a driver has to do when the engine stops or acts up is to divest himself of the idea that he knows just what the trouble is. He is sure he can fix it in a minute and he putters around a long time before he makes up his mind that it is something else, and it takes a lot of time to prove that to some persons.

"The best way to go about it," said H. C. Brokaw, principal of the Automobile School of the West Side Y. M. C. A., 318 West Fifty-seventh street, New York, "is to start without preconceived ideas as to what the trouble may be, and follow a system, which is really a process of elimination. To start a gasoline engine, three things are necessary—gasoline, compression and a spark at the right time. To keep it running it is necessary to have also water for cooling (unless an air-cooled engine) and oil for lubrication.

"If the engine stops on the road and pressing the starter pedal fails to start it, the first thing to do is to get the crank out of the tool kit and crank over the engine. If, with the gears in neutral, the engine cranks over hard, it indicates a lack of lubricating oil, or a lack of water, which has allowed the engine to reach a temperature where the lubricant fails to perform its work. If the engine turns over fairly easy it is not necessary to look for oil or water trouble.

"The next test is for compression. If the driver is not experienced and is unable to tell simply by the resistance to the starting crank if each cylinder has compression, he should open all petcocks except on one cylinder and turn the crank two revolutions, noting if there is a resistance for one-quarter of a revolution in the two revolutions. Compression occurs only on one stroke of the piston in the four stroke cycle. Each cylinder should be tested in a similar manner, opening all petcocks except on the cylinder being tested; see if the compression is practically equal in all cylinders.

"If one cylinder has very weak or no compression, the trouble will be found usually in the exhaust valve. First examine the push rod to see if there is clearance between it and the valve when the valve is supposed to be closed; if there is, the valve must be lifted out and the valve and seat inspected for carbon. Sometimes a piece of carbon will lodge on the valve seat, and, due to the hammering of the valve, will become fastened to valve or seat. For temporary repair generally it can be scraped off with a knife and the valve be ground in upon reaching the garage.

"If the trouble is not in the exhaust valve, it might be in the inlet valve. In some types of engines, the valve head may break off and get into the cylinder and when the piston comes up punch a hole in the piston head. A petcock may be loose so that it will jar open sufficiently to affect the compression and so cause the cylinder to miss fire. These troubles usually are confined to one cylinder and not to the whole engine.

"The gasoline is the next to be inspected. Is there gasoline in the bowl of the carburetor? This may be determined by inspection, opening drain cock, or "tickling"—flooding. If not, examine gasoline tank and see if there is a supply; then see if the shutoff valve in the line leading to the carburetor is open; if so, drain the bowl of the carburetor to get rid of possible water and dirt. To check the possible clogging of gasoline pipe or carburetor screen, notice if the bowl fills up again in a reasonable time.

"Do not adjust the carburetor. If the engine has been running it is practically certain that the carburetor has not become out of adjustment. Inspect the intake pipe, or manifold, to see if it has been loosened by vibration. If the engine still refuses to run, put about a tablespoonful of gasoline in each cylinder and crank over the engine. If this runs the engine for a few revolutions it indicates that the trouble is in the gasoline system and leaves but the spray nozzle, which may have dirt lodged in it, or the auxiliary air valve, which may be stuck, as remaining causes.

"Next inspect the ignition system. The first thing to do is to loosen one of the wires from a spark plug and lay or hold it so the bare end will be ⅛ inch from the base of the plug and have some one crank the engine by hand or with the starter. If a spark does not occur, go first to the interrupter points and short circuit the fixed point with a screwdriver or other metal tool and see if there is a spark. Examine the points for dirt and see if they come together and open properly. Then examine the condition of the battery, testing it. Examine the connectors on the battery, which sometimes jar loose; examine the wires leading to the interrupter and switch; see if they are loose, or broken, or short-circuited. This need not be done if the spark shows at the interrupter.

"Examine the distributor for moisture or dirt and

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see if the wires have become loose. If a magneto only is used, it is a simple matter to see if the interrupter points are making and breaking properly and if the distributor is clean and dry. If these appear to be all right the trouble is doubtless in the armature winding or the condenser and cannot be repaired upon the road.

"The wires to the plugs may be burned or short-circuited. If, with an apparently good spark, we have compression and there is a mixture passing into the cylinders, the trouble may be in the spark plug. To test a spark plug it is necessary to remove it. Widen the gap to 1/8 inch and lay the plug with wire attached upon the cylinder; crank the engine and see if a spark jumps the gap. Widening the gap is necessary, because the spark will not jump so far under pressure as in the open air. If it does not jump the plug may have a broken insulator, or need cleaning. An extra set of plugs should be carried to replace those which become dirty; cleaning should be done in the garage. If uncertain about condition of plug, exchange it with one in another cylinder that is working properly.

"This covers most of the usual troubles experienced on the road. There are, of course, a great many other possibilities, but if these tests, carefully made, do not disclose the cause of the trouble, the novice would better send for a garage man. If one or two cylinders miss fire, the trouble is most likely to be caused through lack of compression or short circuited spark plug. If the engine refuses to run the trouble is most likely to be due to lack of gasoline, or failure of battery or magneto.

"The general rule given herewith should be cut out and pasted under the hood, or carried in an envelope in the tool box for ready reference. It may save much time and trouble when far from a garage. Carefully followed it should locate almost any trouble likely to be experienced, and it is the locating, not the fixing, which takes time."

General Trouble Rule.

Remove nothing except as directed in the test rules. Remember, the following conditions are absolutely essential to make the engine run:

Gasoline—Is tank full? Are pipes clean? Is carburetor clean? If carburetor needs adjusting, do it, otherwise leave it alone. Does manifold leak?

Compression—To test—Open all petcocks except the one on cylinder to be tested; crank engine, noticing how strong the compression is in each cylinder.

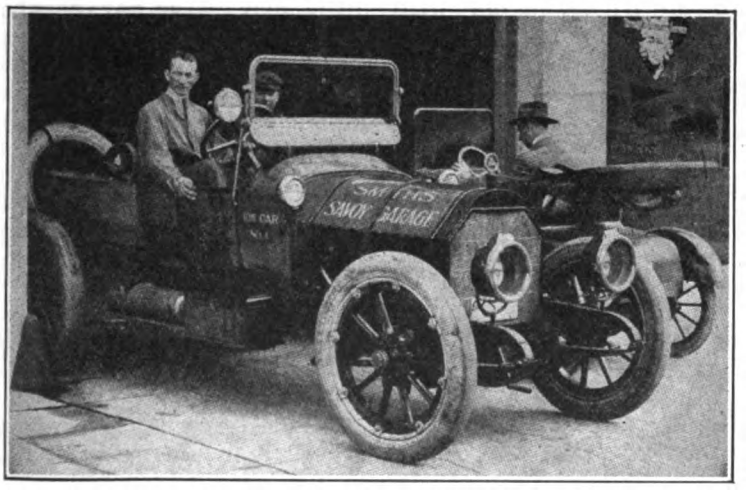
Ignition—A—Test for a spark by taking the wire off any plug; hold wire about 1/8 of an inch from plug; crank engine with switch on. Spark should jump to plug. B—Are the batteries run down? Does the vibrator (if any) buzz? Is timer clean? Do timer points make good contact? C—Are any wires loose, burnt, wet, broken or short circuited? Are spark plugs clean and are points 1/50 of an inch apart? D—Does magneto armature revolve? Is safety spark gap clean? Are interrupter points clean and adjusted right? Do all brushes make good contact? Is distributor clean? Is distributor rotor loose, broken, or making poor contact? E—Check magneto wires as per "C."

Loose wires and terminals and neglected batteries, also dirty gasoline, cause much trouble.

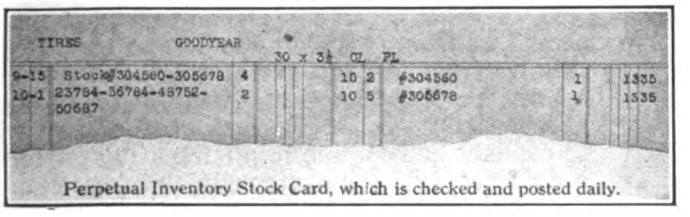
To keep a gas engine running. cooling and lubrication are needed.

Systematic Service Smith.

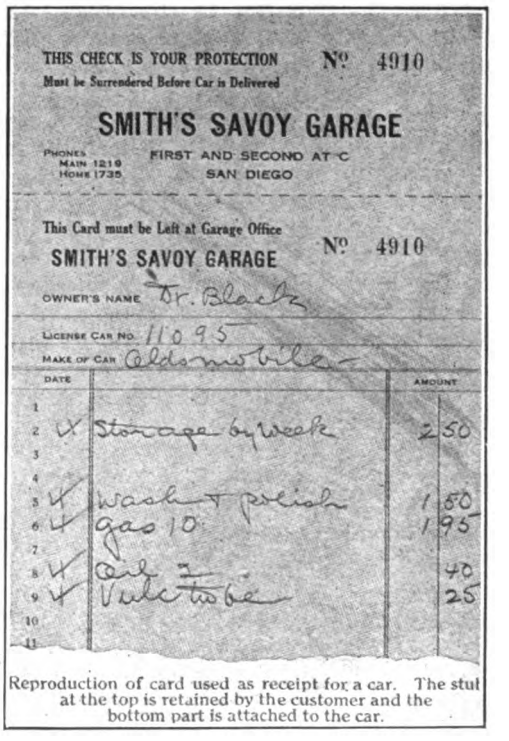
In San Diego, California, is a garageman named Smith. Motorists know him as "Service" Smith, which gives a pretty good line on him. No matter what a customer wants or when he wants it, Smith tries his best to deliver the merchandise. He has a key to each of the two leading automobile supply houses in San Diego, so that he can obtain a desired repair part at any time—nights, Sundays or holidays. He also has a key to the condition of his business, in the shape of a good set of books. You



Service Smith on Duty.



Perpetual Inventory Stock Card, which is checked and posted daily.



Reproduction of card used as receipt for a car. The stub at the top is retained by the customer and the bottom part is attached to the car.

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could rout Howard B. Smith out of bed at two o'clock any morning and he could then and there tell you his assets and liabilities down to the last penny.

Smith's books prove to him conclusively that service pays. They also give him some information that is valuable in directing the business so that it will pay the highest profit. Every gallon of oil or gas that goes into his big service car (the only one in San Diego or Los Angeles that is always on call) and every expense connected with it is known absolutely. He knows that it pays mighty well to maintain this good service, or it would not be continued.

Smith is just as systematic about every other angle of his business. He takes absolutely no chances. Every time money goes into the cash drawer, a memorandum is made on the cash register tape as to what that money represents. Every morning these slips are totaled on an adding machine as to gas, oil, grease, storage, sundries, vulcanizing, washing, floor repairs, distillate, towing, tires, tubes, etc., and the various totals are posted to a daily sales record.

Customers' accounts are kept in a card index ledger, so that a floor salesman may refer to it when a question of credit is raised. The bookkeeper checks each account very carefully before sending out a monthly statement, for Smith realizes that mistakes would cost him either money or customers. Every day his bookkeeper posts the tire and sundry sales to an inventory card, and when goods of this same classification are received, they are posted to the proper card. The man in charge of the stock keeps a carbon stock book in which he records all goods received, and the carbon copy goes to the bookkeeper for posting to the office records. This perpetual inventory is checked by an inventory about every sixty days, by the aid of adding machines.

Realizing that quick sales mean bigger profit, Smith keeps a close watch of these inventory cards, and by so doing he knows which advertised lines are the best sellers. Just as he checks up his stock to prevent losses and pick winners, he checks up his invoices, ledger accounts, his bank balance and everything else into which human inaccuracy may enter. He wouldn't guess at his percentage of expense any more than he would guess at the quantity of gasoline he puts into a customer's car tank—everything is recorded. There's good profit in conducting a garage, provided it is managed according to modern business methods.

Visit the National Parks.

Secretary of the Interior Lane has announced that the National Park Service, recently provided for by Congress, has been organized, and Stephen T. Mather, of Chicago, appointed director of the service. Automobile maps of Glacier and Yellowstone National Parks have been issued by the National Park Service. These maps show the location of the hotels, camps, garages, and principal points of interest to the motorist. They contain also a small map showing the principal automobile roads tributary to and connecting the Glacier, Yellowstone and Rocky Mountain National Parks. Any motorist intending to visit the parks may obtain the maps free of charge from the National Park Service, Washington, D. C.

FIRE PROTECTION.

Vigilance and a Little Common Sense Are Far Better Than Loss.

From Murray Fahnestock, Pennsylvania.—A car is such a valuable possession that it is well worth while to use a little care to protect it against fire. Having the car insured is an excellent policy, as it not only protects the owner from loss due to fire, but relieves him of worry. However, insuring the car does not alter the fact that a burning car is apt to cause damage and loss to adjacent property. The owner of even a fully insured car, in fairness to his fellow motorists and the insurance companies, should take all reasonable precautions to protect his car against fire.

If an approved type of fire extinguisher is carried in the car, many insurance companies will allow a reduction in the premium paid for insurance which will soon pay for the extinguisher, not to mention the greater personal safety which the fire extinguisher affords. While it is true that gasoline is not nearly as volatile now as it was several years ago, it is also true that if it will burn in the motor, it will also burn outside of the motor, and it can be ignited by a very small spark. If the power plant is kept clean and in good running order, the chances of fire are but slight.

Many automobile fires result from the ignition of carelessly spilled gasoline, from back-fires through the carburetor, or from leaking gasoline tanks. The vibration of the car, as it passes over rough roads, subjects the gasoline supply system to severe strains, and a regular inspection is advisable. The gasoline may drip on the floor of the garage, and the vapor may be just ready to ignite, when some one enters and strikes a match or starts the motor.

If there are any oil lamps on the car, these should be, of course, extinguished while the tank is being filled. The gasoline vapors, forced out of the tank, when it is being filled, will sometimes drift for a surprising distance from the tank. If a fire should occur while the tank is being filled, the first thing to do is to cover the opening in the tank with any convenient object. If the regular filling cap is screwed on, the heated gasoline may exert sufficient pressure to burst the tank, and scatter the flames in all directions.

A careful driver will not attempt to start the motor, when a pool of gasoline has collected under the carburetor. Either the car should be moved away from the gasoline, or the gasoline should be given an opportunity to evaporate before attempting to start the motor.

If there is a pan under the carburetor, this pan should be fitted with an opening to permit gasoline leaking from the carburetor to escape. If dirt and oil are allowed to collect around the motor, they greatly increase the fire hazard, for they will tend to conduct flames, due to a back-firing carburetor or a defective ignition system, to the very combustible materials in the body of the car.

To keep the carburetor from flooding, clean gasoline should be used, as a leaky carburetor is most often due to a bit of dirt lodging between the float needle and its seating, thus keeping the valve open. Even when starting, excessive flooding of the carburetor should be avoided. If the ignition system is kept in good order, there is not much danger of a

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spark occurring outside of the wiring and setting fire to any stray gasoline which may be present.

No "Hysterical Economy."

From the Curtis Pneumatic Machinery Company, St. Louis, Mo.—There is a tendency in some parts of the country to be over-cautious on account of the war conditions—"hysterical economy," some people call it. Your business has to exist during the war just the same as it does any other time. So, we may as well sit down calmly and face the true facts. What you want to know is whether your customers are going to stop buying abruptly, or gradually slacken, or what. As long as the people have more money than they ever had before, they are not going to stop buying, or limit their buying. The money of the world is in the United States today, in the hands of the people, and when they have money they are going to buy. Of course, prices are going to be higher, but at the same time wages are higher. With more money, the scale of living is better. More people are prospective customers today, especially in the automobile business, than ever before in the history of the trade.

There does not seem to be a chance at all for prices to come down before the end of the war; even after the war is over the readjusted scale of prices will be decidedly higher than were normal prices before the war. During the war labor will be scarcer. Wages will be higher. The scale of wages will not be reduced until we run into hard times again, and even then we have doubt as to wages ever equaling the lower wages prior to the war.

Every farsighted business man should, therefore, look ahead and protect himself. Don't stop buying now, because prices may go higher yet, and very likely will. Don't retrench, but adjust your business for what is only a readjustment of conditions. Business in the immediate future is not going to get worse. It is going to get better.

New Dearborn Truck Unit.

The Dearborn Truck Co., 2017 S. Michigan Ave., Chicago, is showing two new truck units, which have just been added to its line. These are a two-ton Dearborn unit adaptable for use with any standard chassis, and a new one-ton unit, which is also universal in its application. The Dearborn Truck Co. is a local company, the factory being located at the West Side, at 1250 S. Campbell Ave., Chicago.

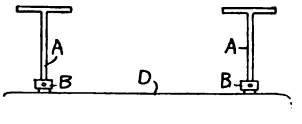
Both of these new units are characterized by the same sturdy mechanical construction that has always characterized the original Dearborn truck units, which were designed for the Ford car exclusively. Ample provision has been made in their construction for overloading, the margin of safety being a liberal one—50 per cent. above rated capacity. Unusual interest in these new units is being shown by Dearborn dealers in all parts of the country and a large number of orders has been booked for immediate delivery, on both types.

Anticipating a rush of orders for these new types of Dearborn Units, the Dearborn Truck Co. withheld its announcement of them to its dealers until both were ready for distribution in quantities. The volume of orders, which is daily increasing, indicate that the Dearborn factory would have been swamped had this information been in the hands of their dealers previous to the introduction of these two new models. It is expected that the introduction of these two new units will have a definite bearing on the solution of the used car problem. Being practical for use with larger power plants than the one-ton Dearborn units, which have given such splendid service with the Ford car, these two-ton units can be attached successfully to power plants of 40 to 50 horse power; cars such as the Pierce-Arrow, Packard, Peerless, Lozier, Locomobile, Oldsmobile and the larger models of the Hudson and Chalmers, and other cars in this class. Owing to the relatively high cost of upkeep on these larger cars, dealers have been built along mechanical lines that will state at prices that are really far less than their actual worth. All of these larger, high priced cars have been built along mechanical lines, that will enable them to give good service for the next five or ten years to come; and a more ideal combination for an inexpensive two-ton truck is hard to imagine than the Dearborn and one of these cars. Other cars that will give good service with the new units are the Overland, Maxwell, Buick, Dodge, Studebaker, Hupmobile, Chandler, Apperson—in fact, any chassis is adaptable.

The new two-ton Dearborn units are built with heavier frame, wheels and general all round heavier and stronger construction to meet every condition of hard service. Their specifications speak truck quality. Five inch channel frame dead axle 2½x2 inches drop forged and heat treated; heavy 3-inch springs, 48 inches long and 9 leaves, with bronze bushings in eyes; additional relief spring over rear axle; heavy truck wheels 34x5 inches, guaranteed hickory spokes and felloes, has 12 2½-inch spokes. Solid rubber tires, 34x5 inches; 1¼-inch pitch Baldwin roller chains and Baldwin steel sprockets. Loading space for 10-foot body.

To Lift a Cylinder Head.

First insert a T wrench, A, from which the socket has been removed, into the shell of a spark plug, B,



riveting same at C. Make two of these. Place one in each end of the cylinder head, D. The head can then be removed evenly and easily without damaging the gaskets.

Silencing the Ford.

The quest for silence should begin before the car is purchased, by a careful study of the instruction book. The new car should be run most carefully, for then the car is new to the driver and the driver is new to the car. The Ford should have about five quarts of oil in the crank case, until the cinders and grit, which have probably entered the bearings during the car's journey from the factory, have been washed out. If the car is run at a moderate speed for the first week or so, the bearings will have a chance to bed themselves down to smooth, close-fitting surfaces which will tend to eliminate noise and wear for a long time. The idea should be to break in the car easily, and not to break it up.

Noise is often the danger signal of wear and possible breakage, for noise is usually due to the rubbing of unlubricated surfaces or to the hammering of

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loose parts. If the spring shackle bolts are noisy from lack of lubrication, it is certain they will wear rapidly. If they rattle because they are loose, the hammering action is apt to cause rapid wear and eventual breakage.

If small parts are worn, it is often better to replace them and thus to keep the car up to a high standard of efficiency, than to attempt makeshift repairs. If a bushing is worn, it is often advisable to replace the pin also, for a worn pin will soon wear a new bushing to a loose fit and will thus curtail the value of the repair.

Some noises and squeaks are rather difficult to locate, but they can generally be found by a process of elimination. If certain sounds are heard when the motor is running and the car is at rest, it is reasonably certain that the trouble is in the motor. Another test is to disengage the clutch and stop the motor while the car is coasting down hill and thus locate chassis squeaks.

Jumping on the running boards, while the car is at rest, is a useful test for locating spring and body squeaks. If the mouthpiece of a megaphone is held near the ear, the large end of the megaphone can be used to locate the direction of the sound. By eliminating other noises, the megaphone makes the source of the noise easier to locate.

Flat surfaces in the mud guards are apt to vibrate and drum. This can often be cured by bending these flat surfaces slightly so that they are either convex or concave and are thus supported against vibration.

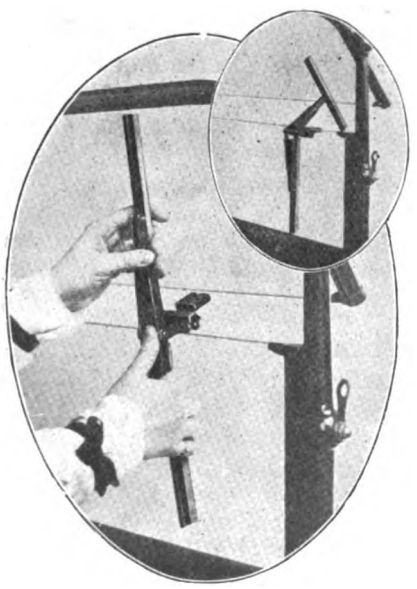
Watching Braking System.

It is imperative that drivers take particular pains with braking system of the car; because at this time of the year, when touring is at its height, nothing is more essential than a good set of brakes that are capable of holding the car on a steep grade. Some owners, to make certain that no trouble will result, have the brakes relined each season and make a careful inspection of them whenever a long run is to be made, in much the same manner as an engineer sees to it that the brakes of the train work properly. The linkage from the pedal or lever to the bands should be carefully gone over and all joints well lubricated.

NEW AND INTERESTING THINGS IN MOTORDOM

Clears the Windshield.

A protection for motorists which fills a pressing need comes in the form of : clearer for the windshield, and is known as the Universal Rain Rubber. The device clears both the top and bottom glass clean across and has as its unique feature a traveling section which slides in the slot. It attaches instantly—holds firm as a vise—but slides without effort.



Universal Rain Rubber.

Multiple rubber—two pieces of gum rubber—make the cleaner flexible with two cleaning surfaces on each arm. The rivets are topped with celluloid heads, which will not scratch the glass. A single stroke of the hand moves it from one side to the other. One of its most desirable features is the fact that it can be removed by simply opening the glass and lifting the rain rubber off. It is made in five different models designed to cover any known type of two-piece windshield. Manufactured by Tri-Continental Corporation, Buffalo, N. Y. Price $1.50.

Maxwell Sales.

Sales of the Maxwell Motor Co. during the first three months of 1917 were more than 58 per cent. larger than the corresponding period of the preceding year. The total for the quarter was 19,000, an increase of 6,968 over the first quarter of 1916. It is anticipated that there will be a surplus account of $600.000, after paying the usual dividends of $3,000.000 and a possible Government tax of between $500,000 and $600,000.

For Starting and Lighting.

The brushes used in the starting and lighting equipment of a car wear out and burn out from time to time and nothing can be done about it except to get new ones. The National Carbon Co., Cleveland, Ohio, make a pyramid brush for every car that is equipped with starting and lighting. The firm's specification sheet lists the brushes for practically every car made. A copy of this will be sent on request.

The Burrill Tire Tool.

Through a printer's error the address of the Burrill Tire Tool Company was not given in a notice on their tools which appeared in the May number of the Automobile Dealer and Repairer on page 94. It is Concord Junction, Mass. We have had several inquiries for the address of this company.

Make This Sign Pay Your Rent.

The Flexlume Sign is a money maker for the garage man or dealer. It is always on the job of inviting work and the best motorist cannot fail to see it. It gives a maximum of brilliant light and does it economically. It has a certain distinctiveness that is lacking in most other signs. It is not expensive and if necessary can be bought by the easy payment plan. Those interested should address the manufacturers, The Flexlume Sign Co., 1445-1451 Niagara Street, Buffalo, N. Y.

Ford Radiators and Hoods.

There is an unusual large call from Ford car owners and dealers throughout the country for a 1917 radiator and stream-line hood to be used on 1915-16 model Ford cars. The Superior Lamp Mfg. Co. of 136 West 52nd St., New York City, has brought out a similar reproduction of the 1917 Ford radiator in black enameled finish and a stream-line hood to go with it, as a complete



Handsome and Well Made.

outfit which lists at $35.00. This outfit can easily be applied to a 1915-16 Ford car, changing it into a 1917 appearance. This same company issues a booklet entitled "Bulletin No. 5" which has just come off the press, and contains various interesting items for Ford cars, such as demountable wheels, wind-shields, tool boxes, crown fenders, etc., etc. Bulletins can be had by mailing a request for them.

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A New Automobilist's Plier.

A handy vest pocket plier (5½ inches long) has just been added to the extensive line of "Red Devil" Pliers. It is a very well finished nickel-plated tool and special features such as knurled handles and specially designed jaws make it serviceable for doing light work around automobile engines. The gripping jaw

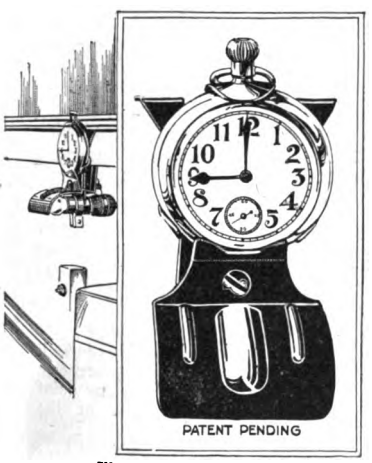


"Red Devil" No. 24.

is adapted for handling pipes, wires, square and hexagon nuts and irregular shaped objects. The jaw is provided with a slip-joint making it adjustable for gripping larger shaped objects. The manufacturers are Smith & Hemenway Co., Inc., 83 Coit Street, Irvington, N. J., manufacturers of the well-known line of "Red Devil" Tools.

Dash Light and Illuminated Clock.

This efficient dash light and clock fits in the cowl beneath the wind-shield; illuminates the entire dash; lights up the foot pedals, coil box, speedometer, etc. Will not shine in your eyes; almost unnoticeable. Securely attached by means of clamp on the angle iron beneath the wind-shield—no drilling. Easily at-



Illuminated Clock.

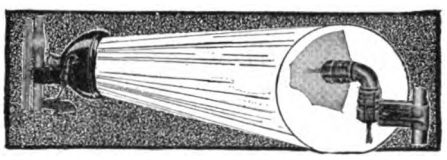
tached, but cannot be removed without screwdriver. Current for this light is supplied from the Ford magneto, therefore at no expense; can be turned on or off at will. Sold complete including wire and bulb ready for use. Made by Rose Manufacturing Co., Philadelphia.

A Tire Tester Attachment.

This is easily attached and will give any service station a permanent holder for its gauge. It is really a tire tester and tire inflater combined. Every garage with free air should be equipped with this Romort automatic air valve and tire tester. It is made by the Romort Manufacturing Co., Seattle, Wash., and Chicago, Ill.

Howe Spotlight.

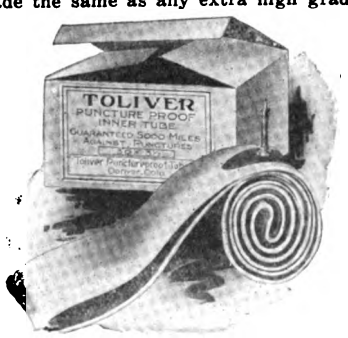
"That the spotlight has come to stay is proved by the numbers sold"—said an official of the Howe Mfg. Co., of Chicago to a representative of this magazine. "The growth of this industry can be compared with the automobile industry itself—we all remember when automobiles came out—only a few people believed in them. They were looked upon as a plaything—as a rich man's luxury. No one ever dreamed that some day there'd be five millions in use. For a few years the sales of cars numbered by the tens, then by the hundreds. The motor car was still a very imperfect machine, but with the advent of dependability, a veritable craze for automobiles hit the American people. They bought blindly. Anything that had wheels on it—anything that would run—found ready sale. So it has been with the spotlight. But the car owners soon waked up to the fact that any light that would fasten onto their windshields wasn't a spotlight—just like they soon found out that anything that had four wheels and a gas motor wasn't an automobile. He knows the spotlight fills a real need, but he also knows the qualities a spotlight must have to meet the need. The 1917 buyer will demand a spotlight that is easy and quick to control and that will hold its position when directed. He will examine the switch and make sure it's easy to operate—look at the wiring with a critical eye and turn down the spotlight that gives a suspicion of ever coming to short circuits. This is the reason for the big sales of the Howe Spotlight."



The Howe Spotlight.

Tire Absolutely Puncture Proof.

Motorists who have had many a pleasure spin marred by puncture troubles will be interested in the Toliver Punctureproof Tube which is guaranteed 5,000 miles without a puncture. It is made the same as any extra high grade



tube and is inflated with air in the usual way, but the secret Toliver Process makes it punctureproof. It is claimed that many users get as high as 12,000 miles service without a puncture. The manufacturers, The Toliver Tube & Tire Co., Denver, Colo., will send complete details and prices on request.

Resignation.

Mr. V. W. Kliesrath, for many years chief engineer of the Bosch Magneto Company, has severed his connection with that company, at the close of a long and successful period as head of the technical department of this celebrated concern. From the very inception of automobile racing, as well as motor boat racing and aviation contests, Mr. Kliesrath has been a prominent figure, known to all interested in the racing circles, where he has always been in charge of a most efficient corps of technical experts at the service of manufacturers and interests of the various racing equipments. Mr. Kliesrath's plans for the future have not as yet been announced.

Counter Display Card.

The Twitchell Gauge Company of 1212 Michigan Avenue, Chicago, offers to dealers an attractive counter display card which holds a dozen Twitchell



You can sell a dozen from this Display Card faster than half a dozen packed away on your shelves.

Gauges, cut of which is shown herewith for reproduction. Wherever used, these sales helps have been found greatly effective.

The Petry Cut-Out.

Cut-outs for automobiles are something like the little girl with the curl—"When they are good they are very, very good and when they are bad they are horrid." The Petry cut-out is of the very, very good kind. It is positive. It is noise-proof when closed, light in weight, strong and easily attached. It has many other advantages because of its scientific design and fine construction. The prices for it are unusually low and it will pay dealers to secure the agency if possible. It would be well to write or wire at once. A handsome counter display is sent with an order for twelve assorted sizes. The manufacturers are N. A. Petry Company, Inc., 1313 Race Street, Philadelphia, Pa. There are distributors at four or five important points in the country, which makes securing the goods comparatively prompt and easy.

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Keep Your

Johnson's Carbon Remover

Cures 80% of Engine Trouble

That knocking in your engine—the difficulty you have climbing hills—poor acceleration—lack of power—pre-ignition—noisy motor, are all caused by carbon.

Put New Life in Your Engine

with Johnson's Carbon Remover and it will run like it did the first 500 miles—quietly and full of "pep." No matter how choked up your motor may be, Johnson's Carbon Remover penetrates and softens the carbon. It then burns and powders and is blown out through the exhaust.

You Can Do It Yourself

Five minutes' time and no labor required. Simply lift the hood and pour an ounce of Johnson's Carbon Remover into each cylinder through the petcocks or spark plug openings. Go to bed—get up in the morning and drive a perfectly clean engine.

Use It Every 1000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will automatically eliminate most valve trouble and your engine will always be at its highest efficiency.

Pints $1.00
Half-pints ..... .65

Johnson's Stop-Squeak Oil

Has the Remarkable Property of Seeping Rapidly Between the Spring Leaves

and to the furthermost wearing points and it there becomes a heavy-bodied lubricant.

The irksome task of jacking up a car, prying apart the spring leaves and lubricating them is forever done away with. You, yourself, can now keep your springs thoroughly lubricated at all times. All you need is Johnson's Stop-Squeak Oil.

Make Your Car Ride Easily

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. Instead of bumping over the road, you fairly float along if your springs are lubricated so you have spring action. Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

For Squeaks of All Kinds

Johnson's Stop-Squeak Oil will remove squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil.

Quarts .....$ .85
Pints ..... .50

Write for our folder on Keeping Your Car Young—it's free.

Johnson's Cleaner

Removes Scum, Road-Oil, Grease, etc.

Johnson's Cleaner really cleans. It removes spots, stains, scum, grease, road-oil, tar, alkali, etc. Even those spots that are ground in—mud freckles—and surface scratches that you thought were permanent—will disappear like magic under Johnson's Cleaner.

Does Not Injure the Varnish

Johnson's Cleaner contains no grit or acid so it cannot scratch or injure the finest finish—it simply cleans and prepares it for a polish with Johnson's Prepared Wax ***Liquid.***

A Mirror-Like Polish

on your car adds to the pleasure and prestige of motoring, and increases the market value of your machine. It is just as important to keep your car looking well as running well. With but very little effort, you, yourself can keep body, hood and fenders just like new—use Johnson's Cleaner and Prepared Wax ***Liquid.***

Price, ½ lb. cans..35c each

If your dealer cannot supply you with Johnson's Automobile Products we will prepay the express to any point in the United States east of the Rockies.







S. C. JOHNSON & SON Dept. AD

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CarYoung

Johnson's Prepared Wax

Now Made in Liquid Form

so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is the same as our Paste Wax except that it is a Liquid.

Johnson's Prepared Wax ***Liquid*** will prove a joy to the thousands of automobile owners who prefer a wax polish on their cars but are not inclined to spend the time or effort which Paste Wax requires.

Apply with Cloth, Brush or Spray

Johnson's Prepared Wax ***Liquid*** is very easy to apply and polish —but little rubbing is necessary. You can go over a good-sized car in half an hour. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches —prevents checking and cracking—sheds water and is absolutely dust-proof.

Quarts $1.20
Pints ..... .60

Tell your Dealer that Johnson's Prepared Wax is now made in ***Liquid*** form and insist upon him securing it for you. Write for our folder on Keeping Your Car Young—it is free.

Johnson's Black-Lak

Renews Tops, Side Curtains, Cushions, Etc.

Are your top and side curtains gray, dusty and leaky? If you knew of a preparation with which you, yourself, could easily and quickly make them look like new, would you buy it?

For Mohair and Leather Tops

Johnson's Black-Lak gives perfect satisfaction on any kind of a top. One coat gives a rich, black surface—just like new. It is easy to apply—dries in fifteen minutes—does not rub off on the hands or clothing — is permanent, water-proof and inexpensive. Do not hesitate to use Johnson's Black-Lak on the finest leather. It acts as a preservative and renders the leather soft and flexible.

For Worn Metal Parts

Johnson's Black-Lak is unequaled for blackening fenders—tire rims—running boards—hoods—radiators—guards—lamps—and in fact all worn metal parts. Prevents rust and keeps your car in a high state of repair.

Quarts $1.10
Pints ..... .65

Write for our folder on Keeping Your Car Young—it's free.

Johnson's Auto-Lak

An Automobile Body Varnish That Amateurs Can Use Successfully. Dries in 24 Hours.

Johnson's Auto-Lak is a splendid varnish for bodies, hoods, fenders and all parts of the car. It can be used by the amateur with perfect results. Dries ready for use in 24 hours. Johnson's Auto-Lak is now made in Clear and Black.

Does Your Car Need Re-Varnishing?

With Johnson's products you can easily do the work yourself. Johnson's Auto-Lak goes on easily and quickly—you can finish your car one day and drive it the next. If you are interested drop us a line and we will give you directions for re-finishing your car yourself in 24 hours. This includes the entire car, from wheels to top.

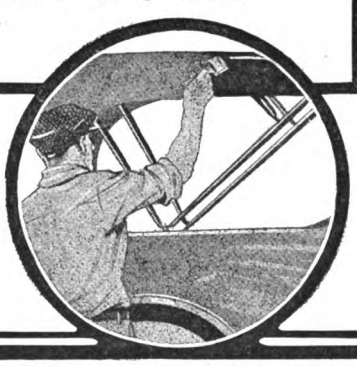
Johnson's Auto-Lak is a new product and not yet generally handled by dealers. If you are unable to buy it locally—send your order direct to us.

Pints....$1.50 Quarts....$2.50

One pint is sufficient for varnishing a roadster.

If your dealer cannot supply you with Johnson's Automobile Products we will prepay the express to any point in the United States east of the Rockies.







6 RACINE, WIS. U.S.A.

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New Energy for Spark Plugs.

The P. S. E. Spark Plug Energizers introduce a well-known electrical phenomenon, breaking a circuit and introducing air resistance. Thus the amperage is slightly decreased and the voltage much increased. A gap in an electric circuit forms an effective resistance, and resistance of any kind increases speed or voltage the same way as the resistance of the nozzle on a hose increases speed of water. And it is a well-known fact that increased speed causes increased heat. The metallic screen surrounding the spark creates a condenser



The Speco Energizer.

action, which so greatly increases the voltage that not only is the heat increased but the voltage stepped up to such an extent that the electric circuit will unfailingly seek the next gap regardless of obstructions. This means that not so much current is used, but the spark is hotter and will go through any amount of carbon, grease, oil, soot and will even fire a plug with broken porcelain. Not only are the dozen or more old, dead plugs you have accumulated restored to indefinite life, but it means insurance against spark plug trouble. On commercial motors, pleasure or physicians' cars, yachts, launches and stationary motor, it may save dangerous delays and disagreeable experiences in bad weather or on hurried trips. A hot spark means complete combustion, the last ounce of power from every drop of gasoline, the elimination of smoke and carbon and a smooth, powerfully running motor. P. S. E. Plug Energizers are retailed under this guarantee: "Try it ten days and if not absolutely satisfied—your money back." Price each $1.00. P. S. E. Manufacturing Company, 1777 Broadway, New York.

Eagle Macomber Motor Car.

Frank E. Barnes has resigned his position as superintendent of the King Motor Car Co. to assume the position as production manager of the Eagle Macomber Motor Car Co. of Sandusky, O. When leaving the King Co. he was presented with a valuable watch and chain by the department heads as a token of their appreciation. The Eagle Macomber Co. are making every effort to build the strongest possible organization as extensive production plans are being made for the coming year. The company has been working quietly until the car and the plant were ready for actual production. This has now been accomplished. The plant is completely organized. Materials are already on hand to begin production not later than July 1st. It is announced however that no cars will be available for the public for some time after this as orders are already on hand for a large number of cars. The Eagle car is fitted with the Macomber air cooled rotary motor for which advantages are claimed. A complete announcement and description of the car and motor will appear at an early date.

What's to be Done About Country Road Glare?

What is the solution of the "headlight glare menace"? Is it "dimming," "deflecting" or "diffusing"? Certainly the motorist cannot drive with any less light—what he really needs is more light. The question is how to get it without danger to the "other fellow." The number of lenses of different types recently brought out indicate an effort to change the quality of the light from the headlights. The widely different effects from different lenses would, however, seem to indicate that no definite idea has yet been universally adopted as a satisfactory solution. For instance, one type of lens seeks to remedy the menace simply by breaking up or diffusing the light rays. Another type does not change the rays but endeavors to correct the glare evil by deflecting the light so that the rays do not rise above a certain level. But there are still the two bright lights, the faces of which are fully visible. Perhaps a more satisfactory means for country driving and for passing other cars is the Windshield Searchlight. The spring controlled bracket, by which the movement of the best searchlights is controlled enables the driver to tilt his searchlight at an angle which throws the light only on the road and at the same time hides the full view of the face of the searchlight from the approaching motorists. With a good searchlight on the windshield, headlights can be switched off entirely and yet each driver has all the light he needs right where he needs it.

Some Truck Load

When a three-ton F. W. D. (four-wheel drive) truck hooked to a thirty-ton wagon will, with a heavy load, keep on its way through a big cinder covered field, sinking ten or twelve inches into the ground, it readily will be admitted that it is "some" truck. When this load is a total of twenty-two tons, which includes a sixteen-ton girder, seventy-one feet long, one is still more ready to concede that "some" truck does not do the truck justice. A Clintonville truck recently made the trip from the Wisconsin Bridge & Iron Works in North Milwaukee, Wis., to the Northwestern Bridge & Iron Works, at Twenty-ninth and Hopkins Streets. A stop was made for the noon hour, during which time the heavy truck and its load cracked the macadam on which it stood. The haul was made under the direction of George Roberts, local representative of the Clintonville F. W. D. Co.

Auto Suggestions.

This is the title of a house organ issued by the Northwestern Chemical Company, Marietta, O., and it is of about the right sort of size, the right kind of printing, and the right sort of editing, to make it readable and inviting. It requires one whole page to catalog the line of chemical productions this company manufactures. Better send for a copy and get information and amusement.

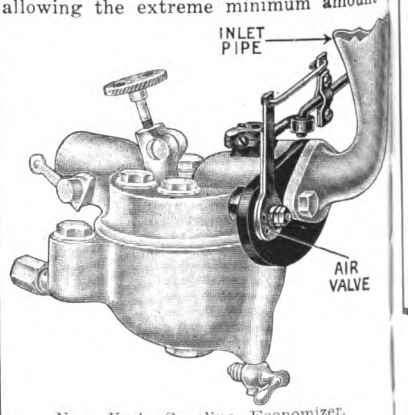
Vitality Supreme.

By BERNARD MACFADDEN, Physical Culture Publishing Company, New York.

There are a good many physical culture books on the market just now, and this is on the whole one of the best for the many who are enough interested in the subject to try to achieve health by exercise and diet, which is better than to try to do so by other self treatment. As is well known, the author has made a life-long study of physical culture and those who will faithfully follow his directions cannot fail to secure health, vitality and strength according as it was given them by inheritance. The book is readable, comprehensive and well illustrated. It contains 260 pages and is well bound. It gives instruction as to proper breathing, what and how to eat, blood purification, exercise for vitality building, bathing, breathing, sleep, cleansing the alimentary canal, etc. No one leading a sedentary life and fail to have improved health if he will carefully read it and then follow its instructions.

Costs Little, Saves Much Fuel.

The New York Coil Company, 338 Pearl St., New York, manufacture a gasoline saving device known as the New York Gasoline Economizer. Its manufacturers lay great stress on the fact that it is not to be regarded as a suction-operated air valve screwed in the inlet pipe but is attached to and becomes a part of the present Ford carburetor. It is installed without drilling or tapping between the inlet pipe and carburetor and is connected by a simple linkage with the throttle rod. As the throttle is opened air in mathemetically fixed proportions is admitted at a high velocity to the over-rich gasoline mixture, allowing the extreme minimum amount



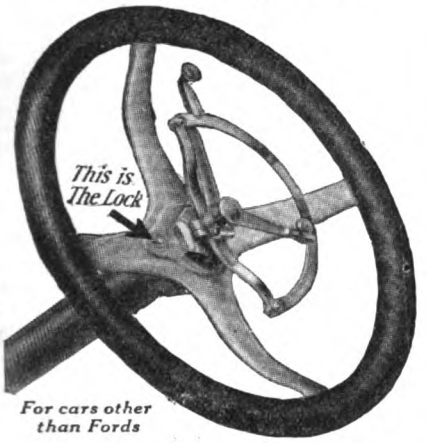
New York Gasoline Economizer.

of fuel to be used. This concern further points out that practically every high grade present day carburetor has built into it a device for performing the same function, and claim that this attachment places the Ford carburetor in identically the same field as the most expensive carburetors used on high priced cars. The price is $2, and it is thoroughly guaranteed. Interesting literature will be mailed upon request.

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Are You a Standard Dealer?

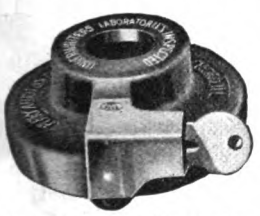
A Thief-Proof Lock For Every Car



For cars other than Fords

The "Perry" fits every make of car. Can be installed by any mechanic in 15 minutes. Does not interfere with or change any of standard parts of steering gear. Absolutely safe to drive when unlocked. And no one can drive or tow a car when "Perry Locked."

For Fords—$5.00



Fastest selling Ford specialty the trade has ever seen. Greer Automobile Co. sold 95 of the first 100 inquiries. Lock replaces standard Ford cap on planetary housing below steering wheel. Liberal profit to you. Write today for prices.

AUTOMOBILE owners prefer to trade with standard dealers—dealers who sell nationally advertised standard accessories.

There are standard tires, standard lubricating oil, standard speedometers, etc., each the standard in its class.

The Perry Lock is the standard automobile lock. It reached this distinctive place because it is the simplest, the best, the most practical. It CAN'T get out of order.

50,000 "Perry" Locks are sold every month. It proves that it is the ready seller with greatest merit.

"PERRY"

The Only Lock That Thieves Won't Touch

Your profit, Mr. Dealer, lies in the article which sells the most readily—on which you can make the quickest turn-over of capital.

You make two profits on "Perry" Locks because you will sell two "Perry" Locks for every one you sell of any other kind.

You don't have to explain anything about the "Perry" Lock. You simply say "One turn of the key disconnects the steering wheel and the car can't be driven or towed away."

The "Perry" takes the place of other locks. You don't have to carry a large stock of all kinds. Show your prospective customer the "Perry" Lock and he will take it. He knows it is a standard article and standard articles are the safest to buy.

The demand for "Perry" Locks is increasing. Are you prepared to get your share of the profits from the sale of Perry Locks in your community?

Small stock—big demand—quick turnover—good profit—that's "Perry" Lock.

Mail the Coupon

"TELL ME ABOUT IT"

PERRY AUTO LOCK CO.,
Dept. A-8. 1238 Michigan Blvd., Chicago, Ill.

Gentlemen: I have read your description of your "Perry" Auto Lock and would like to know about your special proposition to dealers.

I sell.....cars

Name.....

Address.....

Town..... State.....

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A New Bumper for Fords.

The demand for a rear end bumper on Ford cars has prompted the Gemco Manufacturing Company of Milwaukee to design one. Its popularity is increased by the fact that it is a neat job. It is light in weight and has a special carrier for tires, lamp and license bracket. This special carrier is not a permanent fixture, but may be added at any time. It can, however, only be used in connection with this special rear end bumper for Fords. When the Ford is fitted with a front end bumper and a rear end bumper, the wheel base is seemingly lengthened, thereby adding to the appearance. The attachment is made to the car's rear spring, therebv simplifying the work for the garage dealer. This new accessory is rapidly being introduced in the markets so that they are already on inspection at many garages. Favorable comments are freely being made by Ford car owners.

Remarkable Growth.

On and after June 1 the Apco line of specialties will be manufactured and marketed by the Apco Mfg. Company, Providence, R. I., which concern succeeds the Auto Parts Company. The new company is capitalized at $200,000, an increase of $170,000 over that of the former company. The plans call for an increase of factory space of over 50 per cent. This was necessary owing to the increasing demand. The policy of the new company will be to market its products through the jobbers and a big publicity campaign is planned for the near future. The Auto Parts Company was started eight years ago with a single article for the Ford car and today manufactures a large number of specialties which are well known to the trade and owners. The Apco guarantee of satisfaction or your money back will be continued.

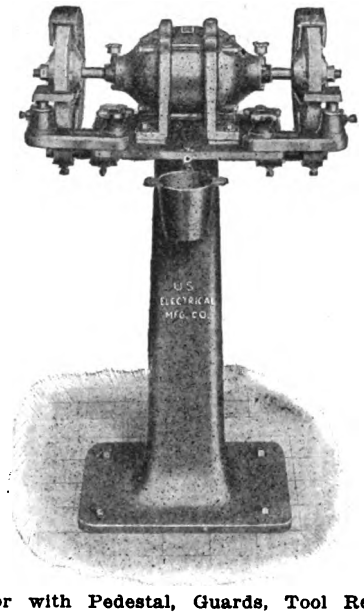
New Grinding Motor.

Illustrated herewith are shown cuts of a new low-priced electric grinding motor made by the U. S. Electrical Mfg.



Motor and Pedestal.

Co., Los Angeles, Cal. The machine is a high grade and effective one in every way, although low in price because made in large quantities by special tools. The machine is sold motor only for bench mounting, motor with pedestal, or motor with pedestal, guard, tool rests, water buckets, etc. It costs practically nothing to set up this tool. It is easy running and silent in operation. The motor is powerful but consumes but little electricity. Its ball bearings are mounted in a special housing with sealing rings that are proof against dirt and grit.



Motor with Pedestal, Guards, Tool Rests, Water Bucket, etc.

These bearings are standard in size, and readily removable for replacement in event of wear. The entire motor is totally enclosed. The spindles are heavy one-piece construction of the best grade of spindle steel. Convenient tool grinding rests are adjustable in any direction. The flanges are ample and are turned absolutely true on all sides to insure perfect balance and wheels running true. The water pot can be swung under the table out of the way. The heavy wheel guards are easily removable.

Two New Ford Car Attachments.

The Apco Mfg. Company, Providence, R. I., is marketing two new specialties for the Ford car; a horn button attachment and a flag holder. The horn button attachment should appeal to the Ford owners, as it enables the operation of the Ford horn without removing the hands from the steering wheel. The button is located in the center of the wheel as on high-priced machines, can be attached in a few minutes and comes with necessary wiring to make connections. The design is neat and sturdy, makes for decided convenience, and retails at 25 cents. The Apco flag holder holds three flags and in such manner that the flags are displayed to an advantage. The flag staffs are so crossed that the middle flag can be well displayed, and the holder can be easily attached to the filler tube which, being tapered, makes attaching the usual flag holder more or less work. The Apco design comes finished in black enamel and lists at 25 cents.

Monroe Car Price Increased.

The Monroe Motor Company has announced that the price of the Monroe has been increased to $1095. The Monroe Company has fought against increasing the price of their car just as long as it was possible. Long after all other high-grade comparable cars had increased their price the Monroe remained the same. However, the steady increase in the cost of materials and labor finally made it necessary to do one of two things—increase the price or decrease the quality. The latter could not be even considered. But in accordance with their usual policy of looking farther ahead than for the mere temporary profit the Monroe only increased the price to $1,095—which is nowhere nearly proportionate to the increased cost of production. The remarkable growth of the Monroe Motor Company bears testimony to the high quality of their product. Everywhere their dealers are sending in together with more orders enthusiastic reports not only in regard to the sale of their cars but about the wonderful satisfaction these cars are giving their owners.

A New Piston Ring.

A new entrant into the piston ring field is the HarWard Manufacturing Company, 3939 Magnolia avenue, St. Louis, Mo. After a long series of practical tests and experiments this concern has developed a one-piece ring of unique construction as shown by the accompanying cut. The interlocking members of the joint engage in such a manner that no opening occurs in any direction through it, even when expanded to a worn cylinder. The inventor's idea in developing this joint was to get away from the long lap construction, thereby preventing gumming oil and carbon between its members, from retarding the free and quick movement of the ring in expanding and contracting to follow the varying diameter of the cylinder. The eccentric groove around the inside surface of the ring gives an important ad-



vantage but without sacrificing any of the edge bearing surface.

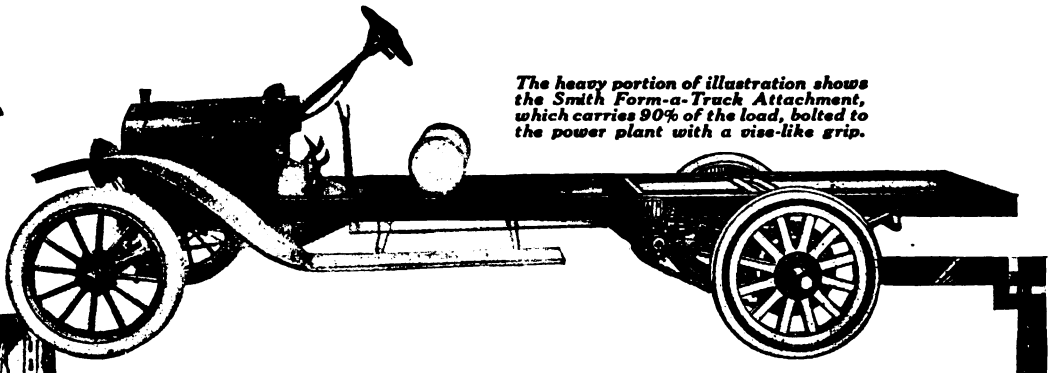
Two rows of separate oil pockets are cut into the outside surface for receiving and distributing excesses of oil which would otherwise pass upward into the combustion chamber. The heavy film of oil retained in these pockets is also for the purpose of giving high compression. The manufacturers consider this one of the most important features of their product. There are also one or two other features introduced into the ring construction, an important one of which is not visible to the eye, but is a certain quality put into the ring by a new process of manufacturing, which they have developed. The ring is covered by two distinct patents, with others pending.

New Fuel Generator.

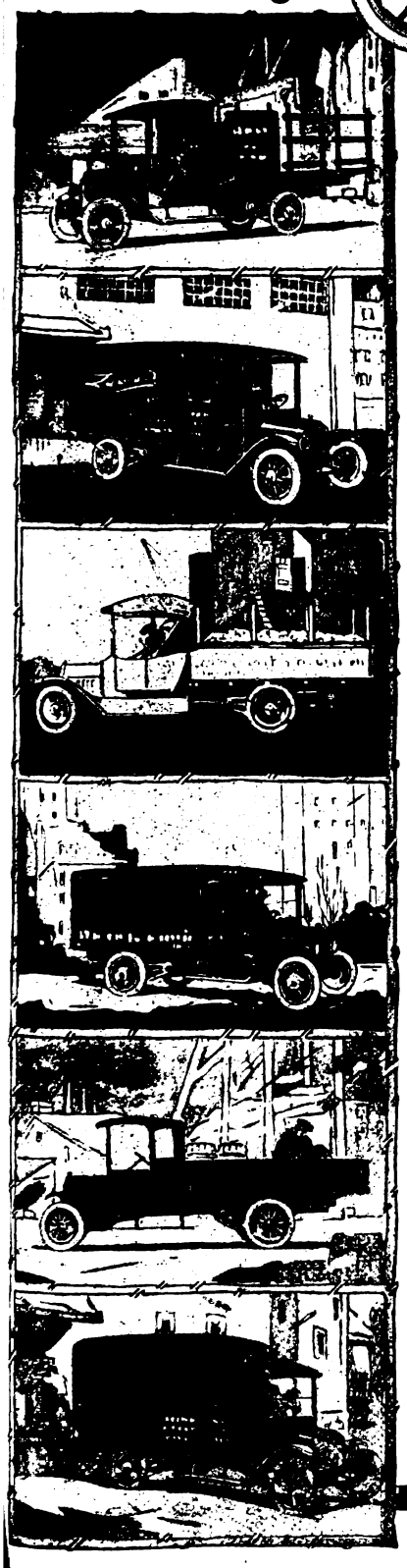
The Duntley Gas Generator Co. guarantees that their new hydro-pneumatic gas generator will save more than fifty per cent. of fuel cost or the money paid for it will be refunded. This gas generator enables the use of a fuel of one-half kerosene and one-half gasoline at a cost of 14 cents per gallon. It handles this low-grade fuel with perfect com-

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Smith Form-a-Truck $350 f.o.b. Chicago



The heavy portion of illustration shows the Smith Form-a-Truck Attachment, which carries 90% of the load, bolted to the power plant with a vise-like grip.



500% Increase in Dealer Profits Already in Sight

THE demand for Smith Form-a-Trucks in sight for the next eight months practically guarantees profits for Smith Form-a-Truck dealers 500% greater than last year—and last year Smith Form-a-Truck dealers made more money than any other dealers in the motor truck industry.

18,000 Smith Form-a-Trucks have been sold for immediate delivery in January, February, March and April.

Sales at this rate will demand a production of 60,000 this year, 500% in excess of our total production for 1916.

And if the increase which April shows over January keeps up, there is no end to the volume of business to be done by Smith Form-a-Truck dealers.

April sales are 800% in excess of January sales: 400% in excess of February sales: 100% in excess of March sales.

—and 50% of the production which at the start of this year we believed would take care of the entire year's business.

The 10,000 Smith Form-a-Trucks sold for April delivery is equal to the entire production for 1916.

And Smith Form-a-Truck dealers are getting the profits out of this huge business.

Territory is already at a premium. Dealers are being offered big cash bonuses for their sales franchise.

There is still room for big dealers who can qualify.

Many of the livest dealers in the industry—the biggest money makers—the men with the biggest reputations, have moved to new sections of the country where there was a Smith Form-a-Truck dealership available—they saw the real profits to be made.

If you are qualified to be a Smith Form-a-Truck dealer, this is the biggest opportunity you have ever had offered to you. Wire today.

Smith Motor Truck Corporation

Manufacturers of Smith Form-a-Trucks

Executive Offices and Salesroom: Smith Form-a-Truck Building

Michigan Boulevard at 16th St., Chicago

Eastern Branch, 1834 Broadway, New York — Kansas City Branch, 1808 Grand Avenue

Southern Branch, 120 Marietta Street, Atlanta

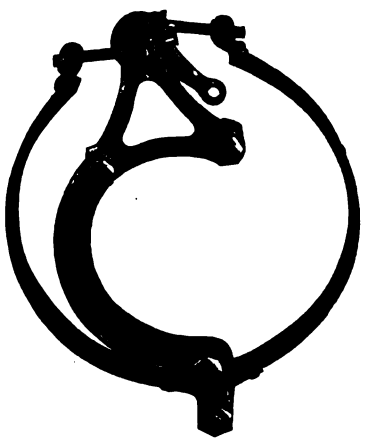
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bustion and eliminates carbon deposits. There is an absence of any gaseous odor or smoke or vapor. The motor operates on a superheated hydrogen and carbon-monoxide gas of unknown chemical analysis. The mixture, however, is known to possess very high heat units, which increases the power of the motor from 10 per cent. to 15 per cent., depending upon its condition. No vaporized fuel enters the cylinders and in consequence, there is nothing to carbonize or to work past the piston rings and deteriorate the lubricating oil in the crank case. It will be appreciated by motorists or owners of trucks; there will be less bearing troubles. The valves will rarely require grinding in, except at long intervals. Rings, wrist pins and bearings will have lengthened life, and motor repairs will be reduced to a minimum. The motor runs cooler and spark plugs maintain clean and bright firing points which rarely ever require attention.

For full information, address the Chicago Pneumatic Tool Co., 1615 Michigan avenue, Chicago, the sole distributors.

Emergency Ford Car Brake.

There has long been need of a good emergency brake for Ford cars, as the present internal cast-iron brake is inefficient and becomes worn to practically uselessness after two thousand miles' running, when it rattles, allows the car to creep when being cranked and refuses to hold. The Holdford brake can be applied in place of the external brake in a very short time, as there are no extra attachments used or holes to be drilled,



Holdford Brake.

etc., and after the first adjustment will wear the lining completely out without readjustment and will positively lock the wheels instantly, if desired, on any hill, with any load. The foot service brake on a Ford car, when used to any extent as on light trucks, delivery wagons or for general city work, causes 75 per cent. of the trouble on the rear ends, as all the strain is applied through the transmission. The Holdford brake is applied to the outside of the brake drum without displacing the old internal brake and connected to the foot pedal by means of an equalizing bar, relieving the transmission of all this strain and furnishing a positive brake at all times. Made by the G. H. Dyer Co., Cambridge, Mass.

Brake Lining Sales Made Easy.

How to keep a stock of brake lining in shape and make sales quickly and easily has been a problem to garage men and accessory dealers. To handle a good-sized roll of brake lining is a job in itself. And to keep the sizes in stock that are wanted most is almost impossible when the rolls must be stacked up in one corner of the room or other out



of the way place. The new brake lining display rack shown here has just been issued by General Asbestos & Rubber Company of Charleston, S. C. It is designed to hold seven rolls, and a rod put through the center allows the rolls to revolve very easily and make it easily possible to measure off the exact length needed. The company is prepared to furnish these racks stained in either mission, mahogany or oak to match the balance of the fixtures in the store where they are placed. This Garco display rack is strongly constructed and should easily last through years of use. It is bound to speed up your sales because it displays brake lining where your customers can easily see it. A glance will tell you whether or not you have in stock the sizes you need—every sale can be made in one-tenth the time required without such a display rack to keep your stock in shape. This display rack is but one of the long line-up of sales helps sent free to Garco dealers. The cost of producing this feature has necessarily limited the number that will be distributed and it is very possible that prompt action is necessary if you are to secure one of these for your store.

First-Aid Outfit.

In this issue will be found an illustration, with a description, of a first-aid outfit which every motorist should carry. It consists of a strong metal case made of heavy bessemer steel, 11½x5½x2¼ inches, finished in black baked Japan and fitted with a strong instantaneous snap. Full particulars as to the contents of the outfit will be found in our announcement in this issue. Such an outfit may be the means of saving your life some time or other, or the life of some friends. The cost is $2.50, but we have made an arrangement with the manufacturers of such a character that we can supply the Automobile Dealer and Repairer for a year and this outfit for the price of the outfit, that is, $2.50. Those who have already subscribed can have one of these outfits for $1.60 and remittance can be made by check, money order, or in any convenient way. Address Motor Vehicle Publishing Company, 71-73 Murray Street, New York City.

A Charming Health Resort.

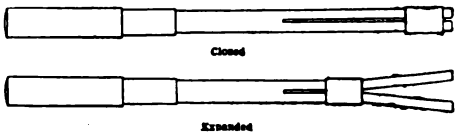
If any of our readers are under the weather and want to spend a few weeks recuperating, we know of no place where this can be done to better advantage than at the Walters Sanitarium, Walters Park, Pa. This institution is located on a hill, overlooking a magnificent valley. The air is about as pure as the air can be. Dr. Walters, the proprietor, has achieved great results in the past forty or fifty years at his sanitarium, which has had to be enlarged several times to accommodate patients. Any man who is run down and wants to build his health up can do it at this institution in a very satisfactory manner. An elegant illustrated booklet, giving full particulars, will be sent to any one who will write for it. Our subscribers who are physicians in some cases could send convalescent patients to the Walters Sanitarium to advantage.

Little Giant Starter for Ford Cars.

Many of our subscribers who are owners of Ford cars will be interested in the announcement on another page of the Little Giant Starter Company, Canton, O., manufacturers of the Little Giant Starter especially for Ford cars. Particulars will be sent to anyone who is interested enough to write. This company wants agents to sell their starters and our subscribers who are dealers and repairmen should write for special terms to agents.

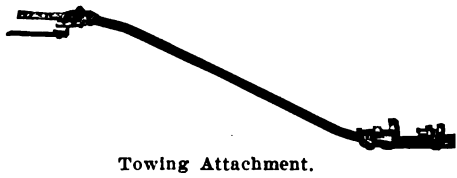
Useful for Garages and Repair Shops.

The G. H. Dyer Company, 155 Brookline street, Cambridge, Mass., make a useful bushing extractor for Ford cars.



Bushing Extractor.

It will remove steering knuckle, spindle arm and spring bushings in a jiffy. It will pay for itself in a few minutes. The price is $1.25. This firm makes



Towing Attachment.

also a good towing device. It steers the car that is to be towed and can be attached in one minute. It is a time saver and a money maker. For further information address the manufacturers.

"Story of the Automobile."

This little book is as interesting as "a tale that was told." It gives the history of self-propelled vehicles from 1760 to the present year. It has 300 pages illustrated with charts and comparative tables, is bound in cloth, and is sold for $1.50. It may be found with leading booksellers, but if you are unable to procure it address the publishers, A. J. Munson & Co., Great Northern Bldg., Chicago, Ill. A limited and abridged edition of this work is offered free as long as the copies last. They will soon be exhausted, however, and you should write quickly in order to get one.

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$1195
Mitchell Junior—a 40-h. p. Six
120-inch Wheelbase

Mitchell SIXES

$1460
7-Passenger—48 Horsepower
127-inch Wheelbase

Trust Mr. Bate

All sorts of arguments are offered on motor cars today. But men will do wisely who trust Mr. Bate.

John W. Bate is a great efficiency expert, and a great engineer. He has spent 14 years on the Mitchell.

This entire factory—covering 45 acres—was built and equipped by him. He has spent millions of dollars to equip this plant to build this one type economically.

He builds 98 per cent of the car here. Our new body plant builds the bodies—all under ideal methods.

Nobody else can build a like car at like cost. Any comparison will prove that.

Note the Extras

This factory saving shows in our extras, which cost us this year about $4,000,000.

31 Unique Features—
24 per cent Added Luxury—
100 per cent Over-Strength.

No other car is so complete. No other car at near this price is so handsome or so strong.

His Final Cars

The latest Mitchells show the final results of all Mr. Bate's revisions. He has worked out more than 700 improvements. He has added every extra that seems desirable. He has added 24 per cent to the luxury cost, out of our body-plant savings.

Over 440 parts are made of toughened steel. All safety parts are oversize. Vital parts are built of Chrome-Vanadium. Gears are tested for 50,000 pounds per tooth. Engines for 10,000 miles without wear. And in two years not one Bate cantilever spring has broken.

TWO SIZES

Mitchell—a roomy, 7-passenger Six, with 127-inch wheelbase and a highly-developed 48-horsepower motor.

$1460

Four Passenger Roadster, $1495. Sedan, $2175. Cabriolet, $1895. Coupe, $1995.
Also Town Car and Limousine.

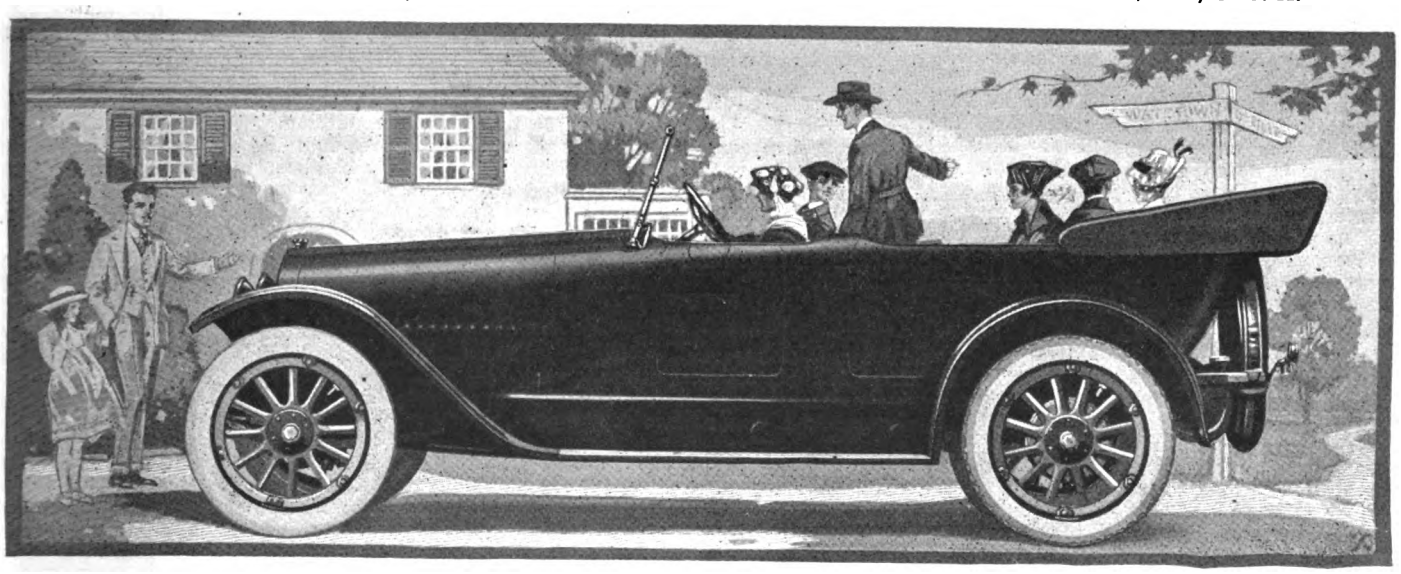
Mitchell Junior—a 5-passenger Six on similar lines, with 120-inch wheelbase and a 40-horsepower motor. ¼-inch smaller bore.

$1195

All Prices f. o. b. Racine

Buyers know these facts. A million dollars will be spent this year to tell them. We want to hear from dealers who like the Mitchell prospects.

MITCHELL MOTORS COMPANY, Inc.
Racine, Wis., U. S. A.



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Frackto Kloth Will Cost More.

The Davis Chemical Mfg. Co., 306 Warren avenue, Brockton, Mass., announce that commencing July first the price of their well known Frackto Kloth for windshields will be advanced from 35 cents to 50 cents, this increase having been rendered absolutely necessary by the much greater cost of materials used in the manufacture of this article. Those desiring to purchase should bear this in mind and send their orders in at once.

Special Offer on First Aid Emergency Outfit.

On another page will be found a full description of a first aid case for emergency use. Every man who runs an automobile should carry one of these cases constantly to provide for possible accidents. While it may be, of course, that he will never have a chance to use it, the time may come when it would be important enough to save somebody's life. We are offering this outfit (the price of which is $2.50) in a strong steel case, together with a copy of the Automobile Dealer and Repairer for a year for the price of the outfit itself or $2.50. Those who have already subscribed can have the outfit for $1.60 and remittance can be made by money order or in any convenient way. Address Motor Vehicle Publishing Company, 71-73 Murray street, New York.

Has Great Hauling Strength.

The Little Giant Convert-a-Car makes an interesting offer to dealers. This will be given by sending for particulars to the Chicago Pneumatic Tool Co., 615 Michigan avenue, Chicago. Your best interest as a dealer should cause you to write at once. It is an over-size and separate spring truck for connection with a Ford car, and is made in three sizes, 1-ton, 2-ton and 3½-ton. In addition to this, this firm provides a pneumatic gas generator which it is claimed will save over half the cost of fuel. This uses a half-and-half mixture of kerosene and gasoline with steam and air and gives more miles and more power for less cost. There will be a whole lot of these commercial bodies sold this year, and those who get into the business at once will reap immediate and large profits.

A Low-Priced Vulcanizing Outfit.

The Sunshine Light Company, Salt Lake City, Utah, make a complete outfit for vulcanizing which they sell for $1.50. With it vulcanizing may be done in five minutes and the work is guaranteed to last as long as the tube lasts. No experience is necessary to use this vulcanizer, and it not only appeals to the car owner, but to dealers it supplies a means of a profitable business in selling to others. Information can be had of jobbers or those interested can write direct to the manufacturers.

Send for a Free Sample.

Every reader of our magazine is entitled to a free sample of Golden Star Auto Body Polish. It is claimed this is the best cleaner and polisher on the market. It contains nothing to destroy or dull the finish, and is water proof and weather proof. It should be a big seller, and dealers should take up with it. It is made by R. W. Morris Manufacturing Co., Inc., Kansas City, Mo.

Illuminated Flag Holder.

Now that the feeling of real war is sweeping over the country, automobile drivers and owners insist on flying the American flag from their cars. Up to the present time most any crack or crevice in the front of the car, into which a flag stick could be put, has been pressed into this patriotic service. Inasmuch as the radiator cap is the logical place to put such an ornament, the Howe Mfg. Co. of Chicago, producers of the Howe spotlight, have introduced a specially made illuminated radiator flag—carrier with flag—that can be attached to any radiator cap. The light, necessarily a small one, is protected by a highly polished nickel plate deflector—shaped so that all of the light rays are put on the flag and no direct light rays are seen by



Illuminated Flag.

the driver. The flag is 6 inches by 8 inches, of high-grade silk. The ends are sufficiently protected so they will not slip out easily.

A clamp which will fit on any radiator cap holds the upright securely and affords a most convenient method of attaching a flag to the automobile. It is of special note that the motorist is in no way inconvenienced by this clamp. The radiator cap may be removed as often as desired without removing the flag or clamp. The clamp may be purchased separately, 35 cents, and will serve as ordinary flag holder.

This highly improved illuminated flag holder will be furnished completely with bulb, flag and wiring for $1.25, without bulb, $1.00, at all dealers and jobbers.

Remarkable Growth.

Production records of Fuller & Sons Mfg. Co., Kalamazoo, Mich., transmission makers, show during the first five months this year two and one-half times the output of the same period 1916. The new plants now being erected, which will be ready for occupancy along in the summer, will no doubt enable this company to make a very much larger increase in production for the corresponding period of last year.

Convert-a-Car.

The Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill., a $14,000,000 corporation, has an exceedingly interesting dealer proposition. They are now offering the garage trade their Convert-a-Car which is a super-size Ford truck-unit. It is noteworthy that this is a truck-unit, made by a truck manufacturer; that thousands of their Little Giant heavy-duty trucks are economically and dependably delivering all over this country, and in many places abroad. To this new field of Ford truck-unit manufacture, they bring a wide reputation and twenty-three years of aggressive experience in designing and building tools and machinery for engineering projects of every description. The Convert-a-Car is not a makeshift, but built up of such over-size standard units that it is an actual truck in construction and ability. A letter to the Chicago Pneumatic Tool Company will bring the progressive dealer or garage man some interesting facts and figures on the present truck situation.

Free Advertising to Dealers.

The Amazon Rubber Company at Akron, O., are the originators of a unique line of advertising material, all of which is furnished to the dealer absolutely free of charge. This includes newspaper advertising, outdoor bulletins and circular letters, without charge for either newspaper space or letter postage. Special road signs, lithographed stationery, business cards, etc., imprinted with the dealer's name, are also given him. One of the main features of the advertising is the outdoor painted bulletin. This bulletin is 8x32 feet long, painted in several colors, and stands for a period of three years. These boards are all erected for the dealer without charge for erection or rental.

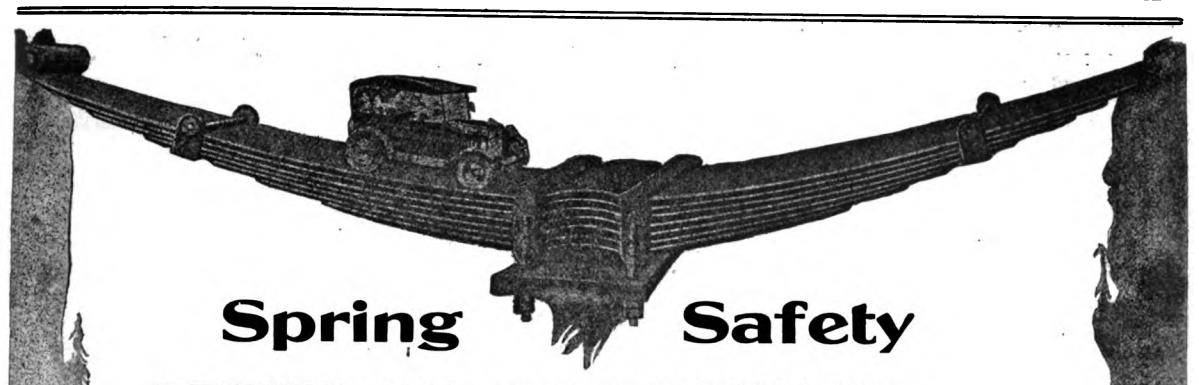
Castor Oil for Motors.

Preparing for unlimited national expansion, the Sexton Oil Company has opened its new factory at North Chicago, Ill., which assures an output of 300,000 gallons per week without double shifts. A strong campaign will be carried on over the country for new business, which the concern will be able to handle with its increased facilities. The tremendous strides made by the company during the last year in the sales of its patented castor motor oil made it necessary to increase the factory facilities. "Probably no product ever placed on the market has ever met with the success that has marked the introduction of our castor motor oil," said President P. J. Sexton, "and our difficulty has been in keeping up with the demand. Castor, combined with the best mineral oils in the properly determined proportions provides a most efficient lubricant for an internal combustion engine and its heat registering qualities prevents the oil from breaking down under the heat of the engine."

More Light.

The Osgood Lens & Supply Company, 2021 Michigan avenue, Chicago, Ills., would like every dealer who is a reader of the Automobile Dealer and Repairer to write to them for some attractive sales data in connection with their new Osgood lens, which is said to throw waist-high light with no glare for one third of a mile.

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Spring Safety

MOTORISTS know that their cars are no stronger or safer than their springs.

When a car owner comes in with a broken spring, don't sell another just like it—sell a safe spring and make the motorist a booster for you—sell him a

Tuthill Titanic Lubricated Spring

Guaranteed forever against center breakage—guaranteed at all points and in all respects for one year

Tuthill Titanic Lubricated Springs are *strongest* at the center—the place where seven out of ten spring breaks occur. **No weakening center bolt of center nib.** But a patented center arch and "wedge and yoke" plate, holding the spring leaves in a vise-like grip and making Tuthill Titanics strongly reinforced and unbreakable at the center.

Our Special Ford Front Spring carries the same broad guarantee.

Get your share of the big spring replacement business in Tuthill Titanics. More Tuthill Titanic Springs are used for spring replacement than all other makes put together. Easily adapted to any axle construction *without extra expense.*

Write to-day for valuable spring booklet and 1917 price list; the most complete price list ever published for spring replacements—also the name of the nearest distributor.

Tuthill Spring Co., 760 Polk St., Chicago

Where the Profits Are.

Take an ordinary auto repair job, one spring to be fixed. Say you charge $3 for your work. If of this, $1 represents material and the job takes 3½ hours; you are getting a little over 50 cents per hour for your time. No more. Take the same job. One spring to be fixed. But this time you will use Harvey Semi-Finished Repair Plates instead. Your material cost will remain $1, for Harvey plates cost only a trifle more per pound than spring steel and there is nothing like the waste. Now here's your real saving. Instead of 3½ hours' labor, you will cut this in half or less. But the job is worth $3 the old way and you are giving a better job with Harvey Plates. So instead of making 50 cents an hour, you are making $1 per hour. Instead of turning down work because you are too busy, you do twice the repair work. Give Harvey Semi-Finished Repair Plates a trial. A few dollars spent will prove to your value. They are made by the Harvey Spring & Forging Co., Racine Junction, Wis.



Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.

Storage Batteries Simplified. By Victor W. Page. The Norman W. Henley Publishing Co., 4 and 6 West 45th St., New York. Price $1.50.

This is a most thorough and authoritative treatise on the subject of storage batteries. It fully describes the Exide, Edison, Gould, Willard, U. S. L. and other storage batteries for automobile, stationary and marine work. Nothing of importance has been left unsaid that a reader should know about the practical operation and care of storage batteries. Instructions have been made as simple as possible. The book comprises about 200 pages, numerous illustrations and diagrams, and is well indexed.

Legal Points for Automobile Owners. By Leslie Childs. J. S. Ogilvie Publishing Co., New York. Price 50 cents.

This handy little book states briefly and concisely what every automobile owner should know regarding his legal rights and his liability under various circumstances It gives information regarding defense in arrest for speeding, the law on turning corners, rights of pedestrians, etc. The book is written in everyday language and is not in any sense a text book. An index is given in the front of the book and the information is boiled down to 55 pages.

Franklin Cars.

The Franklin Automobile Co. during the week of May 19, received more orders than in any previous week in its history. Factory production also reached a new high mark, 216 cars being turned out in 5½ working days.

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A New Ford Car Light.

A new Ford car electric light has been placed on the market that will no doubt be found valuable to those who desire something that is necessary for a low engine speed. It is called the "Lite-a-Ford." It strengthens the magneto current at slow engine speed and has a reverse action on high engine speed, causing the current to retard You can also dim the lights to any degree you desire when driving in the city or meeting other vehicles. The timer is a rheostat which instantly times the lights to any degree by the simple turning of a knob. This device gives all the advantages of a high-priced lighting equipment and it costs but $2.50. It has received high endorsements and the purchase price is cheerfully refunded if not fully satisfactory. It is made by the Hastings Manufacturing Co., Hastings, Michigan.

New Development in Bench Drills.

Probably there is no phase among the manufacturers of tools that so clearly voices the development of modern shop requirements and of the individual demand of the workman as the slogan, "Make Better Mechanics." Today we have tools and machines common enough in every garage or repair shop that evidence the insistent demand for accuracy in results and for time saving, "speed up" necessities of the modern workshop. Every man who has many drilling jobs to do knows the need of an efficient bench drill, but up until now no great development in this useful tool or machine has been made. But now with the production of the "Yankee" bench drill we have one that in every particular part shows an extraordinary improvement over the type with which we have been familiar. Strength and rigidity have been secured by scientific design, and not through bulk of material, thus ensuring economical lightness in the construction of its mass. Besides, the

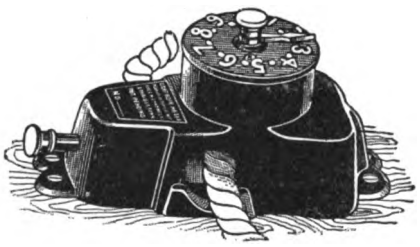


Yankee Bench Drill.

remarkable care and precision in the construction of the various details, special features have been incorporated in the "Yankee" bench drill which stamp it as a tool of high efficiency. In the one feature of the automatic friction and ratchet feed we see markedly the modern tendency of the elimination of the personal equation of the workmen. The feeding of either large or small drills is not left to the judgment of the man on the job. He cannot feed the "Yankee" bench drill so fast that he smashes his drills or so slow that the amount of time consumed on the job is in excess. Uniform and regular feeding goes on until the job is finished.

A Unique Measure

It is no longer necessary to search all over the store looking for a yardstick or tape measure. Every time you sell a rope, garden hose or tubing of any sort, a little instrument called the Gant Meter prevents over and under meas-



Gant Meter.

ure and it is simple and quick of operation. It ought to be in the equipment of every well equipped store, garage and electrical supply house. It is sold by John E. Chumbley & Co., Nashville, Tennessee, who are general distributors.

A New Brake Lining.

It is well known that neglected brake linings are liable to cause a serious accident. The TesTbesTos is made of the very best quality of asbestos, carefully inspected, thoroughly and scientifically manufactured and gives long and satisfactory use. All this can be substantiated by the testimony of those who use it. All the firm asks is a trial, and they are sure that this will soon cause it to be used almost universally. An elaborate and unique folder is being sent out to dealers and no one should fail to send and get it immediately. It can be had for the asking, and at all events when the one who asks sends his business card with his request. This circular gives a good deal of valuable information both in relation to brake linings and to the best method of making money by selling them.

Victor Ford Car Heater.

The Crew Levick Co., Real Estate Trust Bldg., Philadelphia, have taken over the general sales agency of the Victor Heater, 105 Erie St., Camden, N. J. The heater as marketed will be virtually the same as shown at the automobile show only perfected in some details which will be described in a later issue.

New Dealers' Association.

The first steps in the formation of the National Automobile Dealers' Association were taken in Washington, D. C., by the representatives of a number of associations in the large cities, who were there opposing the proposed 5 per cent. tax on automobiles.

A committee has been formed, of which G. W. Brown, Milwaukee, is chairman. E. T. Conlon, secretary of the Grand Rapids Association, is secretary. This committee will get in touch with all the associations throughout the country to arrange for a general organization meeting before August 1. At that time the work will be perfected, and permanent officers chosen.


INSYDE TYRES
Inner armor for automobile tires. Prevent punctures and blowouts. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details Free. *Distributors and Agents Wanted.* Sales Guaranteed. Liberal Profits.
AMERICAN ACCESSORIES CO., Sta. A B., Cincinnati, O.

Electric Trouble Shooter
AMBO
Detects and locates, quickly and accurately, trouble in any American made starting and lighting system used as standard on any American made car.
AMERICAN BUREAU OF ENGINEERING, Inc.
1028 So. Wabash Ave. Chicago, Ill.

"NATIONAL" PRODUCTS
ALL GOOD
Air Compressor, Garage Vulcanizer, "Sure-cure" Vulcanizer, Spring Oiler, Gas Saver and Gasoline Gauge for Fords.
THE NATIONAL MOTOR SUPPLY CO.
PAINESVILLE, OHIO

SAFERLITE LENSES
No Glare No Danger
A shadowless light from gutter to gutter on a line with your bumper and an ample distance ahead for absolute safety.
Your garage man will be glad to get them for you.
SAFERLITE LENS COMPANY
220 Fifth Ave., Room 1707, New York

HIGGINS QUALITY SPRINGS—For Replacement
No hole. No bolt. No hump. No felt. No center breakage. Guaranteed alike at all points. Out-serve and out-sell all others. Immediate shipment. Write for Catalogue C-1917

and Dealers' Discounts.
Higgins Spring & Axle Co.
Dept. 14, Racine, Wis.

AMAZON
SUPERTIRES
ANTI-BLOWOUT
THE AMAZON RUBBER CO., Akron.

VULCANIZERS
Our Vulcanizers have stood the test for over eight years and are used and recommended by tire manufacturers, and the majority of Tire Repair Concerns.
Send for our catalogue.
O'NEIL TIRE & RUBBER COMPANY. Akron, O.

BALL AND ROLLER BEARINGS.

The Gwilliam Company
THE NEW DEPARTURE SERVICE STATION
New York: 2 Columbus Circle (58th St. at Broadway)
Philadelphia: 1314 Arch Street

ROME RADIATORS
Quality, Efficiency, Durability
We repair and replace all makes of radiators
ROME-TURNEY RADIATOR CO.
WHITESBORO STREET, ROME, NEW YORK.

RATTLE, RATTLE, in my car,
How I wonder where you are
?
For Auto Doors and Hoods
Write for Prices and Descriptive Matter
GUOIN MANUFACTURING COMPANY
P. O. Box No. 8 Poughkeepsie, N. Y.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

REPAIR PARTS
For All Makes of
HORNS AND SPEEDOMETERS
Official Klaxon Horn Station
Send for price list
GENERAL SPEEDOMETER REPAIR COMPANY
51 West 63d Street NEW YORK CITY

Free

Our new 1917 Catalog is just off the press. It has the finest line of up-to-date accessories for all cars that has ever been offered at money-saving prices. Every article is guaranteed to give satisfaction, or money returned.

Ask For Catalog D. R.

General Automobile Supply Company
1671-1673 Broadway New York City

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Inner Tubes, any size, $1.75 Each
INTER STATE RUBBER CO.
259 West 15th Street Philadelphia, Pa.

AFFA SPECIALTIES

For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

W. S. GRAFFAM,
14-A Eddy St., West Newton, Mass.

We Still Have a Few 100-lb. Box Assortments
Bolts, Nuts, Set Screws, Rivets, Filister Head Screws, Key Stock, Etc., Etc.
$5.00 per 100 lbs.
Westchester Accessories Co., Inc., 1777 B'way, New York

Carburetors

SHIP THAT TROUBLESOME CARBURETOR

By Parcel Post. We rebuild and install new parts. Largest and most fully equipped carburetor testing plant in the East. Factory appointed service station for all the leading companies. Also a stock of used rebuilt carburetors, $5.00 up. All work guaranteed.

JOHN WILLS, Carburetor Specialist,
284 Halsey St., Newark, N. J.

Magnetos and Batteries

Hecht's Magneto Exchange
Dealers in Magnetos of all Makes.
Lighting Systems and Self Starters.
Expert Repairing of All Makes.
Express your Magneto, Starter and Generator to us. Same will be repaired and returned same day as received.
Distributors and Service Station for
MICHIGAN, SWISS AND NATIONAL MAGNETOS
— Also —
Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos
230 WEST 49th STREET NEW YORK CITY

MAGNETOS

Expert repairing on all makes of Magnetos, Coils, Self-Starters and Generators. Armature winding a specialty. Parts for all makes carried in stock.

MAGNETO SALES COMPANY
1779 Broadway, Suite 229, New York City

USED MAGNETOS
Bosch High Tension, $15 up
Save 50% to 75%
Herbert Aucock, 222 Columbus Ave., Boston, Mass

SPECIAL
Bosch Magnetos

We have about 50 Bosch Magnetos to sell for cash. Every magneto is guaranteed to be in good condition. If in any way a magneto purchased from us proves not as advertised, magneto may be returned at our expense and money will be cheerfully refunded.

DU 4	Variable spark		$20.00
DU 6	"	"	35.00
DR 4	"	"	15.00
DR 6	"	"	20.00
D 4	"	"	10.00
D 6	"	"	15.00
	Bosch A Coils		8.00

GENUINE PREST-O-LITE TANKS
Style B Empty, - $5.50

Portland Magneto Exchange
13 Forest Avenue PORTLAND, MAINE

Tires

INSYDE TYRES,
inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.
AMERICAN ACCESSORIES CO.,
Dept. AD3, Cincinnati, Ohio

INDIAN HEAD TIRE CO.
FRED J. EBLING WOLFORT
All Makes of the Better Grade
157 WEST 51st STREET
Telephone, Circle 679 NEW YORK

Tires

PRICE WRECKERS

All goods bought before the January increase in price sold at 1916 prices.

Blemished New Tires		Double Tread	
30x3	$6.50	39x3	$5.00
30x3½	8.00	30x3½	6.00
34x4	13.00	34x4	8.00
Guaranteed		$1.00 Less for Re-covering	

Give Us a Trial, We'll Both Benefit By It

ROYAL TIRE EXCHANGE
282 Halsey Street Newark, N. J.

Double Tread Tires

Notice Our Prices Before Going Elsewhere
PRICE LIST

Size	Plain	Size	Plain
30x3	$4.50	35x4	$8.50
30x3½	5.00	36x4	9.00
32x3½	6.00	36x4½	9.50
32x4	6.50	36x5	9.50
33x4	7.00	37x4½	9.50
34x4	7.50	37x5	10.00
34x4½	8.00		

For Non-Skid, 50 cents more on all sizes.
We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.
236 WEST 48th STREET, NEW YORK

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
37x5	5.00	9.00	12.00

Ship Your Old Tires by Prepaid Express
McDANIEL RUBBER CO.
613 Ohio Street Cairo, Ill.

DOUBLE TREAD TIRES AND TUBES
Write for prices, stating sizes.
I. JAFFESS
1319 FIFTH AVENUE NEW YORK
Branch Store: 241 W. 54th St. (near Broadway), New York

5,000 MILES GUARANTEED
Standard Make Tires
Send for Complete List
STAR RUBBER COMPANY
1781 Broadway, N. Y. City Tel., 123 Columbus

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Tires

SPRING REDUCTION ON
DOUBLE TREAD TIRES AND TUBES
GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

	Tires			Tires	
Sizes	Plain	Tubes	Sizes	Plain	Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90
30x3	4.50	1.75	32x4½	9.00	2.75
30x3½	6.00	2.10	34x4½	9.00	3.00
32x3½	6.50	2.15	35x4½	9.00	3.00
34x3½	7.50	2.25	36x4½	9.00	3.10

	Tires			Tires	
Sizes	Plain	Tubes	Sizes	Plain	Tubes
30x4	7.00	2.50	37x4½	9.00	3.10
32x4	8.00	2.75	34x5	9.50	3.25
33x4	8.00	2.75	35x5	10.00	3.25
34x4	8.00	2.75	36x5	11.00	4.00
35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY
261-A West 54th Street NEW YORK CITY 112-A East 100 Street

THE HOME OF DOUBLE TREAD TIRES

AUTO TIRES
GUARANTEED 4,000 MILES
If a tire fails to run 4,000 miles, we will replace with another tire for one-half of below price.

Size	Plain	Non-Skid	Tube	Size	Plain	Non-Skid	Tube
28x3	$5.95	$6.95	$1.80	35x4	$13.45	$14.95	$3.30
30x3	6.50	7.50	1.90	36x4	13.95	15.50	3.35
30x3½	7.95	8.95	2.15	34x4½	16.95	18.95	4.00
32x3½	8.95	9.90	2.25	35x4½	17.45	19.45	4.10
34x3½	9.50	10.45	2.35	36x4½	17.95	19.95	4.15
31x4	11.45	12.60	2.95	37x4½	18.45	20.45	4.25
32x4	11.95	12.95	3.05	35x5	19.45	21.95	4.90
33x4	12.45	13.50	3.10	36x5	20.45	22.95	4.95
34x4	12.95	13.95	3.20	37x5	21.25	23.25	5.05

WE SHIP C. O. D. NO DOUBLE TREADS. MAIL ORDERS PROMPTLY FILLED
WE PAY ALL EXPRESS CHARGES WE CARRY A LARGE STOCK

Special Propositions to Good, Live Dealers

STAR TIRE COMPANY
613-14 N. BROAD STREET PHILADELPHIA, PA.

Phones: Poplar 5169—Race 6019-D

CLEARANCE SALE ON BRAND NEW AUTO TIRES
GUARANTEED 3500 MILES. **ALL STANDARD MAKES.**

30 x 3	Plain	$6.75	Non-Skid	$7.50
30 x 3½	"	9.75	"	10.50
32 x 3½	"	11.00	"	12.50
33 x 4	"	15.00	"	17.00
34 x 4	"	15.00	"	17.50
36 x 4	"	22.00	"	24.00

ALL OTHER SIZES ON REQUEST.

When ordering state bead of tire required, Q. D. CLINCHER or STRAIGHT SIDE. Mail orders filled same day, upon receipt of 10% deposit. SEND YOUR ORDER TO-DAY. If size is not on the above list, write us for PRICE LIST without delay, as you are SAVING money by buying your tires now.

M. LIBEN & CO., 205A West 48th Street, NEW YORK

CHEAP DOUBLE TREAD
NEW AND SECOND HAND
Tires and Tubes
Write for Prices
JAFFE BROTHERS
260 West 54th Street NEW YORK CITY

GRIPWELL TIRES
CARRY 4,000 MILE GUARANTEE
MR. DEALER WRITE FOR OUR PRICES, WHICH ARE RIGHT.
UNIVERSAL RUBBER CO.
BROAD AND WOOD STREETS, PHILA., PA.

Tires

TIRES Fresh Stock ALL NON-SKID
Our Guarantee—4,000 Miles

30x3½	$11.00	34x4½	$23.65
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(HUB)

To Fit

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	Net Each
Front 30 H.P.	$1.00
Rear 30 H.P.	1.50

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Front 1910	.50
Front 1911	.70
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Front 1909, 1910, 1911—30 H.P.	1.00
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Rear M/36 1912-13-14, Casted	1.60
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Front 30 H.P. 1909-10-11-12-13	1.60
Rear 30 H.P. 1909-10-11-12-13	1.80
Rear 6 Cylinder 48 H.P.	1.80
Front 6 Cylinder 48 H.P.	1.60

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Front and rear 1910	.60
Front and rear 1911, 1912	.75
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Super Six	1.00

HAVERS

Front and rear, 1913, 1914	.75

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Haynes	Grabowsky
Oakland	R. C. H.
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Velie	Alpena
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Bulletin No. 5

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FOR ALL MAKES OF CARS
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PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

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"Fused Electrically by Patented Process"
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CYLINDERS REBORED AND REGROUND. Fitted with light grey iron pistons and leakless rings. High grade quality. McCadden Machine Works, Inc., St. Cloud, Minn.

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CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

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IMPROVEMENTS WANTED—Send for free bulletins and advice book "INVENTIONS—PATENTING and PROMOTING." Free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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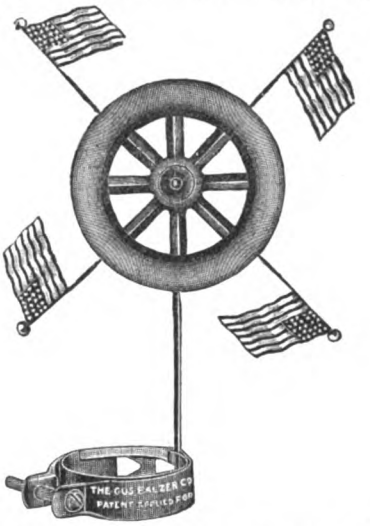
COUPON Books for gasoline and supplies. Samples free. J. P. Forbes, Coshocton, Ohio.

Hansen Accessories.

The Hansen Manufacturing Co., Cleveland, Ohio, makes some unusually desirable automobile accessories. One of these is an automatic air valve. It will commend itself at once to those who know anything about such things. There are models for garages, tire service and gasoline stations. In fact it is useful wherever air is used for filling tires. The Hansen hose clamp is easy to adjust, holds absolutely in place, will not leak and is comparatively inexpensive. If you wish to learn more about these devices write to the firm and they will be glad to give you full information.

A New Flag Device.

The illustration shows one of the five new patriotic emblems just created by Gus Balzer. Consisting of a light metal painted auto wheel, with four artistically waving celluloid flags surmounting the same, which are soldered right



into the wheel (size 7½ inches over all) and is clamped around the spout of the radiator. The wheel revolves on a metal axle by the slightest air pressure. It retails for only 50 cents, and is made by the Gus Balzer Co., 1777 Broadway, New York.

A New Differential.

The Miller Transmission Company, 90 West Street, New York, make a new differential which is said to be of real advantage under every and all road conditions. It transmits the power equally to both wheels alike no matter what the traction surface of either wheel may be. It is a gearless differential and is thus practically free from wear. The assembly is simple and has successfully passed exhaustive road tests. A circular giving full information will be sent to anyone interested, by applying to the manufacturers. It might be well likewise to send detail blue prints of the rear construction of your car in order to enable the firm to know just what you need and what it will cost.

A Mile in 38 Seconds.

A new straightaway mile record for 230 cubic inch class was recently established by a Chalmers stock chassis, with fan removed. Joe Dawson, the racing driver, now a member of the Chalmers experimental department, piloted the Chalmers on its record dash on the Atlantic Beach, Jacksonville, Florida. The Chalmers covered the mile in 38.1 seconds, under the observation of Joseph Tracy, technical representative of the American Automobile Association. Fred J. Wagner, the race starter, timed the event.

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New Automobile Accessories.

Illustrated herewith will be found four useful accessories for the automobile. Fig. 1 is a novel rear tire holder to fit the demountable rims for Ford cars. As will be seen, it is designed to carry one or two tires on demountable rims. The

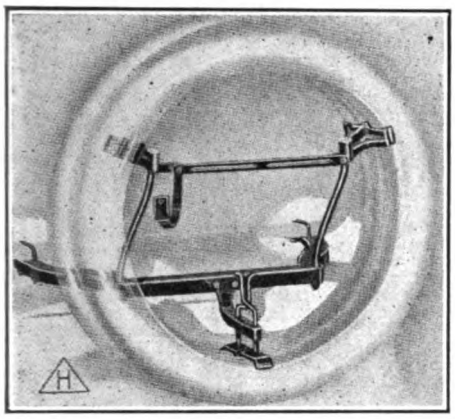


Fig. 1.

tires are rigidly held without the use of troublesome attachments and they can be locked to prevent theft very easily. The design is handsome and of good material. Fig. 2 shows a steel lined

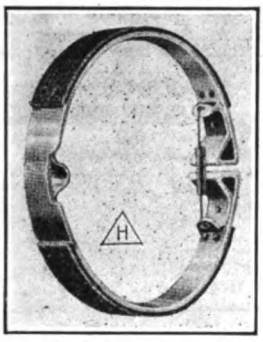


Fig. 2.

brake shoe for Ford cars which is absolutely indestructible. It provides an efficient brake, being lined with a fine quality of asbestos brake lining. The

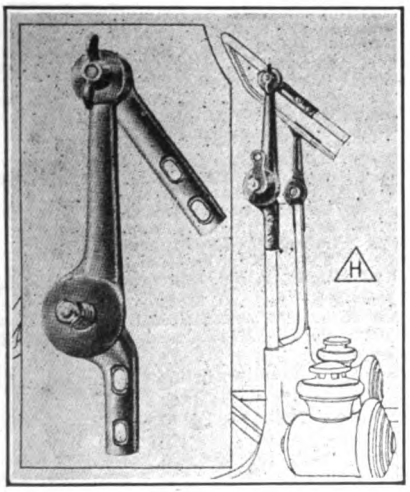


Fig. 3.

price for a complete set of these brake shoes is but $2.00. Fig. 3 illustrates a wind shield attachment. It is easily and quickly applied, requiring no holes to be bored or other changes. It is designed to replace the hinges originally supplied on a Ford wind shield, and insures safety and comfort in all kinds of weather. Fig. 4 is a foot accelerator. It can be applied in a few minutes without boring holes or otherwise marring the car, and permits complete foot control. All these accessories are for Ford

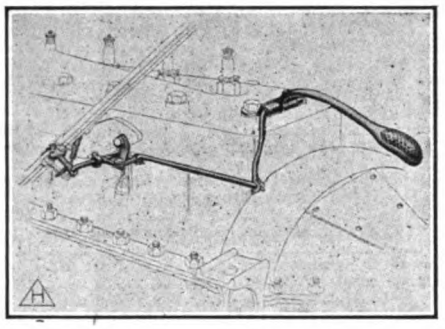


Fig. 4.

cars and with a good many others they are made by an enterprising and growing firm which will be glad to send catalogue to anyone writing for it, by addressing the Humboldt Machine & Stamping Company, Long Island City, N. Y.

New Portable Air Tank and Pump.

A complete, compact and handy outfit for garageman and dealer is the new portable air tank and pump recently put on the market by Black & Decker, of Baltimore, Md. A substantial air tank, fitted with a No. 2 Lectroflater Air Pump, is mounted on a strong cradle base, supported by two large wheels and one large swivel castor. A comfortable pushing handle is attached to the compressor

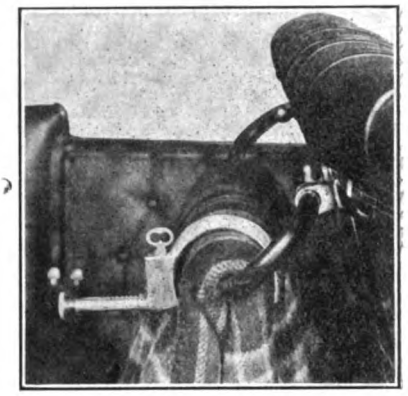


Air Tank and Pump.

platform, and the outfit is very easy to steer and handle. It is fitted with rubber tires, when for use on hardwood or tiled flooring. When emptied, the tank may be wheeled to the nearest electric connection (either current) and left there to refill itself. An automatic switch cuts off the current when proper pressure is reached. One of the big advantages claimed by its manufacturers for this outfit is that its piping and vital parts are thoroughly protected against injury from bumping into cars and other objects, thus preventing leaky joints. This outfit is also extremely useful in machine shops and factories, for blowing dust out of motors and generators.

A Dependable Motor Lock.

Although improvements are being made in almost every channel to combat the ingenuity of thieves, they themselves seem to progress about as rapidly as the ingenuity of honest people. The manufacturers of the Lap Robe Lock claim, however, that it is impossible to steal anything when their lock is used, it being not only strong, but impossible to



The Robe Lock.

pick. The malefactor will surely pass along when he sees how the car is protected by it. Automobile robes and the garments of its occupants are safe and secure when this lock is used. The lock is furnished with two keys and no two sets of keys are alike. It retails for $1.75. It is made by the Robe Lock Co., Inc., Oakland, Cal.

Scores Hit With Cork Insert.

The Advance Automobile Accessories Corp. of Chicago, makers and merchandisers of Cork Insert Transmission linings for Fords has made a remarkable record for getting distribution quickly. Mr. Harvey Cory, President of the company explains, "that no unusual methods of merchandising were used. We didn't put on a 'flying squadron' of salesmen—do any excessive advertising or anything like that. Our advertising department prepared a circular describing the Cork Insert Lining—showing the corks painted in natural colors in the lining. This strong circular supplemented by a letter—was sent to a picked mailing list of some 300 jobbers. The talk was so straightforward and so convincing that 33 1/3 per cent. returns were had and all contained orders. The good qualities of Cork Insert were instantly apparent. Nothing could have been stronger than showing jobbers just exactly how the corks looked in the linings."

This new idea of putting cork in transmission linings for Fords is just what that car has needed to take out the jars and jumps caused by the transmission grabbing.

$5,000 Prize Contest.

Our dealer subscribers should write at once to the Marvel Accessories Mfg. Co., 7233 St. Clair avenue, Cleveland, Ohio, for full particulars of the new $5,000 prize contest which they have inaugurated with respect to their Marvel Jr. Vulcanizer, and mention this paper.

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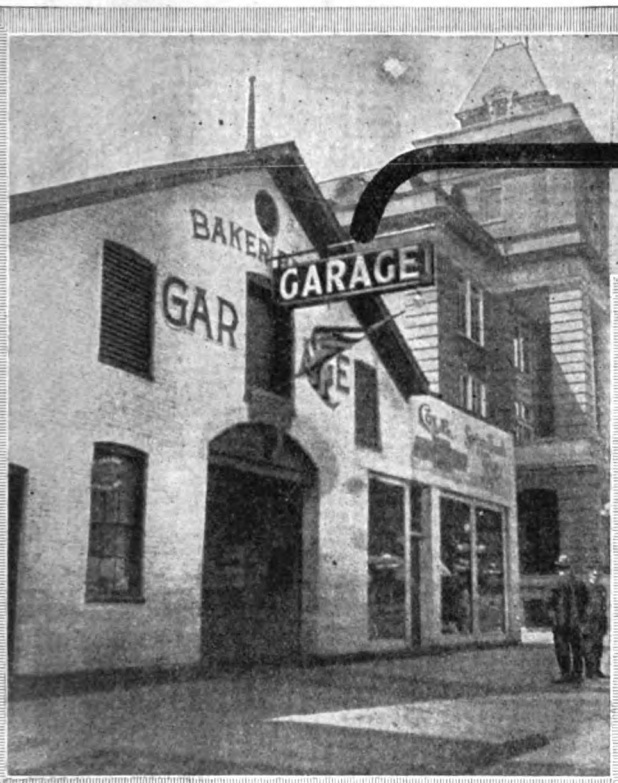
Automobile Trunks to Order.

S. C. Simon & Co., 404 Brown Street, Philadelphia, are expert builders of automobile trunks. They have a good many different styles in stock and will build anything desired to order if requested. The prices are low and their product is guaranteed of the best. They also make hood and radiator covers, clamps to the wind shield to cut out the wind and rain, and a rear window light in case the one on the car happens to have been broken. They also manufacture other useful accessories, descriptions of which will be cheerfully forwarded if the reader will write for a catalogue to the above address.

Special Request

¶ IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser

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GARAGE

LET ELECTRICAL ADVERTISING BRING BUSINESS TO YOU—

A Flexlume sign with its strong, raised letters throwing light down the street for many blocks is the most result-producing advertising within reach of the garage man or the dealer.

It will bring business to your door.

It will make your location stand out as a landmark on the street for it is impossible to overlook a Flexlume.

Flexlume characters are clear, unbroken. They are made of raised white glass with the illumination behind them, arranged in such a way that practically none of the light is lost.

A Flexlume transmits all of its candle power, and the clear, unbroken letters give the sign a greater reading distance than the others.

Besides all this a Flexlume has an atmosphere of distinction.

Yes, a Flexlume is the most efficient night sign, but it is a day sign too. Its solid, raised white letters standing out from a dark background give it the strongest possible daylight display.

And Flexlume signs are not costly. They can be bought on easy payments where cash is not available.

There are special Flexlume designs for most of the leading cars.

Fill out this coupon and get a sketch showing how your sign will look.

THE FLEXLUME SIGN CO.

1445-1451 Niagara St., BUFFALO, N. Y.

Canadian Distributors:
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Pacific Coast Distributors:
ELECTRICAL PRODUCTS CORPORATION, 112 WEST 16TH ST., LOS ANGELES, CAL.

FLEXLUME SIGN CO., Buffalo, N. Y.

Please send me free sketch and information in regard to Flexlume Signs.

Signs should read.....

.....

To read one or two sides?.....

Vertical or horizontal?.....

NAME .....

ADDRESS .....

Ford

SAXON

Overland

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Make a PROFIT on your Tire Changes



The WEAVER UNIVERSAL Tire Changer

Will Handle the Old Rusted Tire and Rim as Quickly as the New

THE "profits" on tire changes are measured by the rapidity and ease with which the changes are made. With one of our Universal Tire Changers installed, your men will no longer have to spend from one to two hours "fighting" with some difficult tire. Rusted and corroded tires or battered rims consume no more time on this wonderful machine than the new tire and rim right out of stock.

The saving in time and labor will pay for this equipment in thirty days.

No Injury to Tires or Rims

Your customers will also appreciate having their tires and rims handled by SMOOTH ROLLERS instead of with a sledge hammer and cold chisel.

Every operation is performed by rollers—there is no springing or "battering" of rims and no cutting or marring of tires.

Will Handle Any Rim

Any size or style of rim or pneumatic tire can be handled on this "Universal" Tire Changer. The adjustments are quick and simple. Weight 250 lbs., a REAL machine. The price will agreeably surprise you.

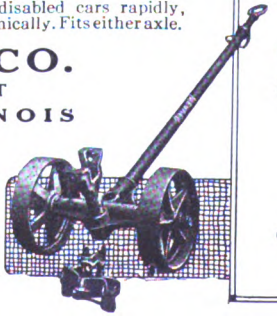


Valveless Bucket Pump

Will handle oil and soft grease in "three ways—true of no other grease gun.

Auto Ambulance

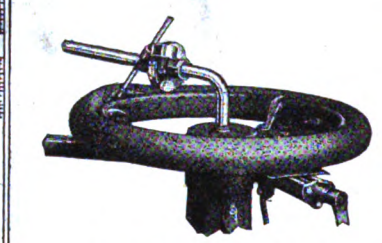
For towing disabled cars rapidly, safely and economically. Fits either axle.



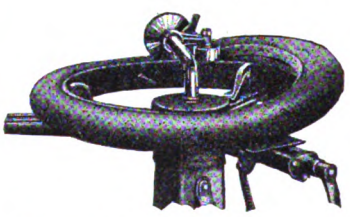
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2175-79 SOUTH NINTH STREET

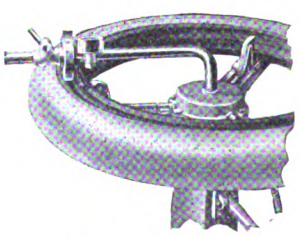
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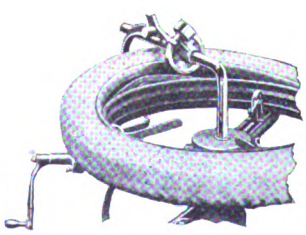
"Rolling" Bead Out of Solid Clincher Rim.



"Rolling" Tire onto Solid Rim—Clincher or Straight Side.



Separating Lock Rings by Roller Pressure.



Gooseneck Attachment "Rolling" Tire off of Solid Rim.

NOTE: For SPLIT RIM see complete view above.

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Do You Get 10,000 Miles Per Tire



War times are economizing times. Motorists everywhere are not only making their own tire repairs, but they are also treating their casings to get more mileage from them.

TIRE-DOH sales have jumped by leaps and bounds since motorists are learning the value of TIRE-DOH when used to

TIRE-DOH-ize Outer Casings

"Every well made tire should give at least 10,000 miles of wear," said an experienced tire man recently. "And it would give that wear with proper care," he added.

"Proper care" means keeping the tires well inflated and "touching up" the casings regularly with TIRE-DOH. By filling the little cuts, holes and sand blisters with TIRE-DOH, the main cause of big tears and blowouts is overcome.



Best Repair for an Inner Tube Tear

Ten thousand dealers are recommending TIRE-DOH for repairing punctures, blowouts and inner tube tears—large and small. They know that it will make permanent repairs without the need of heat or tools—without danger of burning or overcuring the rubber. And they know it will fix torn-out valve stems and do other difficult jobs impossible by other methods.

Not a Tire Filler

TIRE-DOH is not a substitute for air. Neither is it an ordinary patch. It is a rubber compound made by a secret process. When applied, it becomes an actual and permanent part of the tire, firmer and stronger than the rest of it, and never comes off. Seven years on the market and a proved success.

For Motorcyclists and Housewives, Too

TIRE-DOH saves time, trouble and money for bicyclists and motorcyclists as well as motorists. And it also repairs rubber boots, hot water bags, etc. Thousands of users keep two outfits always on hand—one in the repair kit and one in the home.



Complete Outfits, 50c and $1.00

Canadian prices, 65c and $1.25. Everybody needs TIRE-DOH—over 750,000 "kneaded" it last year. This year our powerful national advertising campaign will tell the merits of TIRE-DOH to over thirty million people.

Motorists and others who cannot obtain TIRE-DOH from their dealers should order direct from us, and send us the name of their dealer.

Manufactured and Guaranteed by **ATLAS AUTO SUPPLY CO.** 616 W. Austin Ave. Chicago, Ill.

All Jobbers Sell TIRE-DOH

Dealers should buy direct from their jobbers or use the coupon below, giving name of jobber through whom order is to be filled.

Order Form for Dealers

Atlas Auto Supply Co., 616 W. Austin Ave., Chicago,
Please send the following at regular trade discount through:

(Jobber) .....
.....Doz. $1.00 Size TIRE-DOH Outfits.
.....Doz. 50c Size TIRE-DOH Outfits.
.....Doz. 50c Size TIRE-DOH Alone, 2-oz. cans.
.....Doz. 25c Size TIRE-DOH CEMENT, 4-oz. cans.

Also send free advertising matter checked:
[ ] Envelope Stuffers. [ ] Window Trims. [ ] Counter Display.

Ship Via .....
Name .....
Address .....

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The Buyer's Interest in Wasteless Advertising

BUYERS who appreciate that waste in selling must eventually be passed on to them in some form, are paying more and more attention to the sales methods of the concerns seeking their business.

The extravagant use of space in publications of general circulation, to advertise a commodity or a service appealing chiefly to a certain well-defined class, is not only poor judgment, but *it is an economic waste.*

Can you imagine an intelligent salesman, with a proposition for a steel mill or a dry goods store, calling at every office in town in an effort to locate a prospect? How needlessly wasteful to adopt similar methods in advertising, which is simply an improved means of accomplishing certain necessary steps of a sale.

On the other hand, the seller who uses the business papers reaching *only* the class interested in his message, is employing the most direct, efficient and economical method of getting in touch with prospective buyers.

Properly used, the good business paper bears the same relation to the sales department, that an improved machine does to the production department. Better selling methods go hand in hand with better manufacturing methods.

To encourage wasteless advertising, the most efficient modern means of bringing buyer and seller together, there is every reason why the discriminating buyer should give preferred consideration to the concern that tells its business story in the buyer's own business paper.

Ask this office anything you want to know about Business Papers or Business Paper Advertising.

THE ASSOCIATED BUSINESS PAPERS · INC.

The International Organization of Trade, Technical and Class Publications

Headquarters, 220 West 42nd Street New York

LIST OF MEMBERS

Each member has subscribed to the 10 "Standards of Practice," a high code of ethics covering all departments of business paper publishing.

Advertising & Selling
American Architect
American Blacksmith
American Exporter
American Hatter
American Machinist
American Paint & Oil Dealer
American Printer
American School Board Journal
Architectural Record
Automobile, The
Automobile Dealer & Repairer
Aviation & Aeronautical Engineering
Boot & Shoe Recorder
Brick & Clay Record
Buildings & Building Management
Bulletin of Pharmacy
Canadian Grocer
Canadian Railway & Marine World
Cement World
Clothier & Furnisher
Coal Age
Concrete
Domestic Engineering
Drygoodsman, The
Dry Goods Economist
Dry Goods Reporter
Editor & Publisher
Electrical Review & Western Electrician
Electrical World
Electric Railway Journal
Electric Traction
Engineering & Mining Journal
Engineering News-Record
Farm Machinery—Farm Power
Furniture Manufacturer & Artisan
Grand Rapids Furniture Record
Haberdasher, The
Hardware Age
Hide & Leather
Hotel Monthly
Illustrated Milliner
Implement Age
Industrial Arts Magazine
Inland Printer
Iron Age
International Trade
Lumber Trade Journal
Lumber World Review
Manufacturing Jeweler
Marine Engineering
Metal Worker, Plumber & Steam Fitter
Metallurgical & Chemical Engineering
Modern Hospital
Motor Age
Motor World
National Builder
National Druggist
National Petroleum News
Power
Practical Engineer
Railway Age Gazette
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Shoe & Leather Reporter
Shoe Findings
Shoe Retailer
Tea & Coffee Trade Journal
Textile World Journal
Transfer & Storage
Woodworker

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A Bumper for the Front and Rear of Every Car

The prevalence of extended front aprons and the great variation in fender aprons and frame construction now necessitate corresponding variations in Bumper designs to fit all cars.

In the Halladay Line we offer such variation with the least possible complication of parts.

The Dealer in Halladay Bumpers can be prepared to meet all demands and turn all prospects into buyers without a great investment in stock.

Our standardized models are the nearest possible approach to universal equipment and we manufacture special models for the few cars requiring such equipment.

Bumpers are the best selling Automobile Accessory of to-day and the Halladay Line is the best selling, most profitable and most satisfactory line of Bumpers.

Wise dealers: reflect and get busy.

L. P. HALLADAY & COMPANY, Streator, Illinois

DISTRIBUTORS:

Asch & Co., 16-24 West 61st St., New York City
E. L. Thompson Co., 817 Boylston St., Boston, Mass.
Gray-Heath Co., 1440 Michigan Ave., Chicago, Illinois.
Sanford Brothers, Chattanooga, Tenn., Southern Distributors
Hughson & Merton, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

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Is Your Car Among These?

ABBOTT
ALCO
ALLEN
APPERSON
ATTERBURY
AUBURN
AUTO CAR
BEAVER
BERKSHIRE
BRISCOE
BUICK
BUICK-McLOUGHLIN
CADILLAC
CARTER CAR
CASE
CHALMERS
CHANDLER
CHASE
CHEVROLET
COLE
COLUMBIA
COMMERCE
CROW-ELKHART
CUTTING
CINO
CAR NATION
COEY
CRAWFORD
CROXTON
DECATUR
DORT
DODGE
DETROITER
E. M. F.
ELCAR
EMPIRE
EVERETT
EDWARDS-KNIGHT
FALLS
FLANDERS
FORD
FRANKLIN
FRONTENAC
FULTON
G. M. C.
GUY VAUGHAN
GRANT
GARFORD
HOTCHKISS
HAYNES
HENDERSON
HALLADAY
HORNER
HUDSON
HUPP
HUPMOBILE
HURLBURT
HERRESHOFF
I. H. C.
IMPERIAL
INDIANA
INTER STATE
JACKSON
JEFFERY
KING
KISSELKAR
KEETON
KOEHLER
KRIT
LAMBERT
LITTLE
LEXINGTON
LITTLE GIANT
LOCOMOBILE
LOZIER
MERCEDES
MARATHON
MARION
MARMON
MAXWELL
MERCER
METZ
MICHIGAN
MITCHELL
MORA
MOLINE-KNIGHT
McFARLAN
MARION-HANDLEY
MOON
MOBILETTE
NATIONAL
NANCE-TORRAIN
NORTHWAY
OAKLAND
OLDSMOBILE
OVERLAND
PACKARD
PAIGE-DETROIT
PANHARD
PARTIN-PALMER
NEW PARRY
PATERSON
PEERLESS
PIERCE-ARROW
PILOT
POPE-HARTFORD
PREMIER
PALMER-SINGER
PULLMAN
R. C. H.
RAMBLER
REGAL
REO
RUTENBER
RENAULT
SAMPSON
SAXON
SCRIPPS-BOOTH
SPEEDWELL
SELDEN
SPHINX
STAVER
STEARNS-KNIGHT
STODDARD-DAYTON
STUDEBAKER
STUTZ
SPENCER
STEVENS-DURYEA
THOMAS
TRUMBULL
VELIE
VIM
VULCAN
WARREN-DETROIT
WESTCOTT
WINTON
WHITING
WELCH-DETROIT

Making Good on 138 Different Pleasure Cars and Trucks

SUNDERMAN $5
Vacuum Carburetor

F. O. B. Newburgh $6.50 for other than Ford or Metz

At the left we print the names of 138 different makes of pleasure cars and trucks on which a Sunderman Vacuum Carburetor has been installed.

The great majority were replacements. Their owners wanted a new carburetor because old motors and imperfect carburetion were causing power drains and low mileage per gallon of gasoline.

Replacement business is the bitterest, most brutal and at the same time the most unfair test to which a carburetor can be put. Despite these handicaps the Sunderman Carburetor has made good on all makes of cars and thousands of testimonials prove it.

The Sunderman mixing principle and its simple construction furnish the reason. They prove that

THE SUNDERMAN IS THE CARBURETOR OF UNIVERSAL APPLICATION

When any other carburetor can stand up under such a test and deliver the same herculean power on the same miserly consumption of gasoline—then, and *not until then*, will we admit that we have a worthy competitor.

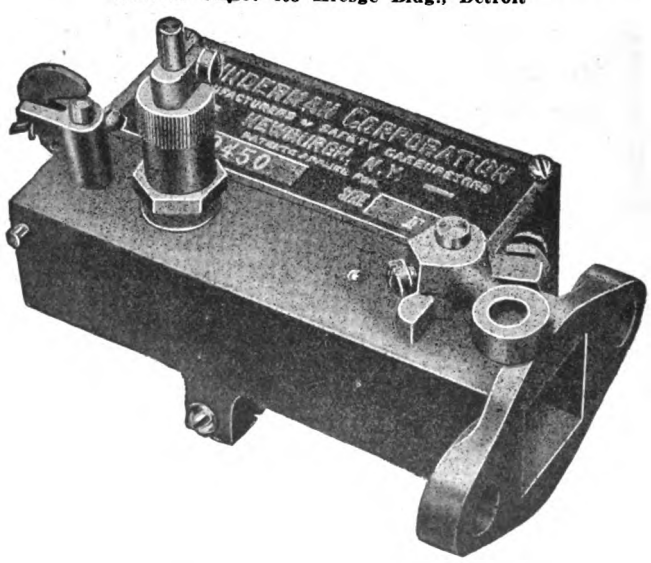
Owners, send your orders in now.

Manufacturers, doesn't this advertisement give you food for thought?

GOOD TERRITORY AND GOOD PROFITS FOR LIVE DEALERS WHO WRITE AT ONCE

Sunderman Corporation, 13 CHAMBERS STREET NEWBURGH, N. Y.

Western Office: 403 Kresge Bldg., Detroit



Makes Good on Every Car on which it is installed whether at the factory or by the owner.

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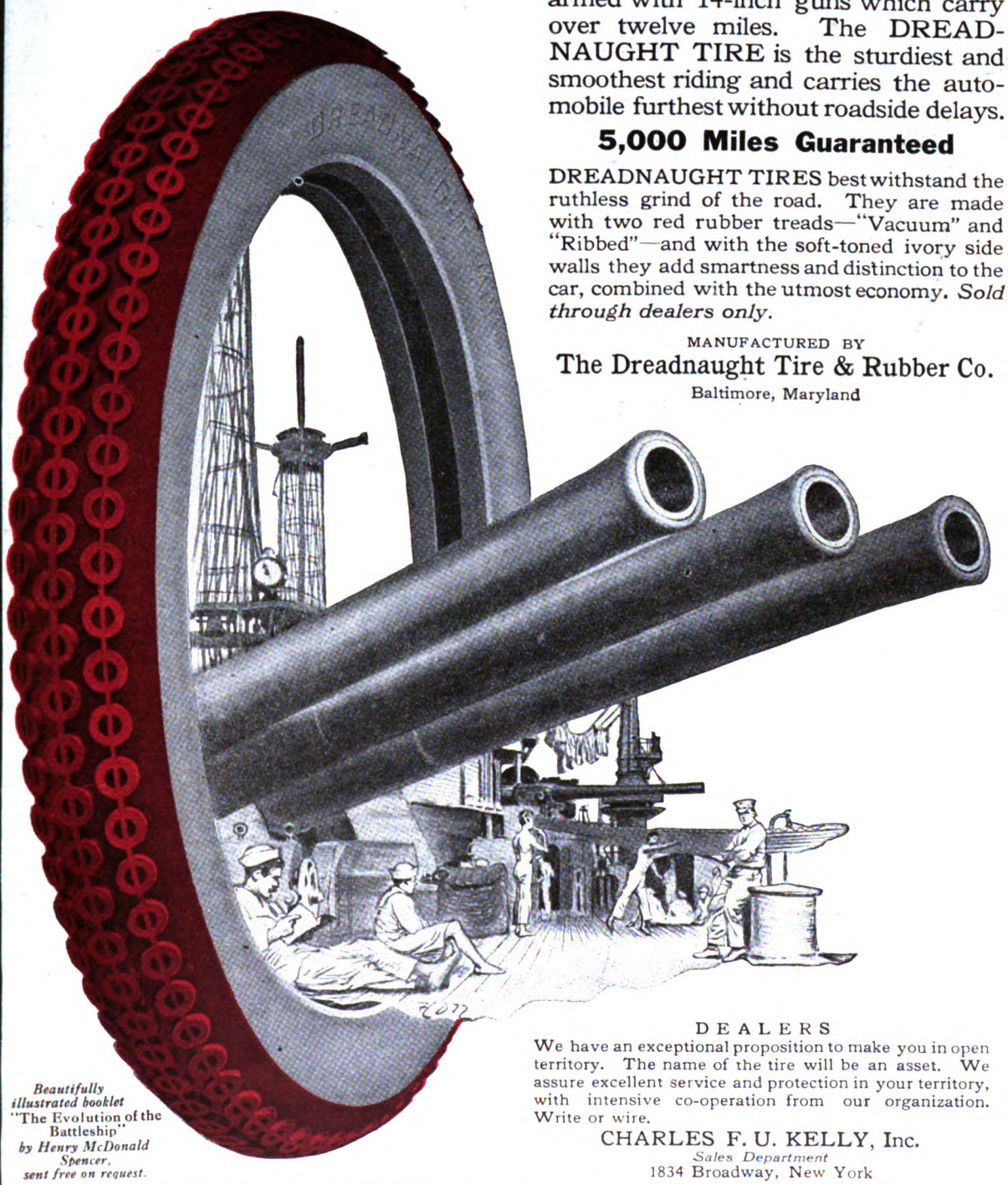
DREADNAUGHT TIRES

OUR latest Dreadnaught Battleships, the most powerful afloat, are armed with 14-inch guns which carry over twelve miles. The DREADNAUGHT TIRE is the sturdiest and smoothest riding and carries the automobile furthest without roadside delays.

5,000 Miles Guaranteed

DREADNAUGHT TIRES best withstand the ruthless grind of the road. They are made with two red rubber treads—"Vacuum" and "Ribbed"—and with the soft-toned ivory side walls they add smartness and distinction to the car, combined with the utmost economy. *Sold through dealers only.*

MANUFACTURED BY
The Dreadnaught Tire & Rubber Co.
Baltimore, Maryland



Beautifully illustrated booklet "The Evolution of the Battleship" by Henry McDonald Spencer, sent free on request.

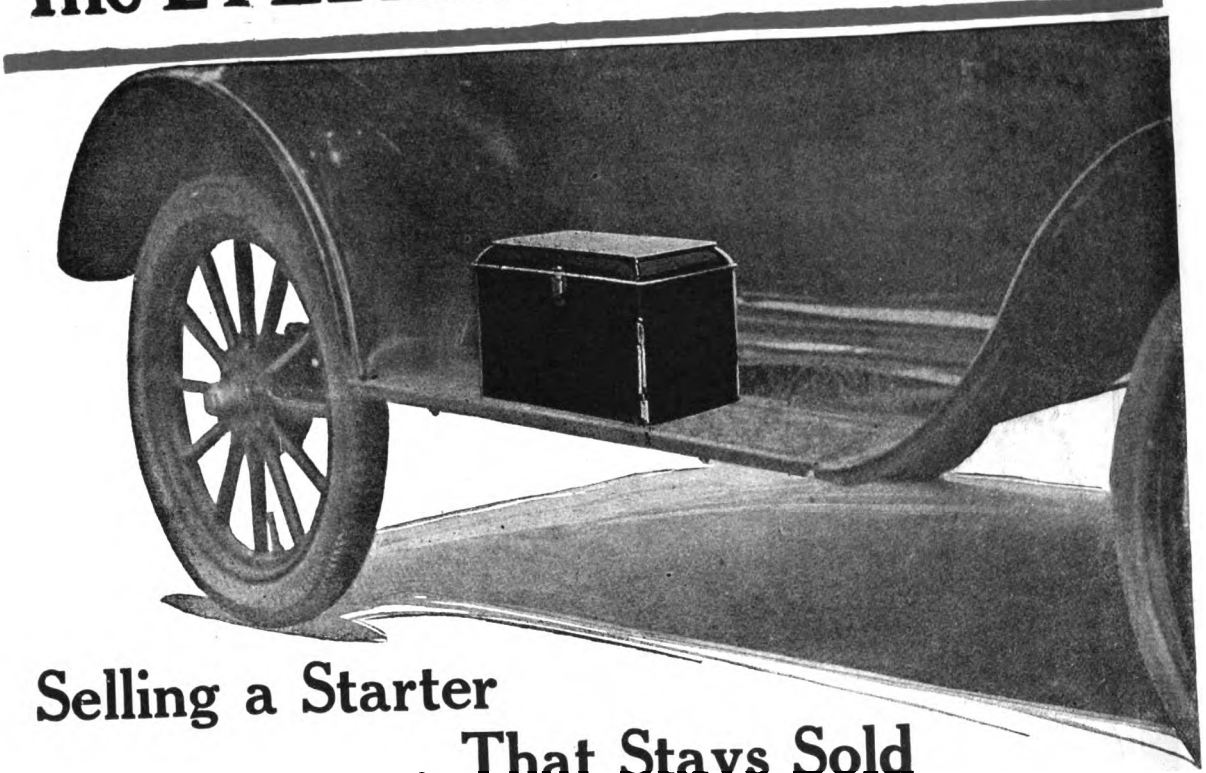
DEALERS

We have an exceptional proposition to make you in open territory. The name of the tire will be an asset. We assure excellent service and protection in your territory, with intensive co-operation from our organization. Write or wire.

CHARLES F. U. KELLY, Inc.
Sales Department
1834 Broadway, New York

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The EVEREADY Starting and



Selling a Starter . . . That Stays Sold

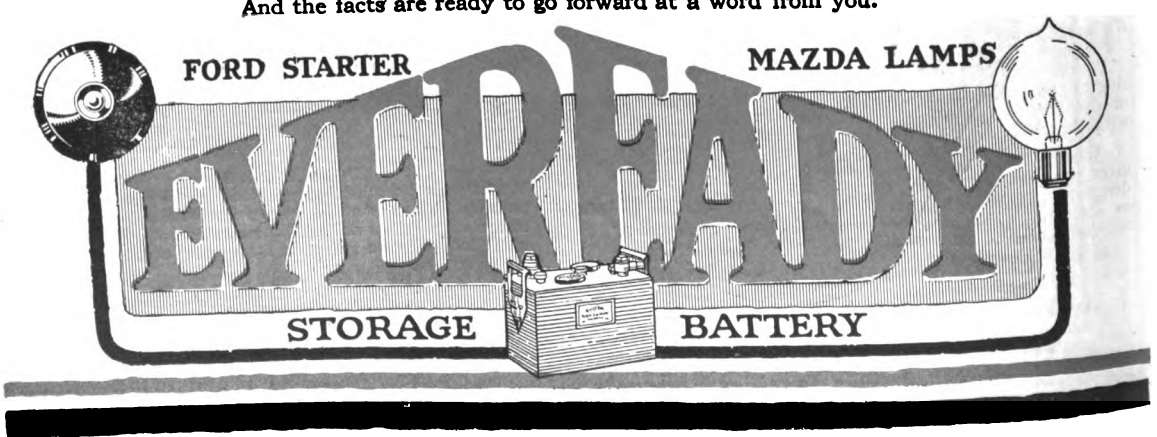
You may sell a starter today and at a fair profit. But what is left of that profit a few months from today when the purchaser continues to bring the starter back for repairs and adjustment? And what happens to your customer's good-will when you sell him a starter that will not stay sold?

Three years were spent in perfecting the Eveready Starter before it was ready for distribution. Three years spent in selecting and rejecting before it was placed in your hands.

And now you have it—to sell, and when sold, to ***stay*** sold.

* * *

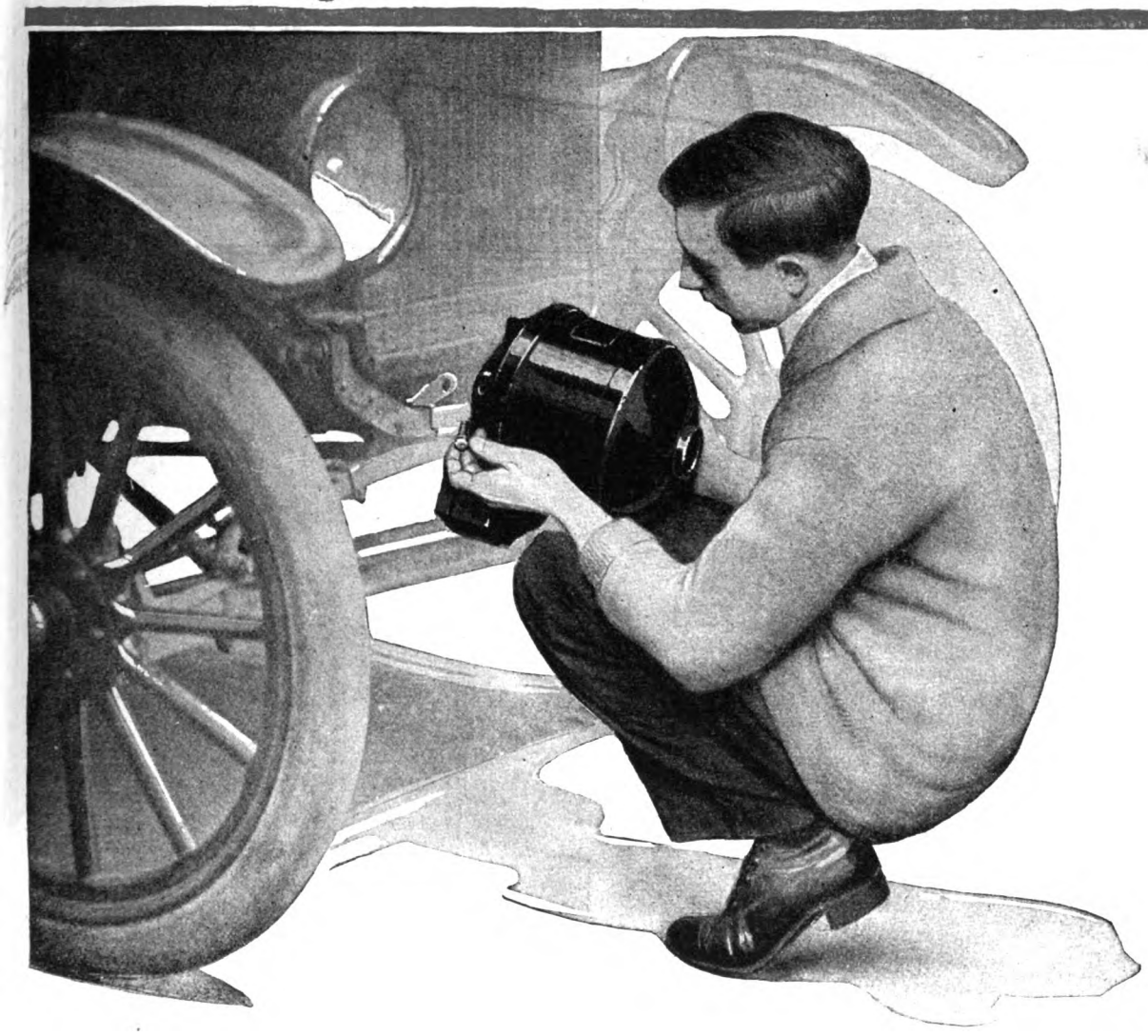
Our distribution is now being carried out. There are a number of exclusive territories for an equal number of live dealers. And the facts are ready to go forward at a word from you.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Lighting System for FORD CARS



—specially designed for three point Ford Motor suspension

THE Ford motor is balanced on the Ford chassis with the weight of the engine resting evenly on all three points of suspension. So if you place a starter on either side of the engine you add considerable weight on one side of the front suspension point, throwing it out-of-balance with the other two points of suspension.

And this increased weight under vibration of road travel, gives the support at the front point of suspension, the tendency to sag, throwing it out of alignment with its bearing on the front cross member and impairing the flexibility of the entire power plant and forward part of the Ford chassis.

In the Eveready System, the motor-generator is mounted outside on the front cross channel member of the Ford chassis, and is coupled direct to the Ford motor shaft.

In this way there is no added weight on the engine support. Nor is the balance of the engine affected in the least. This is a claim no other system can make and it is important because it affects the whole life of the car. And what's more, being mounted in front of the car, cooling of the engine is not interfered with, and both the motor and Ford starting engine are always instantly accessible.

A folder has been prepared describing in detail the features of the Eveready Electric Starting and Lighting System for Ford Cars. Send for it today. Just address

American Eveready Works of National Carbon Co., Long Island City, New York

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Meet the Demand

for this popular pump

Big Sales through big advertising and big demand



"Sure, old man, I've got a Yankee Pump in the car. That will do the work." You can always be sure of a tire pump that works by carrying a

YANKEE PUMP

90 Pounds Before You know It

You may have a power pump that is sometimes powerless —or a foot pump; but you need this powerful, full-lunged Yankee Pump because it's always sure, and easy to work. You stand up straight, pump with one hand, and the gauge tells you when it's "enuf." A woman can use it just as readily. It's "easy air." Ask your dealer to demonstrate a Yankee Pump to you today. If he hasn't one in stock, drop us a postal, and we will see that he gets one. Don't wait for the vexatious emergency.

$5

Apex Electric Mfg. Company
1411 West 59th Street, Chicago, Illinois

Send us your order today with name of your jobber

Gauge Tells The Air Pressure

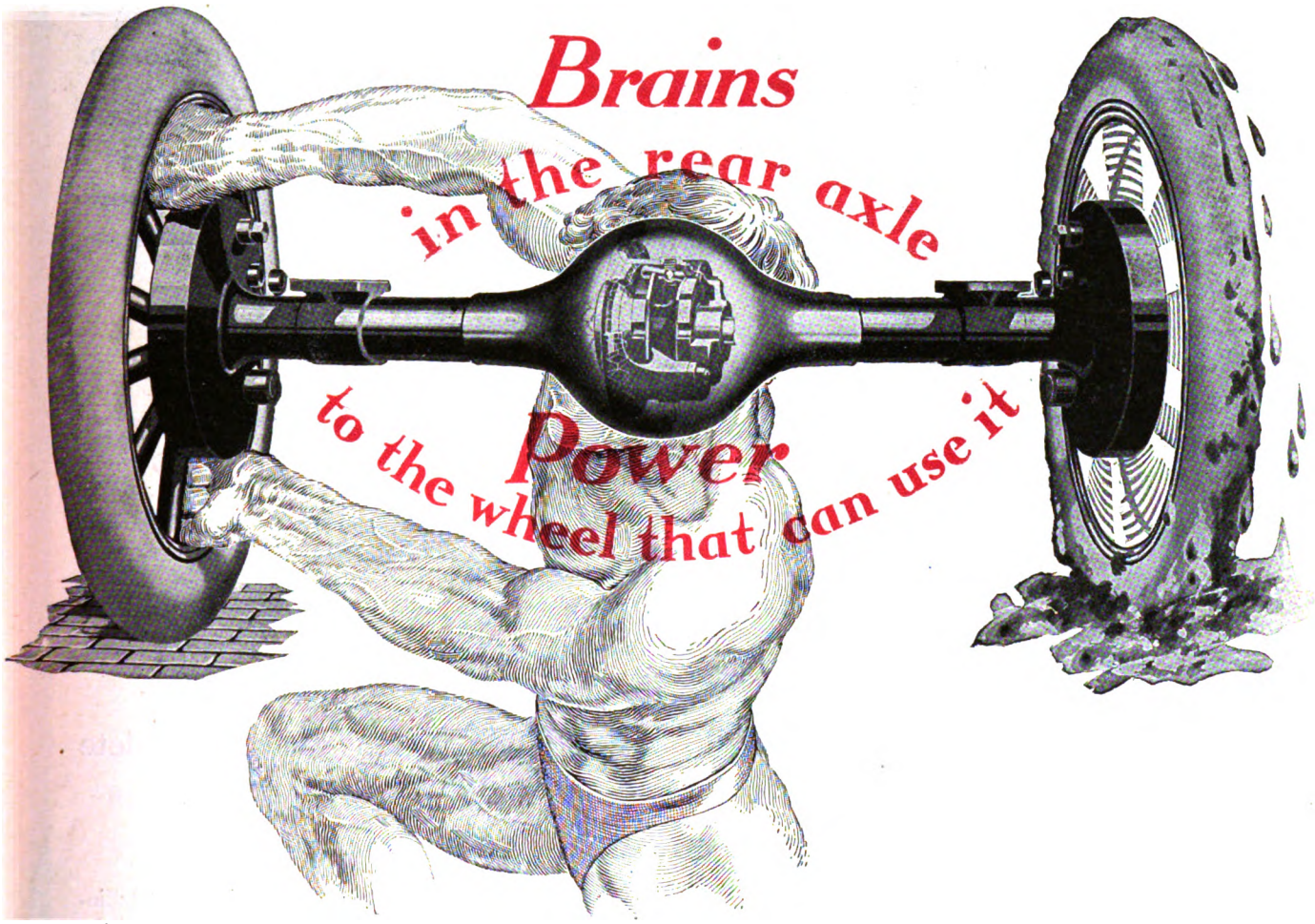
Piston Never Loses Compression

Clamps on running board in a jiffy
Folds to fit in your tool box

A Woman Can Wo
It With One Ha

Digitized by Google

BAILEY
NON-STALL
DIFFERENTIAL



A Fundamental Necessity For Every Car

The Bailey Non-Stall Differential is *not* an *accessory*. It is *not* an added convenience!

It corrects a basic weakness.

The old-style differential, in use since the first automobile, both fails to do what it should and does what it should not.

The Bailey allows the outside wheel to overrun when the car is going around the corner. In this respect *only*, it resembles other differentials.

The Bailey differs, in that it intelligently sends the power to the wheel which has traction and can use it.

Old-style differentials let the power go to waste by sending it to the wheel that does not have traction—(the wheel in the mud, for example).

This causes practically all skidding, slipping, stalling, spinning and side-swaying.

It is an enormous unnecessary waste of power and tires, and often causes accident troubles and expense.

The Bailey avoids all of this.

With the Bailey no power goes to waste, but *all* of it is used *properly*.

It makes you master of all road conditions.

Anybody can install it quickly.

It can be fitted to any rear axle.

Great Dealer Opportunity

Owners and dealers should write us for complete information.

Bailey Non-Stall Differential Corporation, Chicago, Illinois, 1124 Michigan Avenue

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MORE POWER AT LESS COST



Here—at last—is the perfected piston ring—that actually does what others claim to do.

The double flange seal joint is guaranteed not to leak or score the cylinder, and gives a very high compression, which greatly increases the power of your engine—at less expense.

Jointless Piston Rings

Price $1 Each

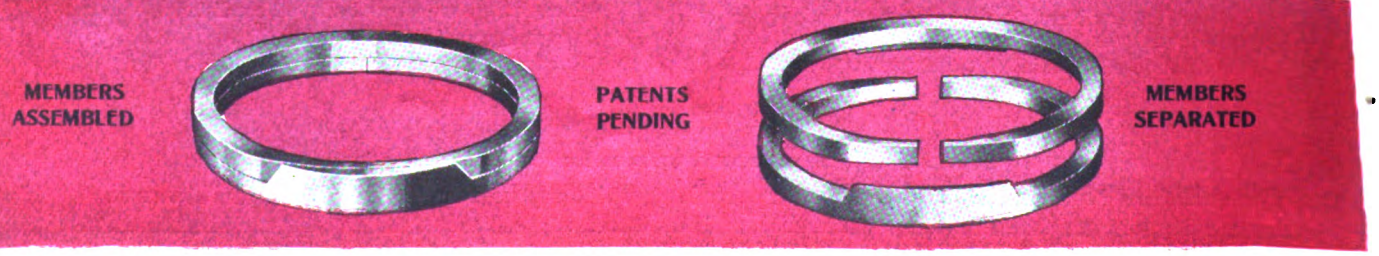
The "Jointless" has been highly endorsed by automobile engineers and mechanical experts who know correct construction.

Write for circular which gives complete description, sizes, prices, etc.

Dealers and Garage Men

Dealers, Garage and Repair Shop Owners should immediately increase their stock of JOINTLESS Piston Rings to take care of the large demand. Order from Jobber now. Be ready for more business. The JOINTLESS will outperform any other piston ring, regardless of cost. To use them is to appreciate their absolute superiority. It is the logical ring to buy. If your jobber hasn't the JOINTLESS in stock, send your order direct to us. Liberal discount allowed.

Detroit Piston Ring Company
Dept. C
Sales Office: 20 E. Jackson Boulevard, Chicago, Ill.
Factory: Detroit, Michigan



Digitized by Google

Yours is the only starter we have ever seen that worked satisfactorily on a Ford car.

The above extract is a "composite" of expressions received from hundreds of satisfied purchasers of the

A·B·C STARTING & LIGHTING SYSTEM FOR FORD CARS

Dealers and Ford owners, the country over, are unanimous in voicing this testimony. The A. B. C. System is best for Ford cars because it is built on the only right principle. It is a strictly two-unit system. The dealer who handles it sells satisfaction. He can stand back of the A. B. C. without fear or hesitation. He will find that every A. B. C. sale is a standing advertisement of his knowledge and good judgment.

Six Things to Remember

For Your Customer.

1—That the A.B. C. System is strictly two-unit —as good as used on all the best cars.
2—That the A. B. C. System does not cut down the power and speed of the Ford; nor interfere in any way with the operation and accessibility of the Ford engine.
3—That the A. B. C. System distributes its weight equally on both sides of the car.

For Yourself.

1—That the A. B. C. System is easiest to sell because it has more talking points than any other Ford starter.
2—That the A. B. C. System is easiest to install because of the simplicity of design.
3—That the A. B. C. System requires minimum expenditure of time and labor for adjustments and repairs. You keep the profit.



Any one of these points is sufficient reason for the dealer to sell—for the Ford owner to buy—the A. B. C. in preference to any other starting and lighting system for Fords.

It will pay you to investigate—now—today—at flood-tide of the tremendous sale just starting. Our helpful policy—"ON AND OFF YOUR SHELVES"—will interest you—profit you. We've worked it out to a sales certainty.

ANY REASON WHY YOU CAN'T MAIL THIS COUPON—NOW?

A. B. C. Starter Co.
Dept. H.
Detroit, Mich.

Gentlemen: — Please send full information regarding the A.B.C. Two-unit Starting and Lighting System, including literature, prices, terms, discounts, etc.

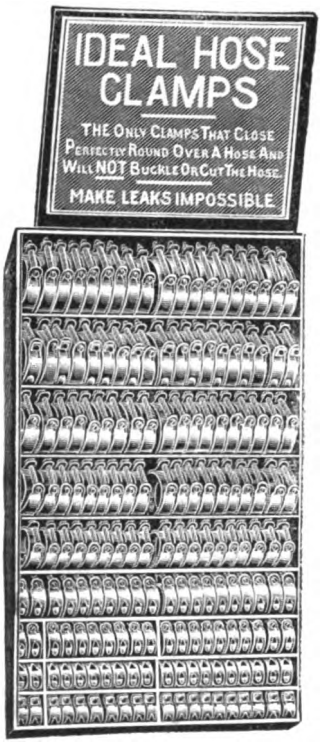
Name .....

Address .....

City ..... State .....

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The Ideal Hose Clamp
Assortment Display Box



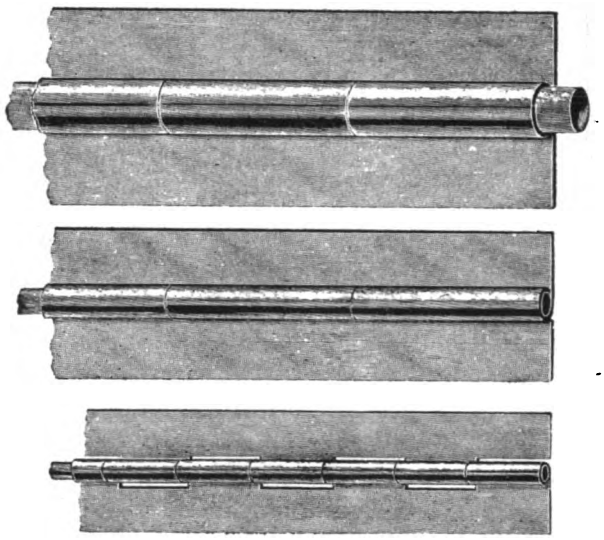
A Counter or Window Display Case with 180 Clamps, 18 sizes — from 5/8" to 2¾"

Retail value, $11.40
Trade price, 6.00

HAVE YOUR GOODS where they can be seen —and they sell themselves.

IDEAL CLAMP Manufacturing Company
203-5 Bradford St., BROOKLYN, N. Y.

Automobile Hood and Continuous Hinges



These hinges are made in a variety of sizes, both as regards width and length, as well as size of hinge pins.

We also make a large line of **AUTOMOBILE HARDWARE.**

Indicate an interest and we'll do our part.

JOS. N. SMITH & CO., - Detroit, Mich.

Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

This Tirefiller is made of the finest quality of pure rubber treated under special processes, never gets "flat" and will last indefinitely.

One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.

National Rubber Filler Co.
MIDLOTHIAN . . . . . TEXAS.

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$250 in Gold for the Best Slogan

We need a good advertising SLOGAN for VULCAN Springs; and in order that you may successfully compete, we submit an outline of our policy and aspirations.

QUALITY

VULCAN Springs have and shall always carry the highest standard of quality—only the good endures.

SERVICE

VULCANS are today made in 588 different types, and in our five direct Branches we actually stock over 80,000 springs. Today, good assorted stocks are available in over 1,800 cities; and, in a few years, we propose to cover 8,000 cities, showing well chosen stocks with reliable dealers.

Rules of Contest

1. Contestant must be associated in some branch of the Automobile Industry, either as Dealer, Jobber, Repairer or Salesman of cars or accessories. Carriage and Wagon Makers and general Hardware and Sporting Goods trade not barred. Any employee of above concerns also eligible.

2. Slogan must be submitted on letterhead of above named trades, and no writing within two inches of slogan. Contestant's name and address must be plainly written below.

3. If several contestants submit the same slogan, in case of acceptance, the full amount will be given to each. Contest closes July 15th.

FIT

We assume the high salaried engineers who design cars nowadays are on their mettle to produce the best designs. In every case, our springs must be an exact duplicate of the spring intended to replace.

HONEST TRUTH

We confine our appeal to the merits of VULCAN Springs and it has always been and always shall be our endeavor to tell the absolute truth regarding the quality of our product and the extent of our service.

VULCAN Springs are as durable as the best grade of material and most careful workmanship can make them. We mention this because good intent is a valuable consideration in the making of a slogan.

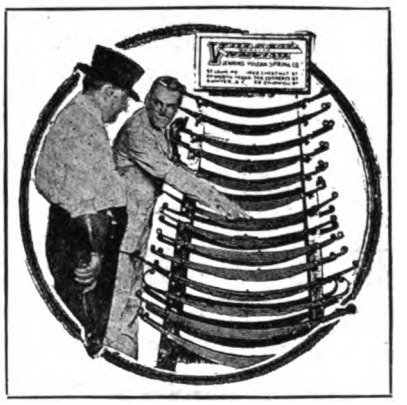
JENKINS VULCAN SPRING CO.
St. Louis, Mo.

Factory Branches Carrying Complete Stocks

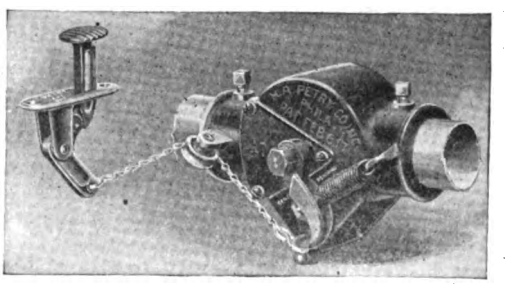
St. Louis ..... **1402 Chestnut Street**
Minneapolis ..... **1024 Hennepin Avenue**
Reading, Pa. ..... **538 Franklin Street**
Fort Worth ..... **706 Commerce Street**
Sumter, S. C. ..... **29 Caldwell Street**

TO SUM UP

VULCAN Springs must be immediately available to the man who needs one, and said man must be so impressed with the quality, fit and service, that he will come back for more. Our copyrighted trade mark shows on every spring. Liberal discount to the trade. Now cut this out and send us a good slogan.



For Your FORD



The PETRY CUT-OUT

Planned and constructed with the same thoroughness as the Petry Cut-out for high priced cars.
Quickly and easily applied and stays permanently **where in belongs.** Gas tight joints. Adjustable spring well away from all heat. No back pressure. No flutter to the valve. No strain in exhaust pipe. Gases are discharged **through** a flaring opening which intensifies sound, facilitating tuning up of motor.

Sold, complete with pedal and chain, for $3.50. Ask to see the Petry at your dealer's.

N. A. Petry Company, Inc.

1307 Race Street **Philadelphia**

DISTRIBUTORS:

Geo. L. Holmes, 1733 Broadway, New York City. Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill. Hughson & Merton, Inc., San Francisco, Cal.; Los Angeles, Cal.; Portland, Ore.; Seattle, Wash.

To Jobbers and Dealers:

The Petry Cut-out is a quick seller and a sure trade maker. Write or wire us at once. Handsome working counter display sent with order for twelve assorted sizes.

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A New Record Established

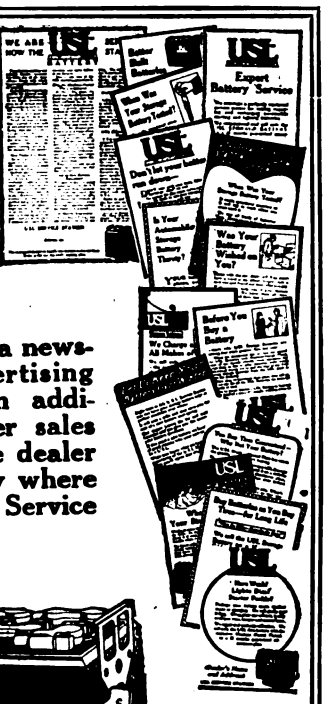
USL leadership sets a new figure in the battery business.

The *quantity* of USL Batteries used in new cars exceeds any other make.

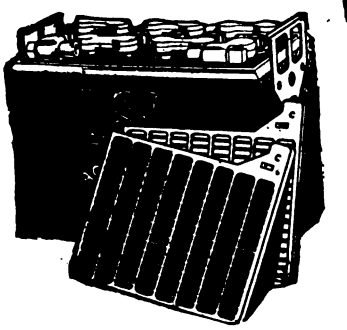
This statement is not based on the largest list of *names* of cars but on the greatest *number* of cars produced by automobile factories.

Our tests of last year proved to the makers of cars that USL Batteries with Machine-Pasted Plates were more durable than any old-style battery. We *proved* our case and the *orders* followed.

We have an agency proposition and a service station plan of interest to dealers who are looking *ahead.* If you are looking for a real money-making battery proposition—write us.



We conduct a newspaper advertising campaign in addition to other sales helps for the dealer in every city where we have a Service Station.



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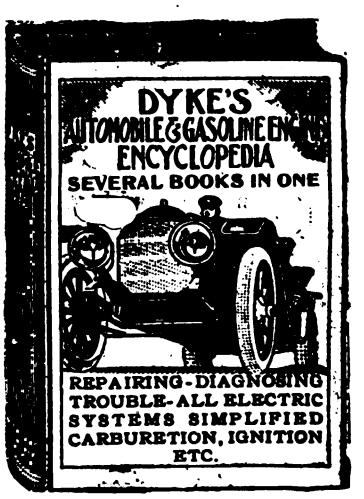
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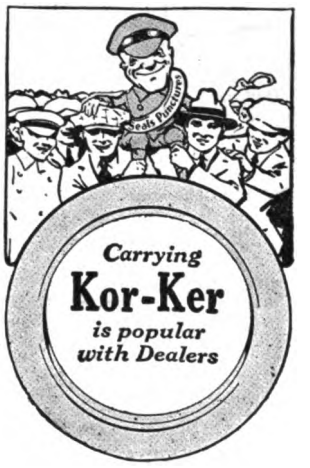
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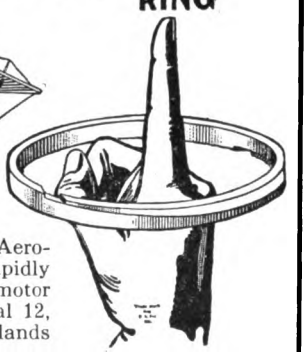
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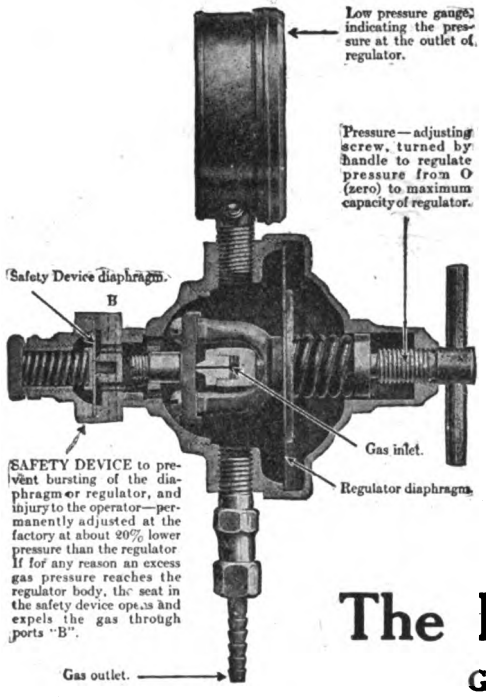
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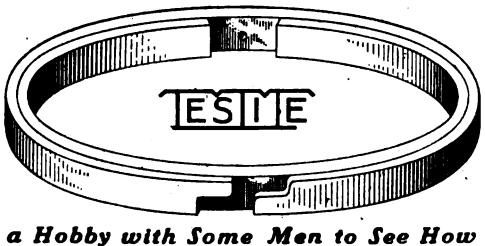
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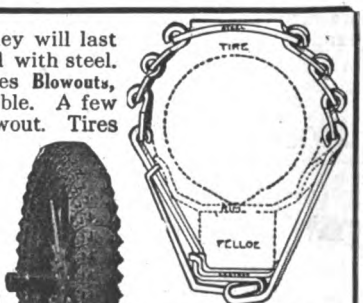
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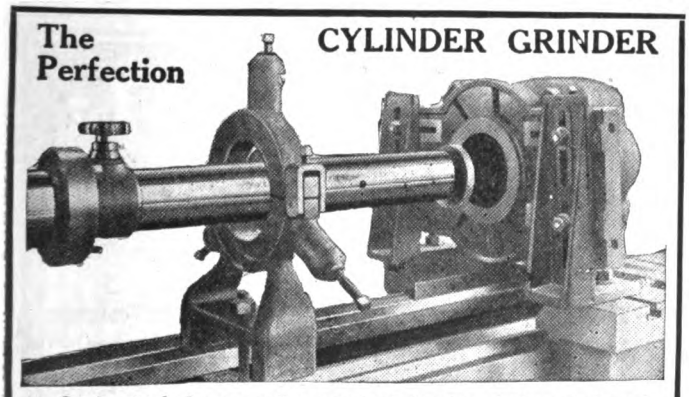
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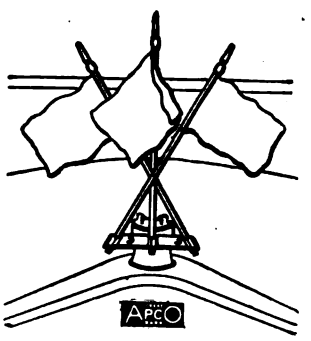


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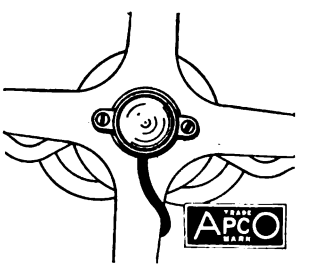


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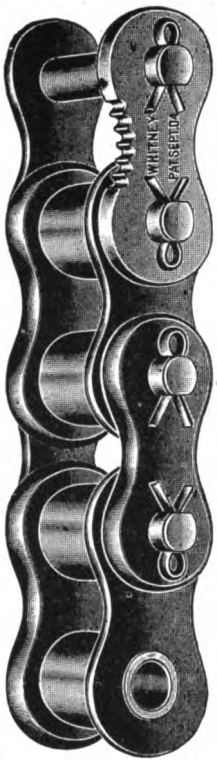
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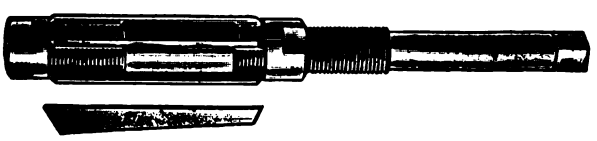
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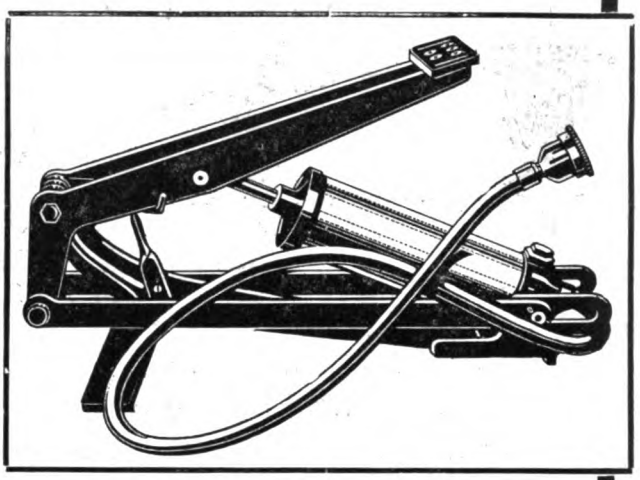
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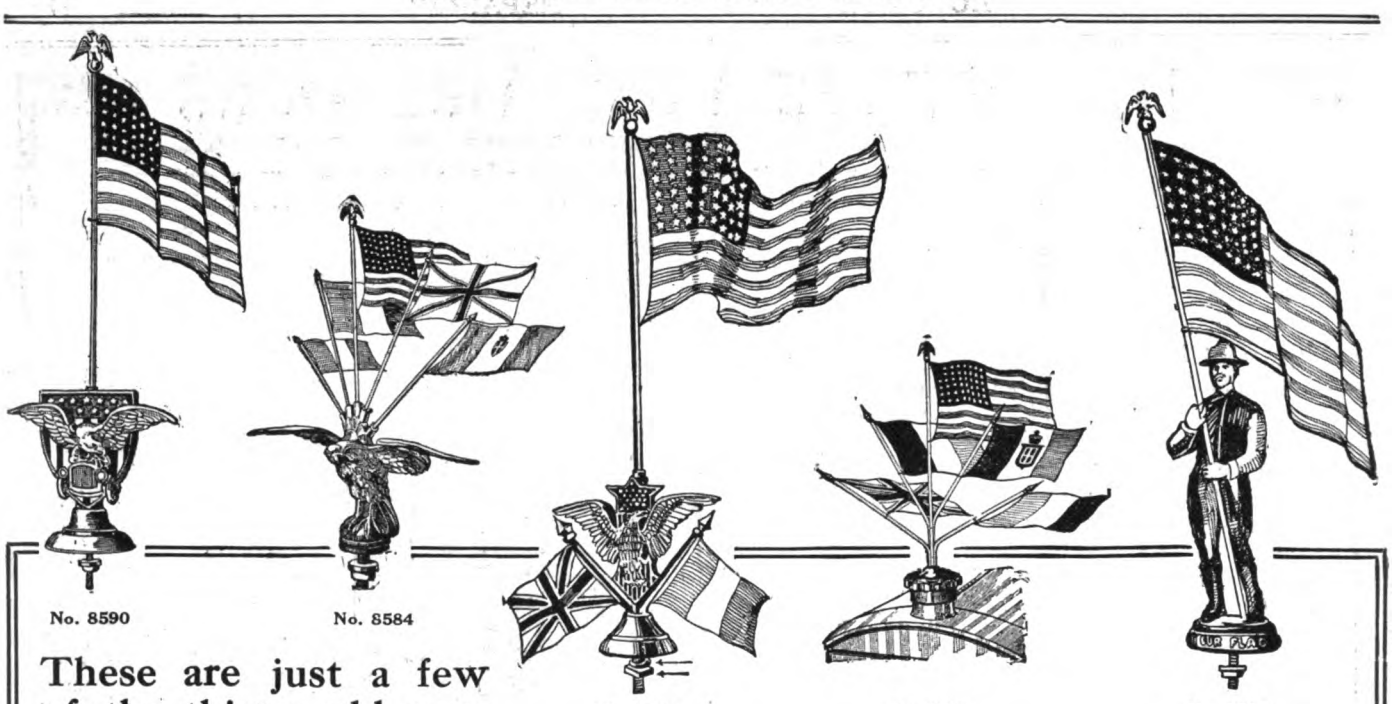
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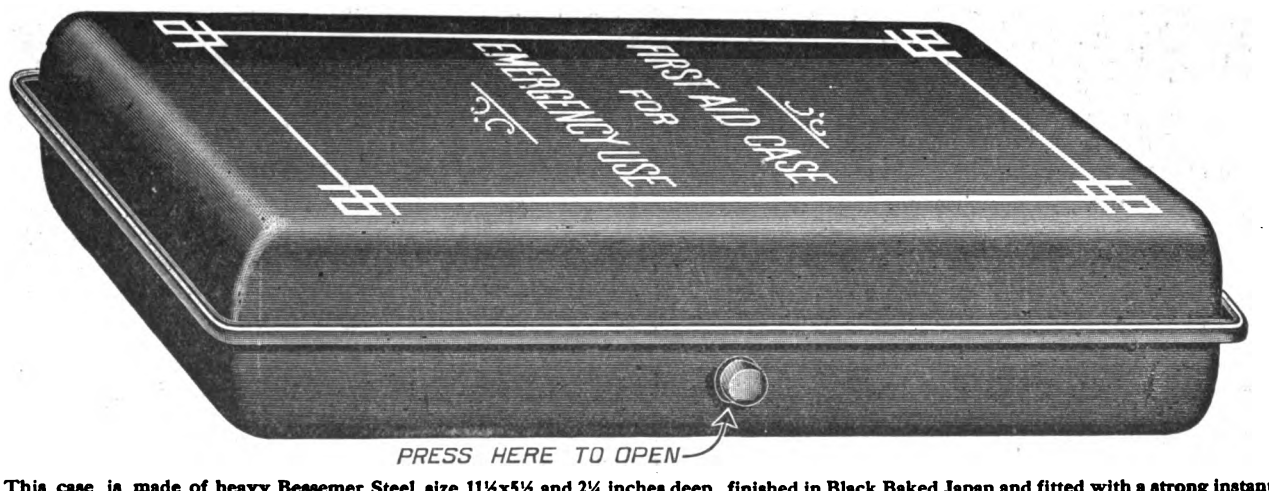
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BATTERY CHARGING BRINGS BIG PROFITS



READ THIS STORY OF H B PROFITS

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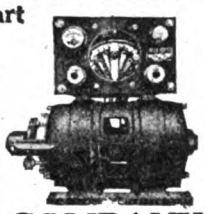
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The original of this letter is on file in our offices at Troy, Ohio.

You, Mr. Garage Owner, Can Start This Business for $15



as first payment for this money-maker, the balance in small monthly terms. Your profits each month should easily take care of these payments. You, too, will find an HB Charger the best investment you ever made. One to seven batteries charged at once. Average cost 15 cents, average price to motorist 75 cents to $1.50—profits about $4.50 per capacity run. ORDER NOW! You take no risk, as we want the HB Charger returned if unsatisfactory. That's only part of our guarantee. Tear out and mail this ad today, with your name, for full particulars.

HOBART BROTHERS COMPANY
Box 26 TROY, OHIO

Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

1500 SIZES. YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING

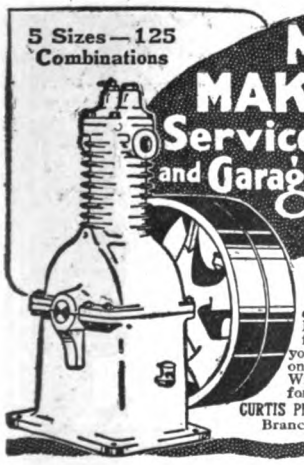
WRITE NEAREST OFFICE

GEORGE NASH CO.
217 Pearl Street
New York City

EDGAR T. WARD'S SONS
44 Farnsworth Street
Boston, Mass.

5 Sizes—125 Combinations

MONEY MAKER For Service Stations and Garage Men



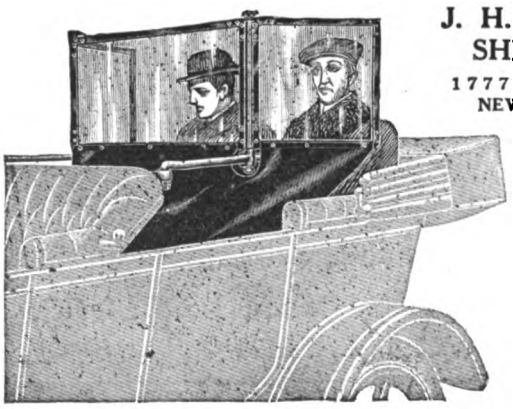
Find out about this trade getter and money maker. Motorists realize what a great menace oil is to inner tubes and go where they can fill their tires with

CURTIS AIR
Free From Oil

The Curtis is the only Garage Air Compressor that can't flood the cylinder with more oil than it needs. No oil gets in the air line. This means clean air, free from oil, therefore fewer punctures and blowouts for your customers. Saves them many dollars every month on tire upkeep. Makes and holds customers for you. Write for our liberal proposition. Or, ask your jobber for prices, but insist on the CURTIS.

CURTIS PNEUMATIC MACH. CO., 1530-A Kienlen Ave., St. Louis, Mo.
Branch Office: 530-E Hudson Terminal, New York

REAR SEAT SHIELD



J. H. TONNEAU SHIELD CO.
1777 BROADWAY
NEW YORK CITY

Representatives

Chicago Coach & Carriage Co.,
1223 Michigan Ave.
Chicago, Ill.

R. C. Wall Mfg. Co.,
228 N. 15th Street,
Philadelphia, Pa.

Columbia Tire & Top Co.,
922 Commonwealth Ave., Boston, Mass.

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LISTEN!



You Dealers and *Repairmen* Who Are Particular About The Quality Of The Goods You Sell

WHEN you sell a Harvey spring there are never any kicks or "comebacks," because Harvey springs give absolute satisfactior to the car owner. They have no bolt hole at center—no weak spots anywhere—and are guaranteed from end to end against all defects. If a spring proves defective at any point, we will replace it.

We are partners with every Harvey dealer. Not silent partners, either—we're spending thousands of dollars this year to post car owners in every section of the United States on the merits of Harvey springs—urging them to look for a Harvey dealer when in need of replacements.

It will pay you—big—to connect with this live-wire advertising. Let people know you handle Harvey springs if you expect to get your full share of spring replacement business—and profits.

Harvey springs are made for over 600 of the leading makes and models of cars and each spring is an exact duplicate of the spring it is intended to replace—fits with an accuracy that will surprise you. Write us at once for name of your nearest jobber.

Harvey RACINE

SPRINGS DO NOT BREAK

FREE

Write for the Harvey Spring Book which contains a complete list of springs for all the leading makes and models of cars—gives sizes, weights, measurements, prices, etc., and prevents mistakes in ordering replacements. We mail it free.

HARVEY SPRING COMPANY

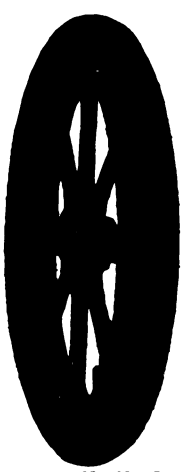
7 **849 Seventeenth Street, RACINE, WISCONSIN**

PARKER-HYDRAULIC PRESSED STEEL WHEELS

FOR FORDS

Make an End of Wheel Troubles

Will Not Creak and Are Unbreakable



Patent No. 986,452

When a wooden wheel is broken, it usually is necessary to get a new wheel. When a Parker-Hydraulic Pressed Steel Wheel is bent, it can readily be straightened.

Parker-Hydraulic Pressed Steel Wheels weigh eight or ten pounds per wheel less than the ordinary wooden wheel with demountable rim.

Being made of steel, these wheels are more durable than wooden wheels and they have a baked-on enamel finish that will not crack or chip off like paint.

Tires can be changed in three minutes, due to the improved method of demounting the rims.

Price, per set, $32.00

F. O. B. Cleveland, Ohio

Your choice of either red or black spokes. Each set, neatly crated, includes four wheels and one spare rim, socket wrench and new hub bolts.

Dealers, Write for Circular and Attractive Contract

The HYDRAULIC PRESSED STEEL CO.

Cleveland, Ohio

GENUINE

Armstrong Stocks and Dies



FOR THREADING PIPE OR RODS

HINGED PIPE VISES PIPE CUTTERS

Manufactured by

THE ARMSTRONG MFG. CO.,

335 Knowlton St., Bridgeport, Conn.

It's EASY with a QUIK-EZY

TO CHANGE TIRES ON A SPLIT RIM



The Quick-Ezy Tire Tool with its powerful screw will yank any old rusty split rim apart in a jiffy. It grips at three points and won't bend or slip.

Every garage needs it to give quick service to tire customers and to save time and money.

Every motorist needs it for emergencies on the road.

It's new. *The Quick-Ezy.* Write today for full information.



THE H. L. HURST MFG. CO.

2183 North St., CANTON, OHIO

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PERFECTION PISTON RINGS

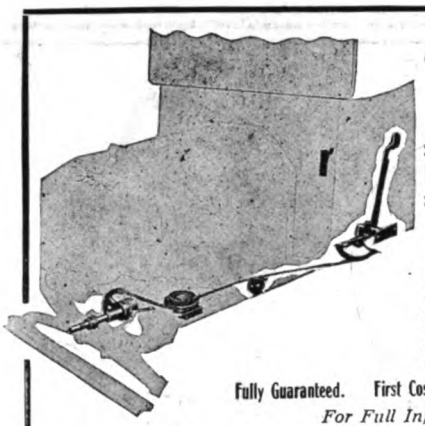
The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. **Try them and prove it.**

Dealers Wanted. Write for prices and discounts.

Manufactured by AMERICAN PISTON RING CO., 1925 S. Charles Street BALTIMORE, MD.

N. A. PETRY CO., Inc.
1209 Race St., Philadelphia, Pa.
Eastern Representative, North and South, East of Denver.

A. H. COATES
444 Market St., San Francisco, Cal.
Western Rep., North and South, West of Denver.



THE FAMOUS
"Little Giant" Starter
FOR FORD CARS

A Mechanical Starter OUT OF SIGHT

Entirely within the hood. Everywhere recognized to be *superior* to all other mechanical starters made for Ford cars. Easily installed, **safe, simple, durable, dependable, and always ready.**

Fully Guaranteed. First Cost Is Whole Cost. Live Agents Wanted.

For Full Information, Address
THE LITTLE GIANT STARTER CO., CANTON, OHIO

Light Weight Piston for FORDS

MORE SPEED — LESS VIBRATION



Weight 1 Lb. Less Than Standard Ford

Manufactured to the Limit of 2 Ounces Variation in Weight

A PISTON AS FINELY MADE AS THOSE USED IN THE HIGHEST PRICED CARS

A reduction of 4 lbs. weight on reciprocating parts saves a tremendous percent of crankshaft and wrist pin bearing wear.

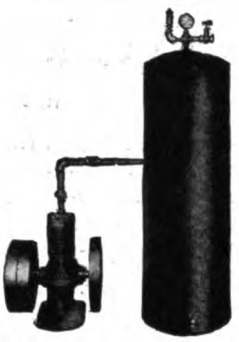
The DYER LIGHTWEIGHT PISTON for FORDS possesses all the ADVANTAGEOUS features of alloy and aluminum pistons without their BAD FEATURES such as slapping, oil throwing, seizing and poor compression and COSTS BUT LITTLE MORE THAN STANDARD FORD PISTONS.

This piston is tough, durable, absolutely round, perfectly machined, has a domed head, uniform walls and special oiling features.

Standard or overs; $1.75 each (complete)

Inquire of your jobber or write us for latest catalogue.

THE G. H. DYER CO., Cambridge, Mass.



MAYO FREE AIR OUTFITS

No. 8A combination as illustrated above consists of our No. 8 Air Compressor, 16 x 48 air tank, tested to 300 lbs. for working pressure of 150 lbs., 200-lb. pressure gauge and all fittings complete.

Constructed to last forever—up to the Old Reliable Mayo standard in every particular.

An outfit especially suited to small and medium-sized garages, repairshops and service stations.

Write for prices and full particulars

MAYO - SKINNER MFG. CO.
2115 Elston Avenue CHICAGO

"HEXALL" SOCKET WRENCH

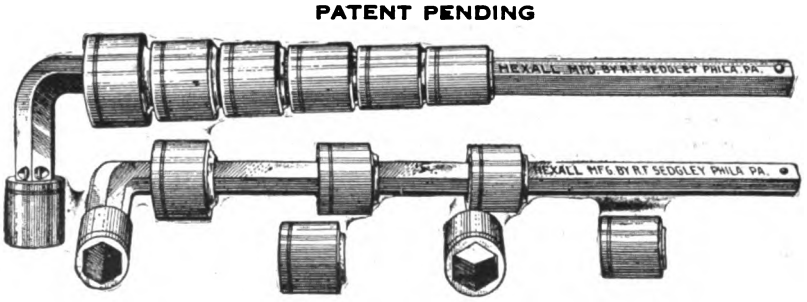
TRADE MARK REG. PATENT PENDING

The test of time, the standard of excellence and the factor of service has all been embodied in this wrench. There are no weak spots in it—yes, it stands inspection on all the cardinal points of wrench virtue.

Seven Sockets (5/16"—¾") made from bar steel, case hardened. Handle made from ½" hexagon steel. Sockets pack neatly on handle when not in use. Friction ball in handle prevents them from dropping off. Used as an extension with wrench on short end. Weight 21 oz.

"BREAK ANY SEDGLEY WRENCH AND WE REPAIR IT—NO CHARGE."

Ask Your Jobber or Write for further particulars.



R. F. SEDGLEY, 2311-13 NORTH 16th STREET, PHILADELPHIA, PA.

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FORD CARS ARE Stolen Everywhere

$3.00 INSURES YOURS FOREVER

You know the only effective protection is to *Lock* the *Ignition* because it is convenient and you HAVE to LOCK it to stop motor, but—DO—you know that the ONLY Switch Lock made that covers ALL the screws with sliding steel bars and furnishes absolute protection is the

NEW YORK "SECURITY" SWITCH LOCK

Made by the NEW YORK COIL COMPANY.

Your present well constructed Ford Switch is retained, no wires or bolts are loosened. You simply take off name plate and in its place put our Switch Lock. It is the Switch Lock recognized by ALL to be superior in construction, *correct in price*, and gives a feeling of security to such an extent that no practical business man can afford to be without one.

DEALERS:—Our Sales assistance makes this your best seller.

NEW YORK COIL CO., 338-340 Pearl Street, New York, N. Y.

Mid-West Distributors: GRAY-HEATH COMPANY, 1440 Michigan Ave., Chicago, Illinois

ADVANCE

TRANSMISSION LININGS FOR FORDS

"They Make the Ford Brake BRAKE"

Stop the jerking, rattling, lurching and chattering. Will outlast three sets of ordinary linings. Cost but $3.00 a set.

DEALERS!

Write for full information.

ADVANCE AUTOMOBILE ACCESSORIES CORP.,

Dept. F5-1, 56 E. Randolph St. CHICAGO, ILL.

MyleMayker

(Copyright, 1918, Myle-Mayker Company)

FOR FORD CARBURETORS

Gives Five Big Benefits for $5.00

1—Easier Cranking
2—Four Miles per Hour on High
3—Silent Motor
4—Eliminates Carbon.
5—3 to 10 Miles Increase per Gallon of Gas

FAST SELLER FOR DEALERS

MYLE-MAYKER CO., Dept. F-5, 56 E. Randolph St., Chicago, Ill.

THE KING DRAG

The Great Road Builder

In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets could not fail to do a good deal of good.

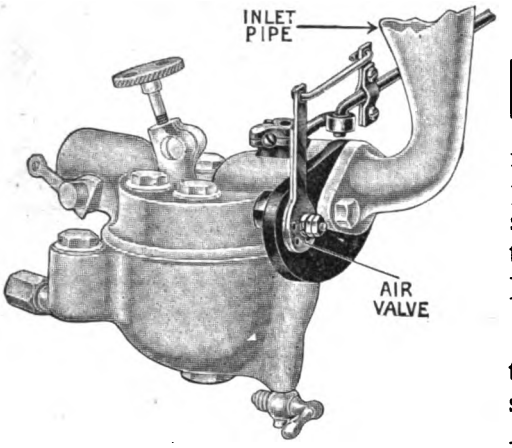
We will send **a sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

Address the

MOTOR VEHICLE PUBLISHING COMPANY - 71 Murray St., New York City

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FORD OWNERS, STOP WASTING GASOLINE
Have an UP-TO-DATE $20.00 CARBURETOR for $2.00



The NEW YORK GASOLINE ECONOMIZER

is ATTACHED to and becomes a PART OF your present carburetor. It moves with the throttle and supplies oxygen from the air in such correct proportion to the throttle opening that more power is ACTUALLY DELIVERED FROM LESS GASOLINE.

This is NOT a new discovery. It is NOT an extensively advertised disappointment in the shape of a suction operated air valve screwed into the inlet pipe. *But* it is simply a cleverly devised ADDITION to YOUR present carburetor, the same as built into and found on all highly developed, expensive, present day carburetors. This is what we guarantee. Our device at $2.00 *will* make your carburetor the equal of any made, and will give you the GREATEST POSSIBLE GASOLINE ECONOMY.

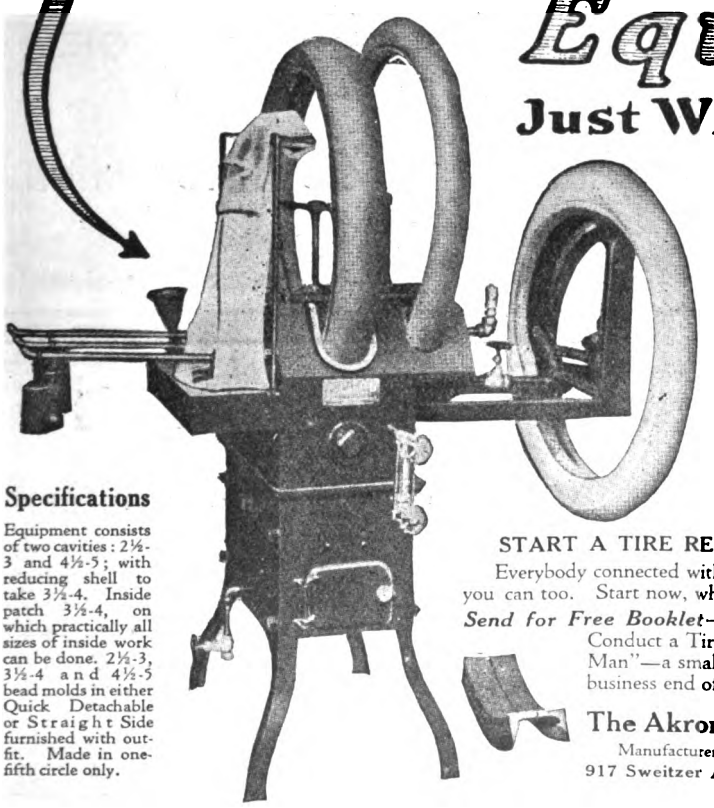
You can attach it in 15 minutes, without machine work. As no holes are bored in the inlet pipe, trial can be made without damage, and your $2.00 will be returned without argument, upon receipt of Economizer within 30 days after purchase date.

NEW YORK COIL COMPANY, 338-340 Pearl Street, New York, N. Y.

Mid-West Distributors: GRAY-HEATH COMPANY, 1440 Michigan Ave., Chicago, Illinois

THIS Great New Equipment

Just What Tire Repairmen Want



TYPE "F"

BIG CAPACITY VULCANIZER

SELF-CONTAINED OUTFIT

Only $125

One of the greatest achievements in the building of tire repair equipment. Look at the illustration; read the specifications on the side. A big capacity vulcanizer that will take the wide range of work that this equipment does, so that you can make almost any kind of repair on both inner tubes and outer casings of practically any size or make—with a self-contained source of steam supply so that you do not need to buy a separate steam boiler or generator—and having the high quality and specifications of this one, has never been offered before for $125.

We make a complete line of Tire Repair Equipment and are in a position to furnish outfits to meet various requirements of service, output and adaptability, at prices ranging from $50 to $225. If interested, ask us for complete catalog.

Specifications

Equipment consists of two cavities: 2½-3 and 4½-5; with reducing shell to take 3¼-4. Inside patch 3½-4, on which practically all sizes of inside work can be done. 2½-3, 3½-4 and 4½-5 bead molds in either Quick Detachable or Straight Side furnished with outfit. Made in one-fifth circle only.

START A TIRE REPAIR BUSINESS—MAKE BIG MONEY

Everybody connected with the automobile business is making big money—you can too. Start now, while the best locations are still available.

Send for Free Booklet—Write today for free booklet, "How I Would Conduct a Tire Repair Business—By an Old Tire Repair Man"—a small booklet, but a very practical one on the business end of the tire repair business.

The Akron Rubber Mold & Machine Co.

Manufacturers of Tire Repair and Tire Builders' Equipment

917 Sweitzer Avenue AKRON, OHIO

Dealers Wanted Everywhere

AD&R

Please send me further particulars regarding your Tire Repair Outfits and copy of your Free Book.

Name.....

Address.....

.....

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Attention, Mr. Garageman!

ROMORT TIRE TESTER ATTACHMENT

PRICE, $1.50

This is a device for attaching your gauge to Romort Automatic Air Valve, and gives the service station a permanent holder for its gauge, ready for instant use by the public, eliminating the necessity of loaning gauge to operator, who three times out of five will drive off with your gauge in his pocket.

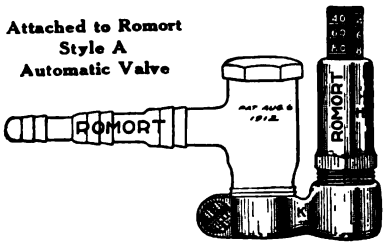
Simply screw your gauge into this holder and you have a tire tester and tire inflator combined in one, and the old trouble of losing gauge is forever over.

Every garage with free air should be equipped with the Romort Automatic Air Valve and Tire Tester Attachment.

The above price includes the Attachment only.

CAUTION—When ordering, state whether for Style A or B Valve.

Attached to Romort Style A Automatic Valve



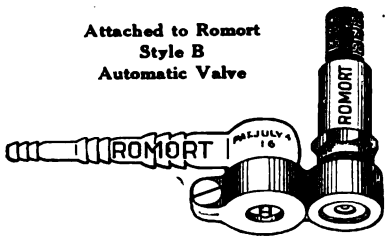
For Sale by All Jobbers

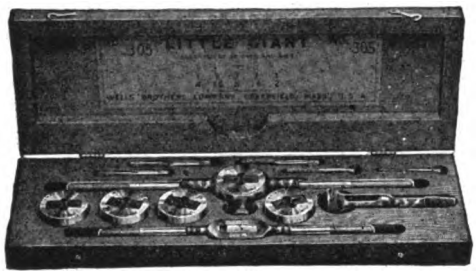
ROMORT MFG. COMPANY

SEATTLE, WASH. 1810 Westlake

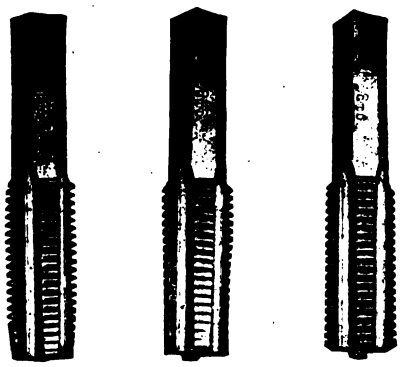
CHICAGO 1323 Michigan Ave.

Attached to Romort Style B Automatic Valve





Automobile Screw Plate



Hand Taps



Burring Reamer



Ford Piston Pin Bushing Reamer



Ford Spindle Arm and Spindle Body Bushing Reamer

"Nothing Is Good Enough If Something Else Is Better"

Do you believe in this motto? If you do you are probably a user of G.T.D. screw cutting tools and reamers. If you believe in it and are not already a G.T.D. fan, it's time we became acquainted.

As a preliminary step towards getting acquainted, ask some fellow repairman what he thinks of G.T.D. taps and dies. Your first move, however, is to ask for a copy of our catalog showing the most complete line of quality threading tools in the world.

Write today. Ask for Catalog No. 37.

Greenfield Tap and Die Corporation

Greenfield, Mass.

NEW YORK CHICAGO LONDON GALT, ONTARIO

Add to Garage Profits by Oxy-Acetylene Welding

Savings made please your patrons and pay good substantial profits.

PREST-O-LITE

Dissolved Acetylene

(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high-grade welding apparatus for $75.00 (Canada $100.00). The average user will also need gas cylinders at an additional cost, and about $10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.

Send for details of Prest-O-Lite Service for Oxy-Acetylene Welding.



THE PREST-O-LITE CO., Inc.

The World's Largest Makers of Dissolved Acetylene

U. S. Main Office & Factory, 820 Speedway, Indianapolis
Canadian General Office, Dept. X, Toronto, Ont.

$1.00 *Break-Not* **$1.00**



Break-Not Battery Tester

Dealers:-

This is a big seller. Have you a stock of ***Break-Not*** Hydrometers? If not, get in touch with your nearest Jobber at once and write us for prices. Retails for one dollar! Interesting proposition to Dealers! Best instrument of its kind.

E. EDELMANN & CO.

341-363 East Ohio Street Chicago

New York Branch: 119 West 42nd St., N. Y. City

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GASCO
GASOLENE ECONOMIZER

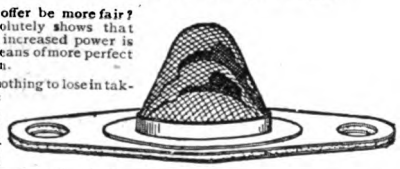
NOW—IT'S UP TO YOU!

Truth is never crushed to earth if given a square deal. Pin a dollar bill to your letterhead—mail it to us and prove Gasco's distinguishing traits.

First, determine the speed of your motor while idling and with the throttle all the way down.

Then unbolt the carburetor flange from the intake manifold and insert the Gasco as if it were a gasket, tighten up the bolts and start up the motor.

If the motor doesn't run faster than it did before, just send the Gasco back and we'll refund your money.



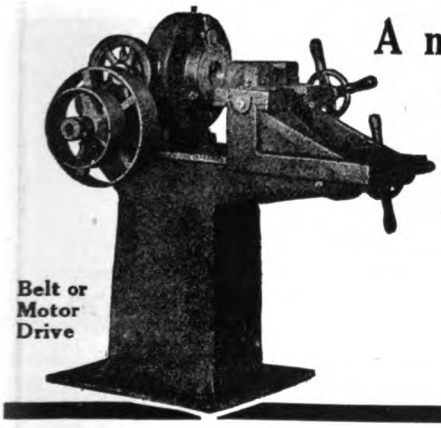
Can any offer be more fair? This test absolutely shows that with a Gasco increased power is obtained by means of more perfect fuel combustion.

You have nothing to lose in taking advantage of this offer, and you can readily prove for yourself that Gasco will save its cost in a short time in the saving of fuel, besides adding power, reducing carbon, and preventing fire due to backfire.

Thousands sold—one large concern purchased 3200.

Dealers everywhere find it a quick seller and a good profit-producer. Our sales plan calls for a small investment and gives a quick turnover. Write today for particulars.

GASKET SUPPLY COMPANY
17th & Ludlow Sts. Philadelphia, Pa.
Mfrs. of Gaskets, Packings, Washers, Stampings, Punchings and Dies.



Belt or Motor Drive

A money-making machine for machine shops or garages



OSTER
COMBINATION THREADING MACHINE
for pipes, nipples and bolts

No. 300A, shown here, threads pipe (straight and bent), and nipples from ¼ to 2 inches in size; bolts from 7/16 to 1¼ inches. No complicated mechanism—a boy can operate. One lever sets and resets dies to size. Catalog showing No. 300A and 3 *larger sizes* on request.

THE OSTER MFG. CO.
2102 East 61st Street Cleveland, Ohio

Three Great Friends Of Motorists
From the G. A. C. Line

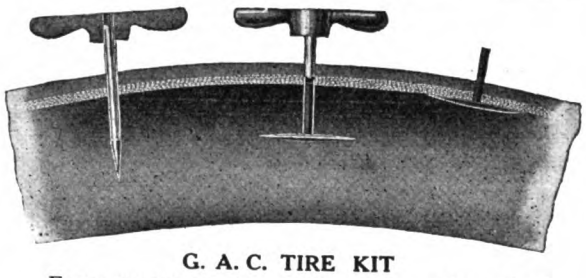
Combining economy, utility and comfort



G. A. C. ACCELERATOR FOOT REST

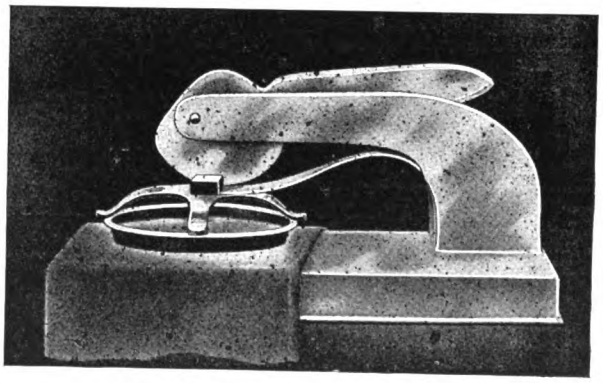
Sudden, continuous lunges on the accelerator result in hardship on the motor and tired, aching legs. The G. A. C. foot rest eliminates any such possibilities. It assures you a constant, even flow of power, a definite saving of gasoline and increased comfort during long drives.

$1.25



G. A. C. TIRE KIT

Every puncture leaves a hole in your tire. Sand and grit will work through, resulting later in a blowout. With the G. A. C. Tire Kit you can easily and permanently seal any hole up to a quarter of an inch in the brief time it takes to vulcanize your inner tube. **$2.00**

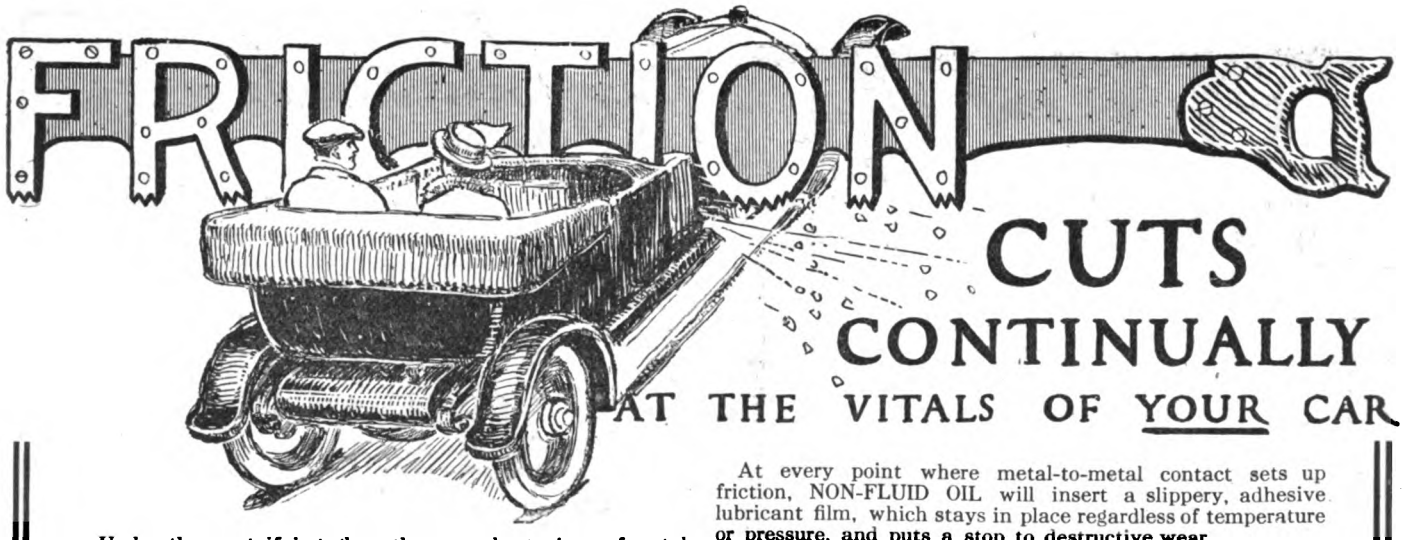


G. A. C. VULCANIZING CLAMP

With this outfit you can quickly and efficiently vulcanize your inner tubes, anywhere, at any time, and almost at no cost. Simple, efficient and compact, it will pay for itself many times over. Patches for this clamp may be purchased from nearly all high grade dealers in automobile supplies. **$2.25**

THE GENERAL APPLIANCE CO.
129 Federal Street BOSTON, MASS.

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CUTS CONTINUALLY AT THE VITALS OF YOUR CAR

Under the magnifying glass the smoothest piece of metal looks like a jag toothed saw. These unseen teeth are at work every minute your car is in motion. They are wearing out and destroying the surfaces of gears and bearings.

A perfect lubricant works in between the metal surfaces, separating them, and allowing them to travel on the lubricant, wearing it out, instead of the metal. As a lubricant approaches perfection, the amount of wear on metals becomes practically nothing.

After hundreds of miles of travel, metal surfaces show only an oil polish when NON-FLUID OIL is used.

At every point where metal-to-metal contact sets up friction, NON-FLUID OIL will insert a slippery, adhesive lubricant film, which stays in place regardless of temperature or pressure, and puts a stop to destructive wear.

The consistent use of NON-FLUID OIL will insure long life for your car at least expense for repairs. Yet NON-FLUID costs no more than common grease, which it outlasts three times.

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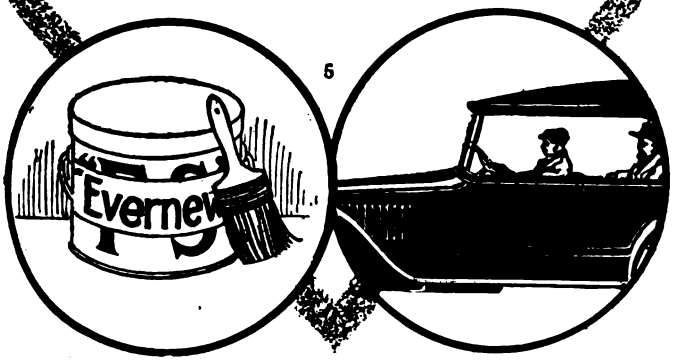
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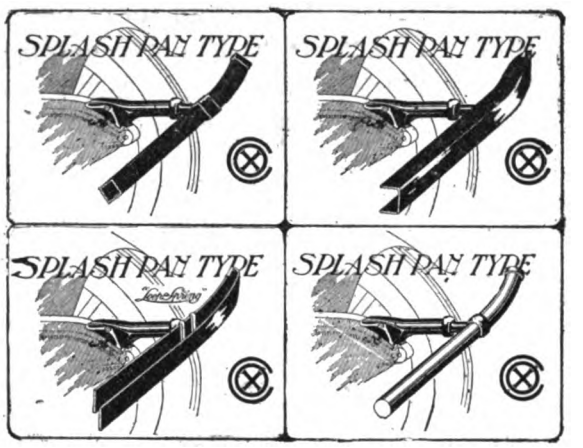
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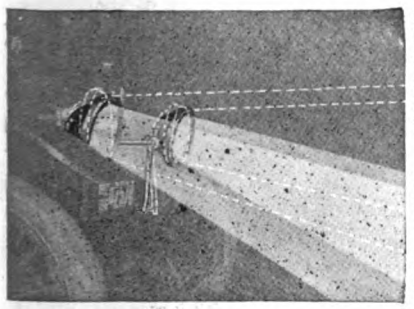
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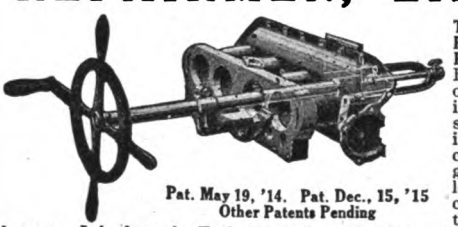
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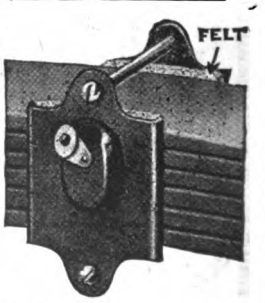
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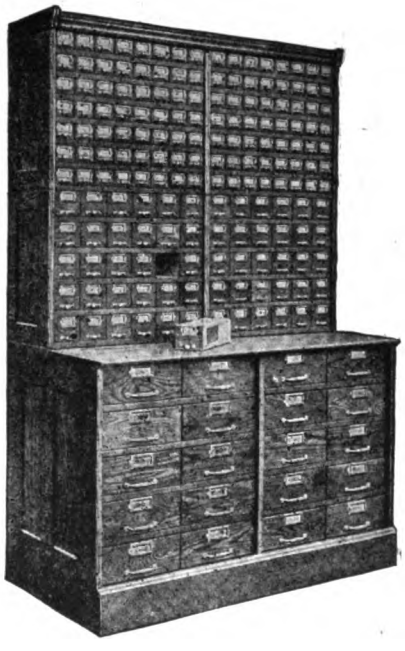
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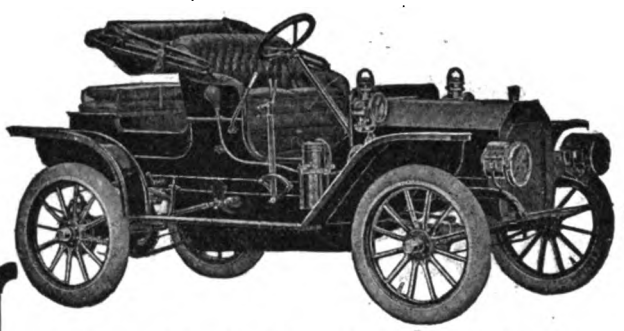
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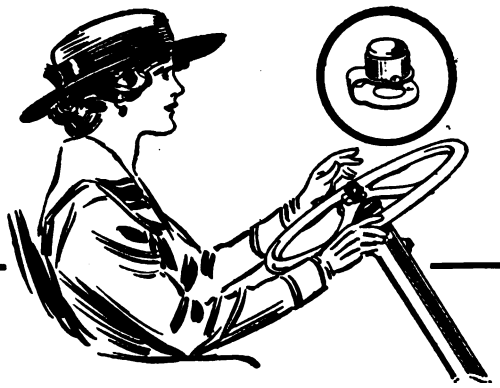
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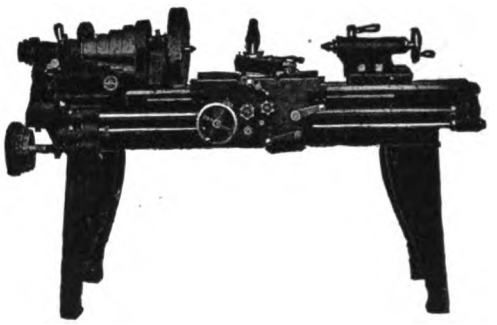
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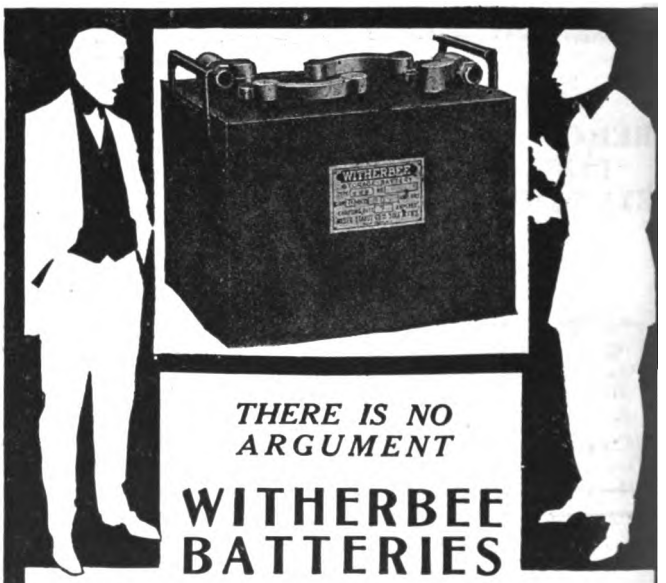


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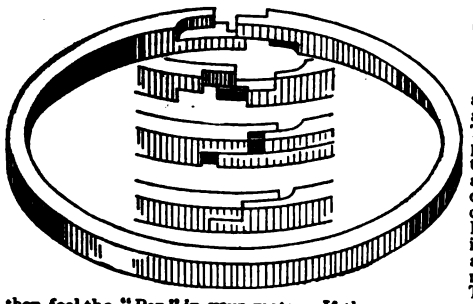
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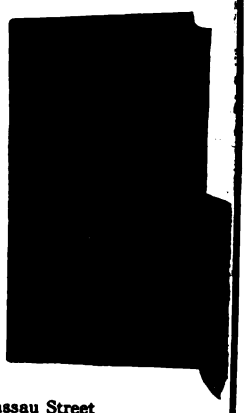


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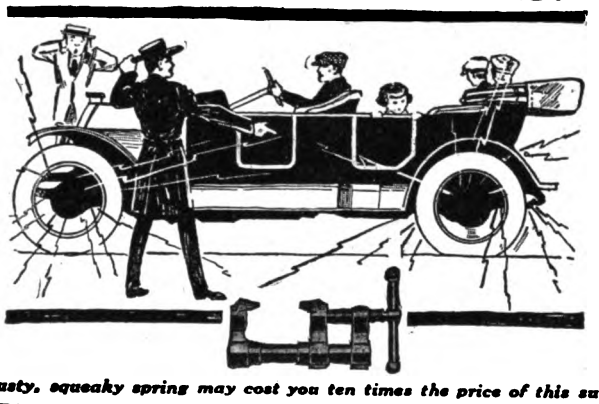
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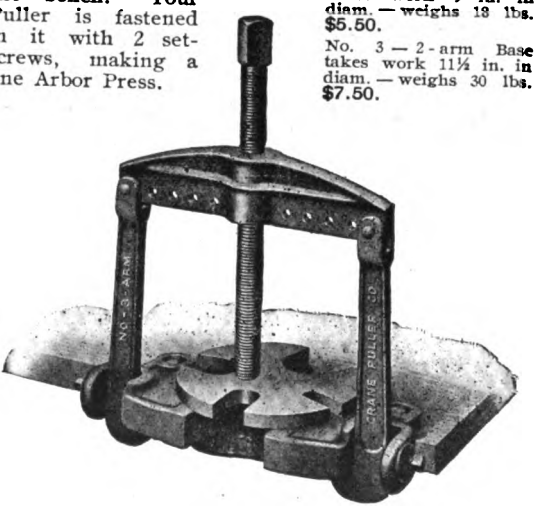
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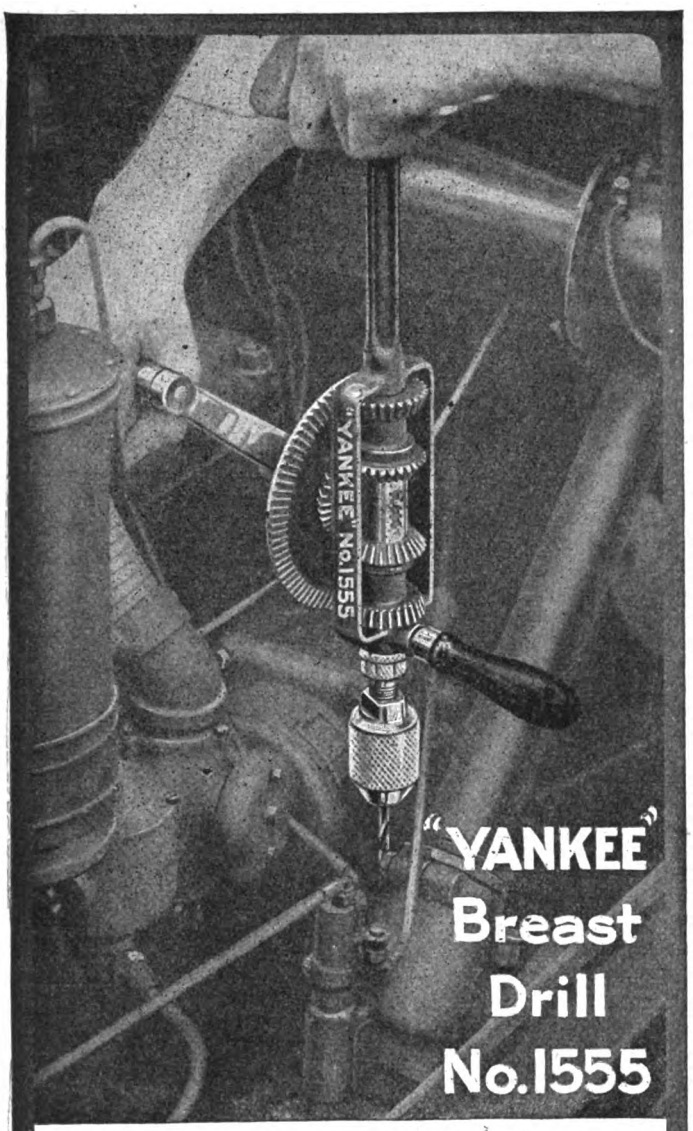
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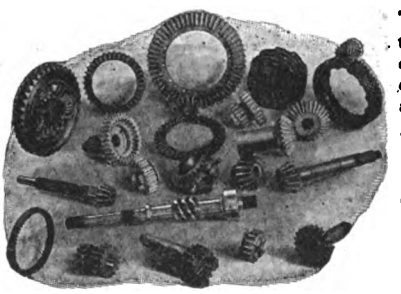
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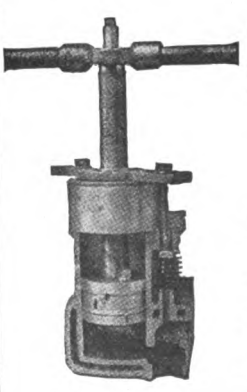
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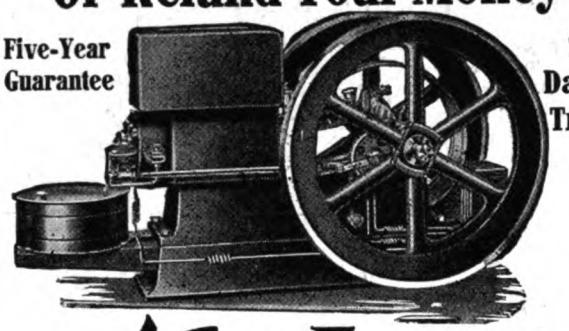
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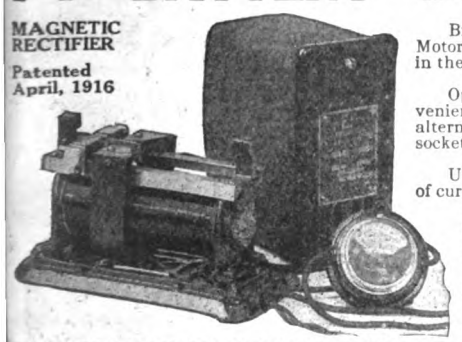
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E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15¼
K	3½	2½	12	17
L	4	3	12	21
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MAGNETIC RECTIFIER
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Operates from any convenient 110 volt 60 cycle alternating current lamp socket. 60 watt capacity.

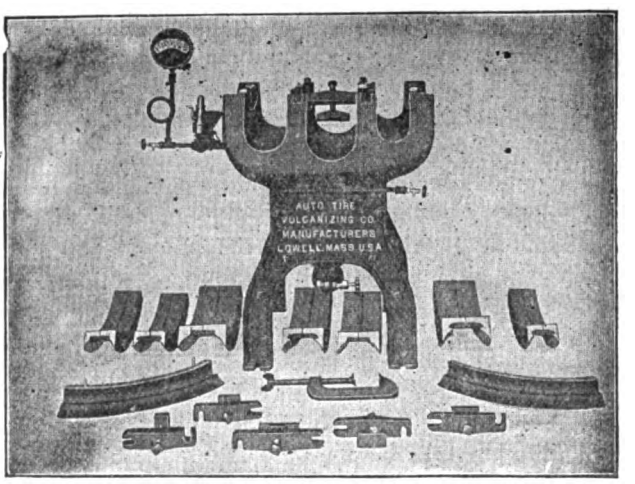
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It's different, superior, economical in operation, in fact beyond comparison.

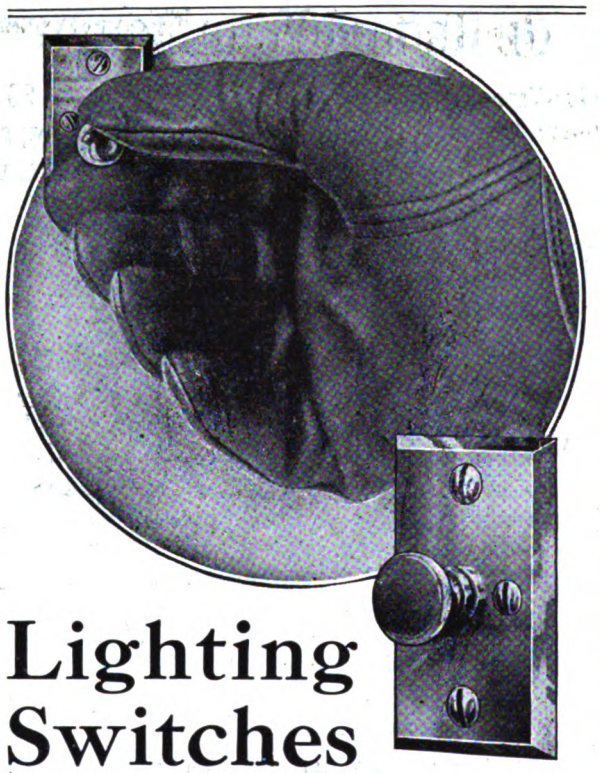
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Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

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The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

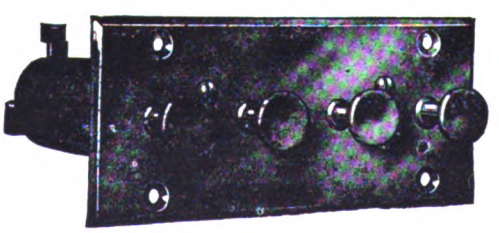
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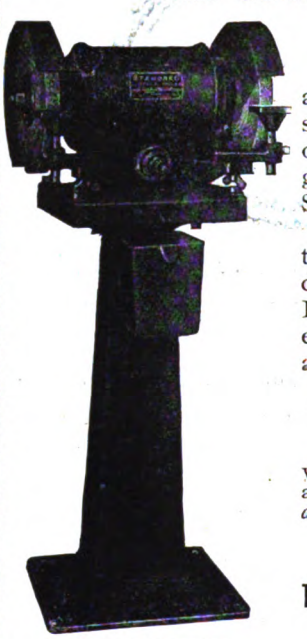


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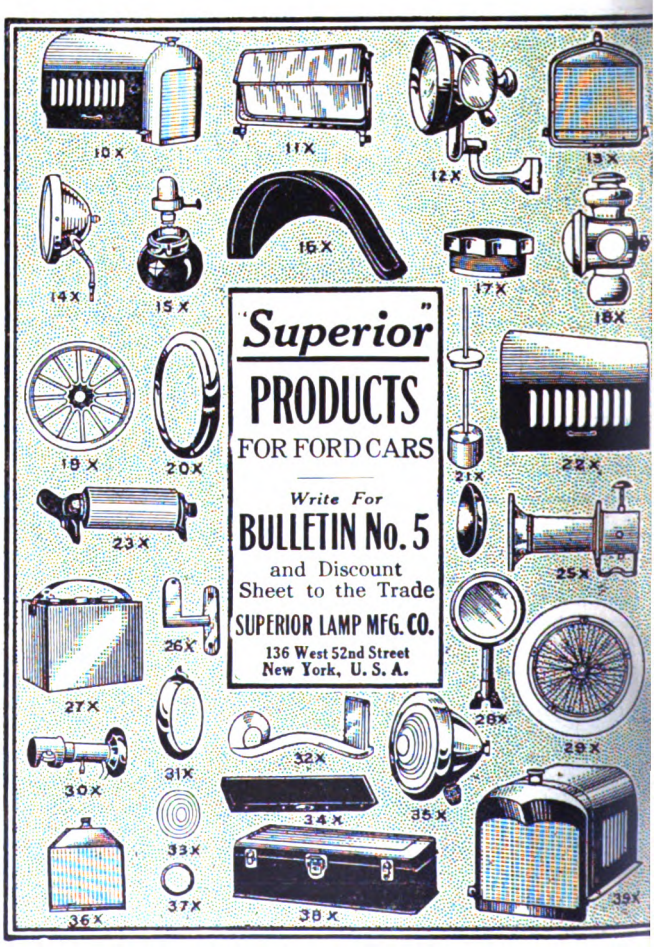
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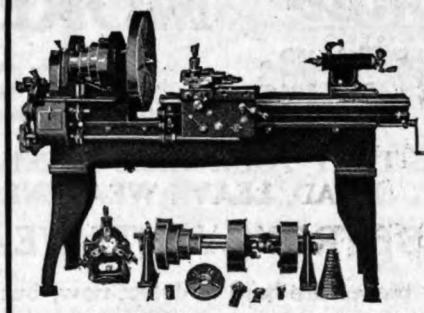
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Machine is strong, rigid and accurate, has 2⅛ in. spindle with 1⅛ in. hole through same. There are six quick change geared feeds and other new features. Great range and value at a reasonable price.

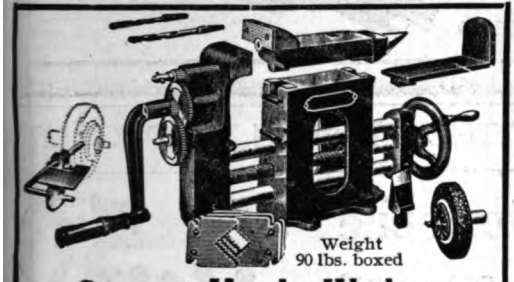
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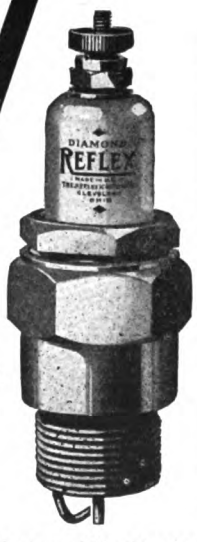
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MORE MILES PER TIRE LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

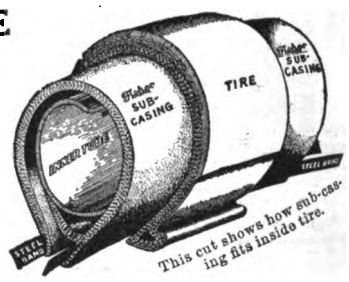
A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

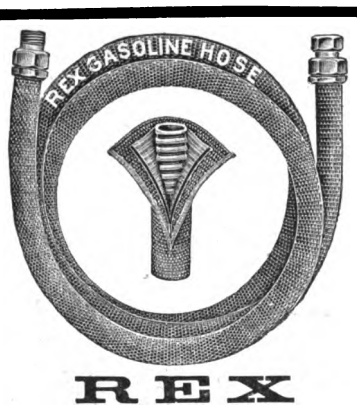
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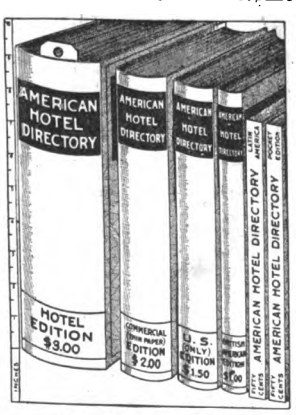
A complete manual for the man desiring to sell automobiles; how a self propelled vehicle operates; simple definitions a salesman should know; manufacturing procedure in motor car factories—essentials of successful salesmanship; how to secure prospects; selling a car; steps necessary; what constitutes beauty, style, comfort, easy riding, convenience, power, flexibility; economy, durability, safety; how to interest prospects; demonstrations; securing order; woman in the case; trading problem; electric vehicles; trucks; etc. 121 pages. Price $1.50 postpaid.

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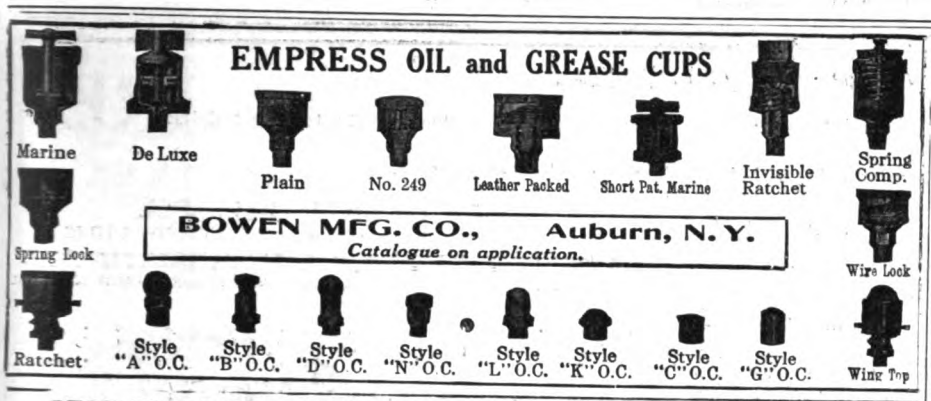
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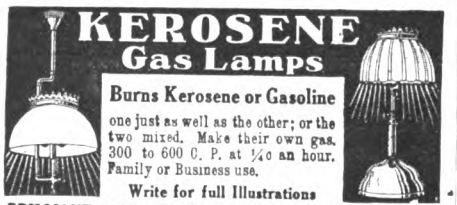
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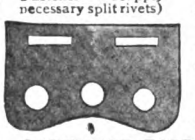
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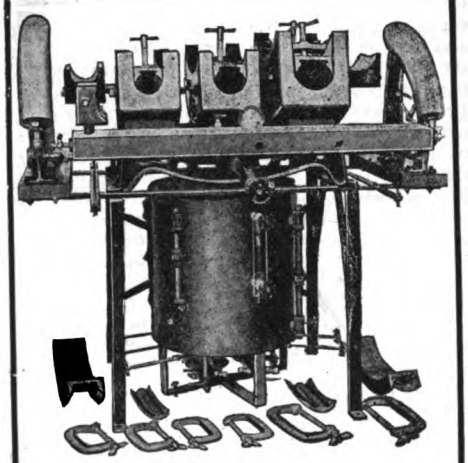
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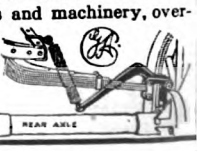
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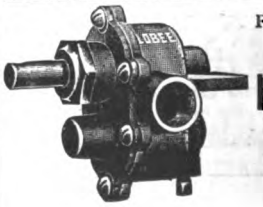
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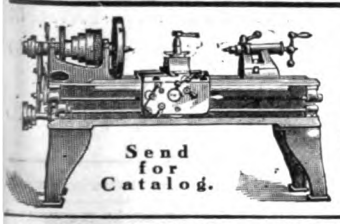
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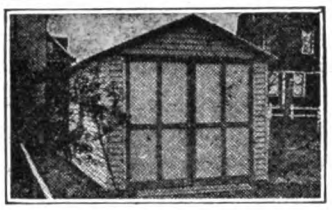
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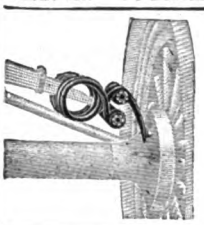


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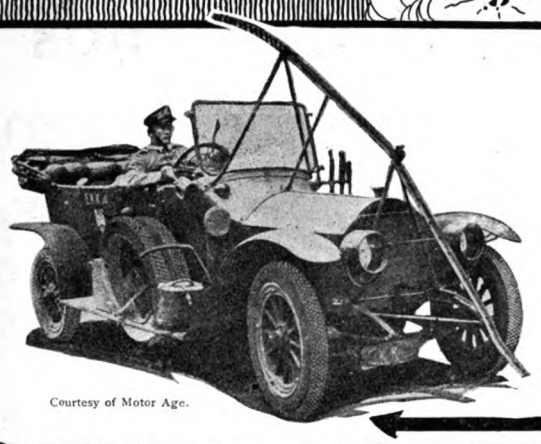
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Steel studded treads are a perfected product of the world's war. Take a look at the photograph above showing how the military cars at the front are steel treaded. This new tread has proven its value to the satisfaction of military engineers and to thousands of investigating European and American motorists.

It offers you the same economy and security. You are entitled to these advantages and we stand ready to show you at our **expense**.



Guaranteed 5,000 Miles Without Puncture

Durable guarantee

Treads are backed in writing by our signed for 5,000 miles of wear without a puncture. This guarantee holds good whether your tires are new or old. Think of it—to be able to drive your car without the constant nerve racking dread of tire trouble—it really means a **5,000-mile tire vacation!**

We Deliver Free

Without a cent deposit, we prepay express and allow you to decide. Remember the new Durable Treads—the only tire protectors in America built according to the foreign pattern—are gripped by the rim, just the same as the tire—absolutely water and sand proof—and are **applied in your own garage** in a few minutes time.

Special Discount

To motorists in territory where Durable Treads have not as yet been introduced, we offer a special discount on the first shipment **direct from the factory.**

Will you let us show you at our expense and risk? All we ask is your request for information—the coupon below is for your convenience.

Mail the Coupon

Tear it off and mail it **now**—don't run your tires "bare-footed" another week. We have an interesting book—"10,000 Miles On One Set of Tires," sample and copy of guarantee, ready to send to you FREE.

Stop throwing away your worn tires. Let us show you how to get 5,000 miles **more service** out of them, just as thousands of other motorists are doing.

Mail the coupon TODAY—do it now—before you turn the page and forget. You will hear from us within a week.

The Colorado Tire & Leather Co.

75 Tread Building, Denver, Colo.

G-5 Transportation Bldg., Chicago, Ill. 720-57 Woolworth Bldg., New York City

COUPON TEAR OFF MAIL

COLORADO TIRE & LEATHER CO.
75 Tread Bldg., Denver, Colo.
G-5 Transportation Bldg., Chicago, Ill.
720-57 Woolworth Bldg., New York City.

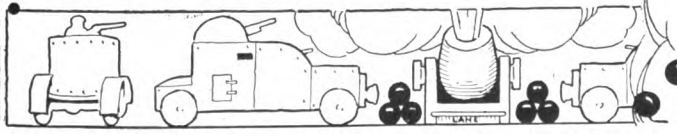
Gentlemen:—Without any obligation send me your free book, "10,000 Miles On One Set of Tires," copy of guarantee, and tell me about your special discount offer.

Name .....

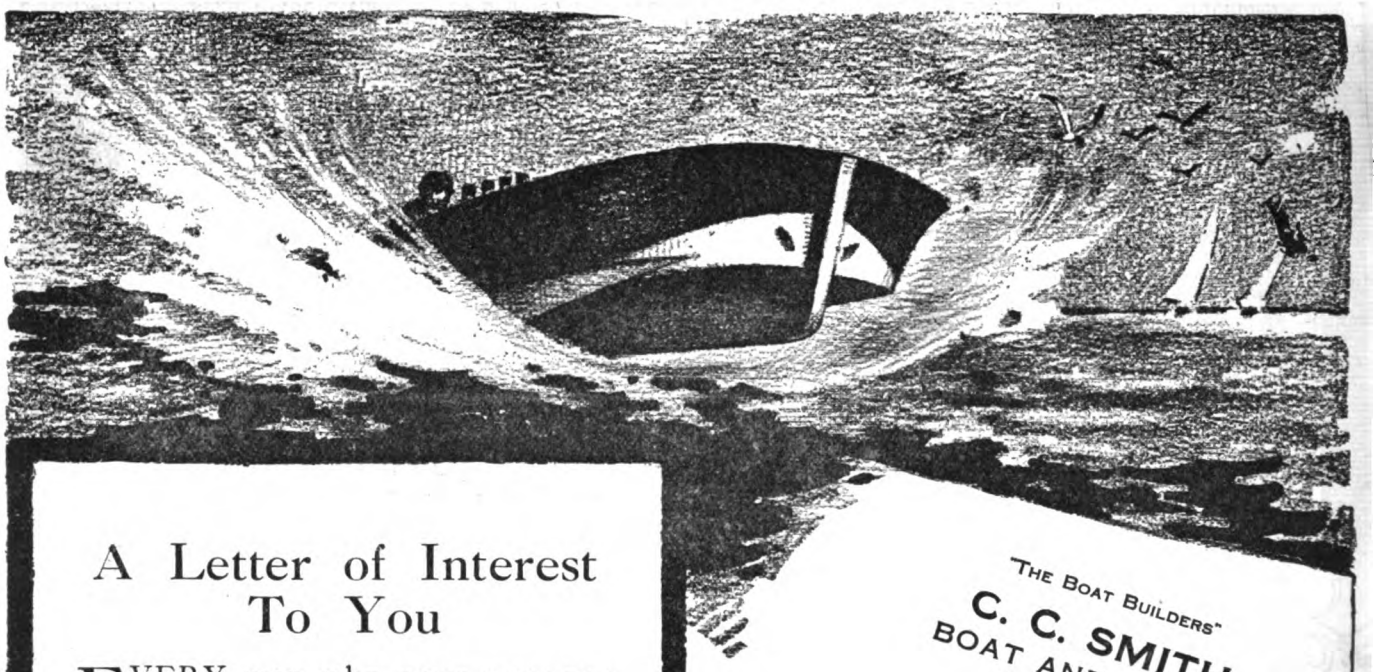
Address .....

.....

My tire sizes are .....



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A Letter of Interest To You

EVERY man who owns a car or a motor boat should read this letter from the C. C. Smith Boat and Engine Company, builders of the fastest boat in the world—the Miss Minneapolis, which has a record of 63.57 miles per hour.

Proper lubrication of the high speed motors used in automobiles and in many boats is of paramount importance to the owners. Your experience has probably shown you that such lubrication may not in all cases be easily obtained.

TEXACO MOTOR OIL

in the opinion of experts who have studied the question of lubrication from every angle, does lubricate properly under even the most exacting circumstances.

The selection of this oil by Mr. Smith and his associated engineers should interest you, not essentially because it related to the fastest boat ever built and helped to give her her speed, but because to a certain extent their business prestige was at stake, and because they had at their disposal all brands of motor oil with which they could experiment and from which to make their choice.

Such impartial opinion from men of great experience in their field is worth profiting by. You can't do better than follow their example.

Use Texaco Motor Oil in your automobile or motor boat. The safest way, the best way, to buy it is in one or five gallon cans.

THE TEXAS COMPANY
New York Chicago Houston
DISTRIBUTING OFFICES IN MOST CITIES

THE BOAT BUILDERS
C. C. SMITH BOAT AND ENGINE COMPANY
C. C. SMITH, PRES.

ALGONAC, MICHIGAN. Aug. 21,

Texas Oil Company,
Chicago, Ill.

Gentlemen:-

Enclosed please find check for ($15.90) to pay for our last shipment of extra heavy TEXACO oil. We herewith want to order for immediate shipment by Adams express 40 gallons in 5 gallon cans of TEXACO #556 extra heavy. We would also say to you that since the races in Peoria in 1914 we have used your TEXACO oil in the Baby Speed Demon, Baby Reliance, Buffalo Inquiry, Miss Detroit and Miss Minneapolis and up to the present time have never had to remove a bearing on account of lubrication or for the inefficiency of the oil. This may be of some value to you as an advertisement.

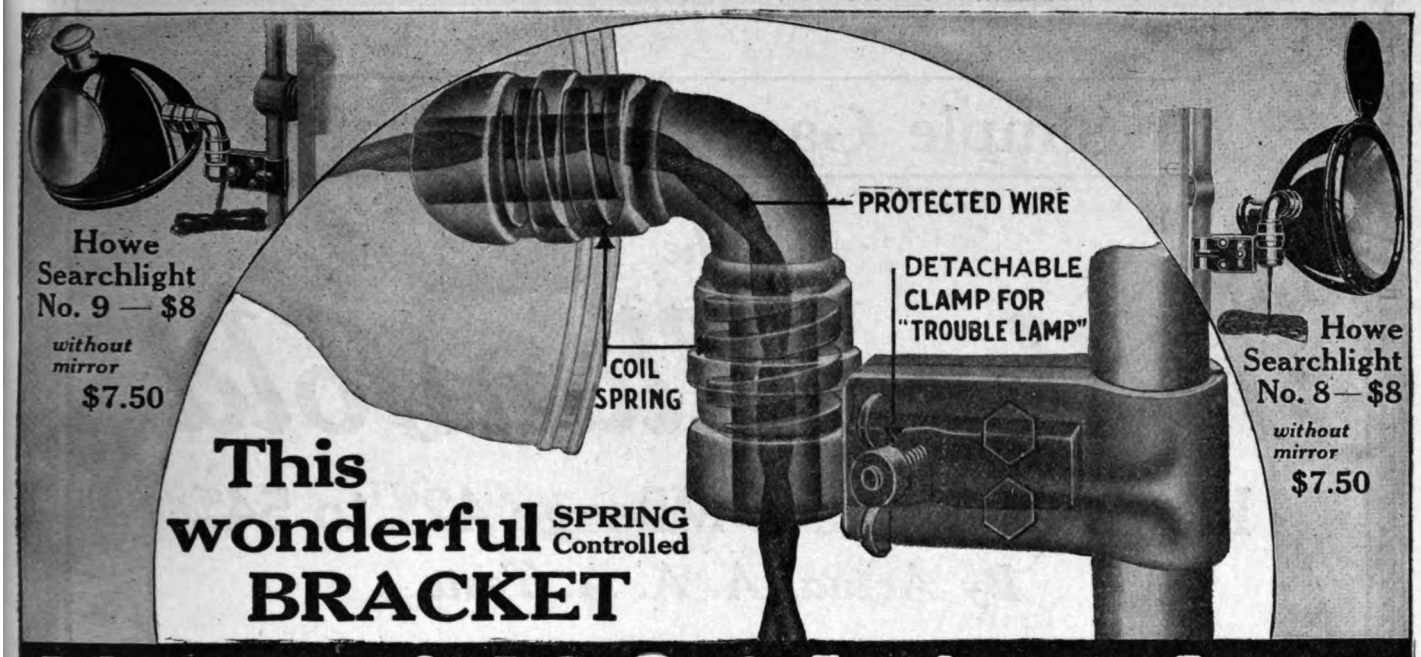
Please give this order your prompt attention we want this oil to drive next Saturday in the Gold Cup races.

Very truly yours,

C. C. SMITH BOAT & ENGINE CO.

Per C. C. Smith Pres.

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Means Light Quick-Anywhere

THE *bracket* is what makes any spotlight worth while. The Howe has the *one* bracket that is 100% effective. You turn *directly* to the spot you want to see, as naturally and easily as you point your finger. Both joints of the Howe Universal Joint Bracket move at the same time. You operate it readily with one hand, yet *right where* you turn it, it STAYS—until again moved. Won't loosen from jars and vibration, for the turning joints are held under firm pressure by *two coil springs.* Through months and seasons of service, the Howe does not get weak or wobbly. *Just as we told you—the*

HOWE Searchlight

Is the Spotlight that car owners want.

They know that it is the bracket that makes the Spotlight worth while. They know from reading our advertising that the Howe Universal Joint Bracket is the one and only bracket that is 100% effective.

The demand is big right now. To get some Howe Spotlights quick, wire for a dozen, mentioning jobber's name.

The Howe is a good selling proposition all the way through—incomparable Spotlight—free display stand—live advertising co-operation. Send the coupon. Handsome display stand given free with initial order of one dozen.

For These Reasons The *Howe Leads Them All*

1—The Wonderful "Spring-Controlled" Bracket.
2—The Universal Joint permitting direct-turn to any angle.
3—Always "stays put"—never loosens or flops around.
4—Never sticks—never hard to turn.
5—Handy on-and-off switch in knob. Works easy while turning lamp.
6—Reflector gives perfect spotlight at all distances.

Six Other Reasons That *Put Howe Far Ahead*

7—A special clamp to fit each different style of windshield post; round, square, oval.
8—Hollow bracket protects wire. Prevents wear, short circuits.
9—Detached for trouble lamp by loosening one set screw.
10—Light weight—perfect streamline body—finish equal to your car.
11—National Mazda Nitrogen gas filled 21 candle-power bulb.
2—100% light efficiency without danger of glare.

HOWE MANUFACTURING CO.
1732-36 South Michigan Ave., Chicago

The Different Models of Howe Searchlight

No. 8 & 9—pictured above, with 4-in. rear-view mirror, $8—Canada, $12.

No. 7—same as 8 & 9, without rear-view mirror, $7.50—In Canada, $11.

No. 11—The Howe Junior—a single shell lamp with same bracket and 2-piece detachable clamp as Nos. 7, 8 and 9, $4—In Canada, $6.

No. 15—same as No 11, with rear-view mirror, $4 75—Canada, $7.50.

Mail The Coupon Now

Howe Manufacturing Company
1732-36 Michigan Avenue, Chicago

Send me... dozen Howe Spotlights, assorted as follows:

☐ No. 7 ☐ No. 8 ☐ No. 9 ☐ No. 11 ☐ No. 15

Jobber's Name.....

Firm Name.....

Street No.....

City..... State.....

Signed .....

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A Simple Gasoline Problem:—

If the

Wilmo Manifold

Increases Gasoline Mileage 42% to 54%

By Actual A. A. A. Tests

How Much Gasoline Money Does the User Save With Gasoline at 25c a Gallon?

Ask every customer that question and see his immediate interest in the Wilmo Manifold, the great conservor of gasoline.

We can show letters from users testifying to as high as 80% increased gasoline efficiency—but the official A. A. A. tests showing 42% to 54% increase should satisfy anybody.

Wilmo Manifold sales are up in the hundred thousands—all in six months.

Made for many makes of cars. See the list below.

Help your customers cut gasoline cost and rid their engines of carbon the Wilmo way. Write today for interesting dealer information on this year 'round success.

The Whittier Company
227 First National Bank Building **Chicago**

How It Does It

The Wilmo Manifold is a one-piece casting, forming a combination exhaust and intake manifold with a thin dividing wall between. The heat from the exhaust brings the walls of the intake up to the proper temperature to fully vaporize the gasoline before it enters the cylinder.

The Wilmo Manifold vaporizes every atom of gas right at the valve openings. Leaves no wet gas accumulating on the walls of the intake passage. Makes a four-cylinder as flexible as a six. Permits you to drive slower or faster, and all with much less gasoline consumption. Makes an old motor and carburetor work without loading up on gas.



Retail Prices

Ford—T	$ 7.50
Maxwell—25	8.50
Overland—59-69-79	10.00
Studebaker—17-4	10.00
Buick—4-34-35	10.00
Saxon—6	10.00
Overland—81-83	10.00
Overland—80	12.50
Oakland—6-32	12.50
Buick—6-D44-45	15.00
Studebaker—17-6	15.00

Manifolds for other makes of cars will be added from time to time.

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Look at Any Ford Engine—

Carefully note the *front-end suspension*— then you'll see why the only satisfactory *starter-lighter* for Ford cars is one that

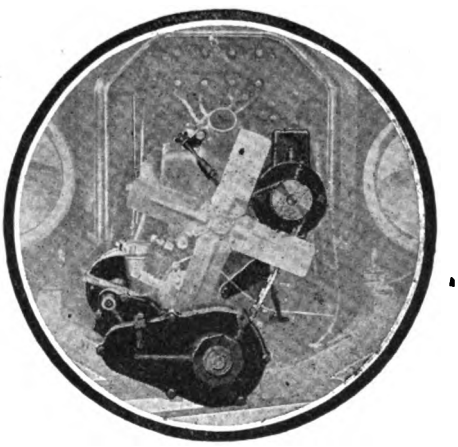
First—Distributes its weight equally on both sides of the engine.

Second—Does not strain the *front support* when cranking or generating.

That's Why Ford Mechanical Design Demands

A·B·C
Two Unit
STARTING & LIGHTING SYSTEM

(Made Expressly For Ford Cars)



Doesn't it stand to reason that a starting and lighting system built to fit a Ford is the best system for a Ford? That's an axiom—not a mere statement. The dealer who sells a "make-shift" sells dissatisfaction. The A. B. C. Starting and Lighting System for Fords, readily adapts itself to Ford design. Its units (one on either side of the engine) insure perfect balance. It is chainless. No drag or strain from starting or generating. Operates under all conditions. Does not lessen speed nor power. First, we proved these truths on thousands of Fords. Now, we're equipped and ready to supply the largest possible demand.

Be SURE the starter YOU sell will make good. You cannot be sure unless it's an A. B. C. Easy to sell—easy to install—easy to make money—if you represent the A. B. C. Ask, today, for our "ON AND OFF YOUR SHELVES" policy; descriptive sales plans, prices, terms, discounts and liberal proposition to A. B. C. distributors.

A·B·C STARTER·COMPANY DETROIT

For Profit's Sake—Let's Get Together—Mail the Coupon

A. B. C. Starter Co. Dept. H, Detroit, Mich.

Gentlemen: Please send full information regarding the A. B. C. Two-Unit Starting and Lighting System, including literature, prices, terms, discounts, etc.

Name .....

Address .....

City ..... *State* .....

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Performance
Sells better than claims



Claims over the counter may make sales, but performance in your customers' cars makes resales.

Dealers who are after the profitable resale business should familiarize themselves with the records of

RAJAH *SPARK PLUGS*

Rajah Plugs are not standard equipment for Hudson cars, but before Mulford drove his Hudson up Pike's Peak in the record-breaking time of 18 minutes and 24¾ seconds—*he changed to Rajah Plugs.*

In all hill-climbing contests and gruelling road races, Rajahs always outnumber any other plug. When a Chalmers car driven by Joe Dawson recently covered a straight-away mile at Jacksonville, Fla., in 38.1 seconds, Rajah Spark Plugs were used.

The plug that meets these exceptional tests is the one to talk up over the counter, confident that it will make good in your customers' cars.

Address RAJAH, *Bloomfield, N. J.*

HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland, Seattle — JOHN MILLEN & SON, Ltd., Montreal, Toronto, Winnipeg, Vancouver

RAJAH TERMINALS AND ADAPTERS are furnished with Rajah Plugs so that they can be used with any car not equipped with the Rajah type of Clip Terminal.

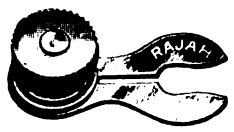
RAJAH TERMINALS



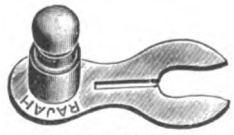
Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.



Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.



Rajah Thumb Nut Terminal
Adapter for Dodge, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six. Pullman.

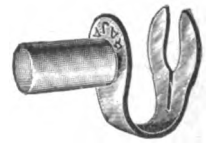


Rajah Stud Terminal
Adapter for Buick, Chevrolet, Oldsmobile.

RAJAH ADAPTERS

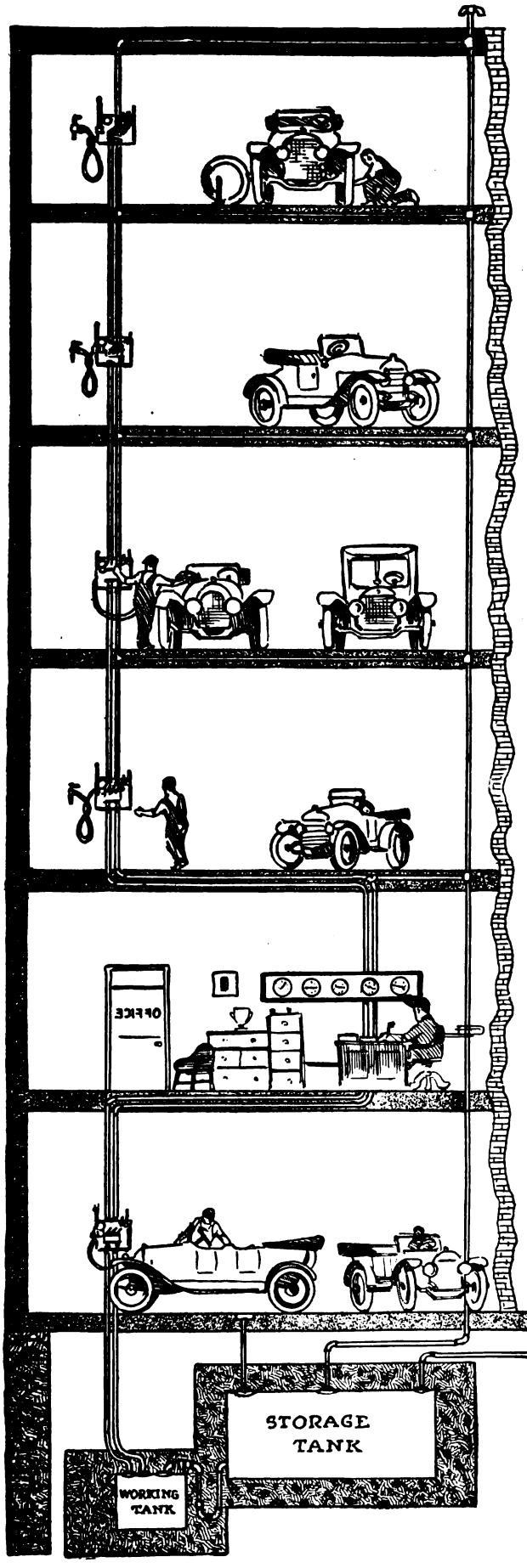


Rajah Ball Terminal
Adapter for Franklin



Rajah Packard Terminal
Adapter for Packard 4 and 6 Cylinder

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Gasoline
"pumped" by air
no labor

A Gasoline Delivery System That Protects Buyer and Seller

Operated by Air Pressure

The many advantages and practical improvements embodied in the "APSCO" Gasoline and Oil Storage and Distributing System eliminate all waste and guess work, reduce labor-cost and give adequate protection against danger from fire and explosion.

Simple Economical Safe

Approved by the Board of Fire Underwriters

Simplicity of construction and operation is secured by discarding cog-racks, pinions, bearings, pistons, cup leathers, piston valves and gearing. Wear and tear are reduced to a minimum. The air-pressure system secures a responsive flow of oil or gasoline to any desired point of use—direct from the storage tank to vat, tank or machine—without the use of labor, pumps or any auxiliary mechanism.

SPECIAL APSCO METER

Approved by the Department of Weights and Measures of the City of New York

This "APSCO" meter measures the actual amount of oil or gasoline sold or consumed. Shows at a glance the exact, individual quantity drawn off, and the total amount used.

The APSCO is Easy to Install

The "APSCO" System is adapted to the multi-storied garage, or the smallest one. It may be installed in old or new buildings. Old style systems can be changed over. The cost is moderate, and varies with the amount of piping, the size of storage tank, and the number of outlets.

Our staff of engineers and designers is at your service, and is ready to furnish careful estimates of the cost of installing the "APSCO" System to meet any particular requirements.

Descriptive Literature Mailed Upon Request

Agencies Wanted

ALLEN PRESSURE SYSTEM CO., INC.

20 West 61st Street New York

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10,000 MILE GUARANTEE Backs This Tire

Every Brictson Pneumatic Tire is sold under a specific 10,000 miles written service guarantee. This guarantee is the ***longest*** and the ***strongest*** ever put behind a pneumatic tire. It is the result of ten years' experience and is a positive protection to every purchaser. Try Brictson Tires on your car at our risk and learn how to cut down your up-keep costs.

"ABSOLUTELY PUNCTURE PROOF"

Brictson Tires are puncture-proof, blowout proof, skid proof, rut proof, rim cut proof, oil proof and gasoline proof. Wonderful resiliency and easy riding qualities as well as economy commend them to car owners. The service and satisfaction they give is rapidly extending their sale.

Retread Your Present Tires

If your present tires are new you should by all means apply Brictson Treads, or tire protectors, thereby making them puncture proof—rut proof—rim-cut proof—gasoline proof and non-skid.
If your present tires have been used and the rubber tread has been worn off or thin, you may get additional service by applying Brictson Treads, also making them puncture proof, oil proof, rut proof, gasoline proof and non-skid.

Free Trial Offer

To convince you that Brictson Tires will give you satisfaction we will let you try them on your car at our expense. Write today for conditions of this Free Trial Offer and full information about Brictson Tires and Brictson Treads.

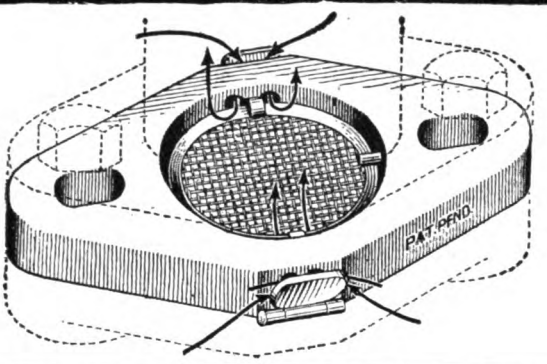
THE BRICTSON MFG. COMPANY

177 Brictson Building **BROOKINGS, SOUTH DAKOTA**

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"THAT'S GOOD! I'LL BET IT'S A YANKEE INVENTION!"





-YES UNCLE THAT'S THE YORK CARBURETOR PERFECTOR

This Wonderful Device Positively Insures

Guaranteed Gasoline Economy

Absolutely guaranteed to do all we claim or your money promptly refunded. We take all the chances.

The York Carburetor Perfector operates by the speed of the gas as it passes through to the manifold, striking the cone-shaped screen, breaking up the mixture or vaporizing the gasoline, and admits air AUTOMATICALLY with the speed of the motor. Helps minimize carbon too, and produces a smooth, sweet running motor.

IT'S A SUCCESS—NOT AN EXPERIMENT!

No Holes to Bore—No Changes to Make.

Fill out this coupon now, enclose $5.00—If you're not perfectly satisfied in 10 days, send it back. Thousands in use—put one on your car and smile.

SOLD BY LIVE DEALERS

Write to us today for important literature.

YORK CARBURETOR & AUTO ACCESSORIES COMPANY, INC.
681 Woodward Ave.
DETROIT - - - MICHIGAN

YORK CARBURETOR & AUTOMOBILE ACCESSORIES CO., Inc.
681 Woodward Ave, Detroit, Michigan

Enclosed find $5.00. Please send me a York Carburetor Perfector for 10 days' trial on your money-back proposition.

Name.....

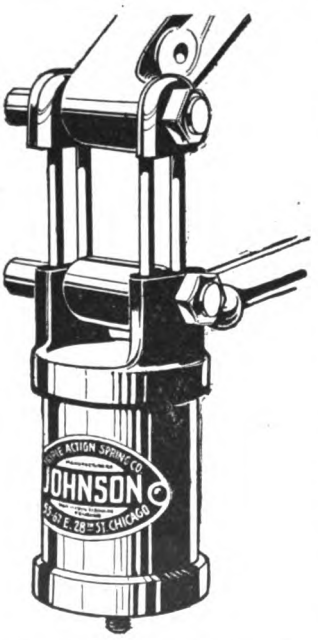
Street.....

City..... ....State..... .....

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Temme SPRINGS FOR ALL CARS



THE picture tells the story. Are *you* the Mr. Smith of Smithville? Are *your* highway signs on all your roads?

Do all the lame cars drive to *your* door for Temme Springs and other things?

If *you* are not Smith, who is? Or who will be? That's the question.

And in most good towns it will be answered soon. For Temme Springs and Temme's Triple Action Service are known to be *as good as gold.*

Hundreds of repairers, who have "banked" on Temme and never lost, are putting up these Temme highway signs today.

These signs *will* bring in business. Temme has tried them, so he *knows.* And now he offers *you* what won for *him.*

Temme Springs *"for all cars"* means just what it says—for all cars *since 1902.* Test us by naming the spring you need. Temme Triple Action Service will have it on the way to you the same day.

"For all cars" means *designed* for all cars to factory specifications. And so good are Temme Springs—so prompt the service—so fair the prices—that dealers in *all* cars now buy from Temme *in preference* to the car maker.

You need these springs, this service, these signs. They will make you money, bring new business, help you build the good reputation you are after.

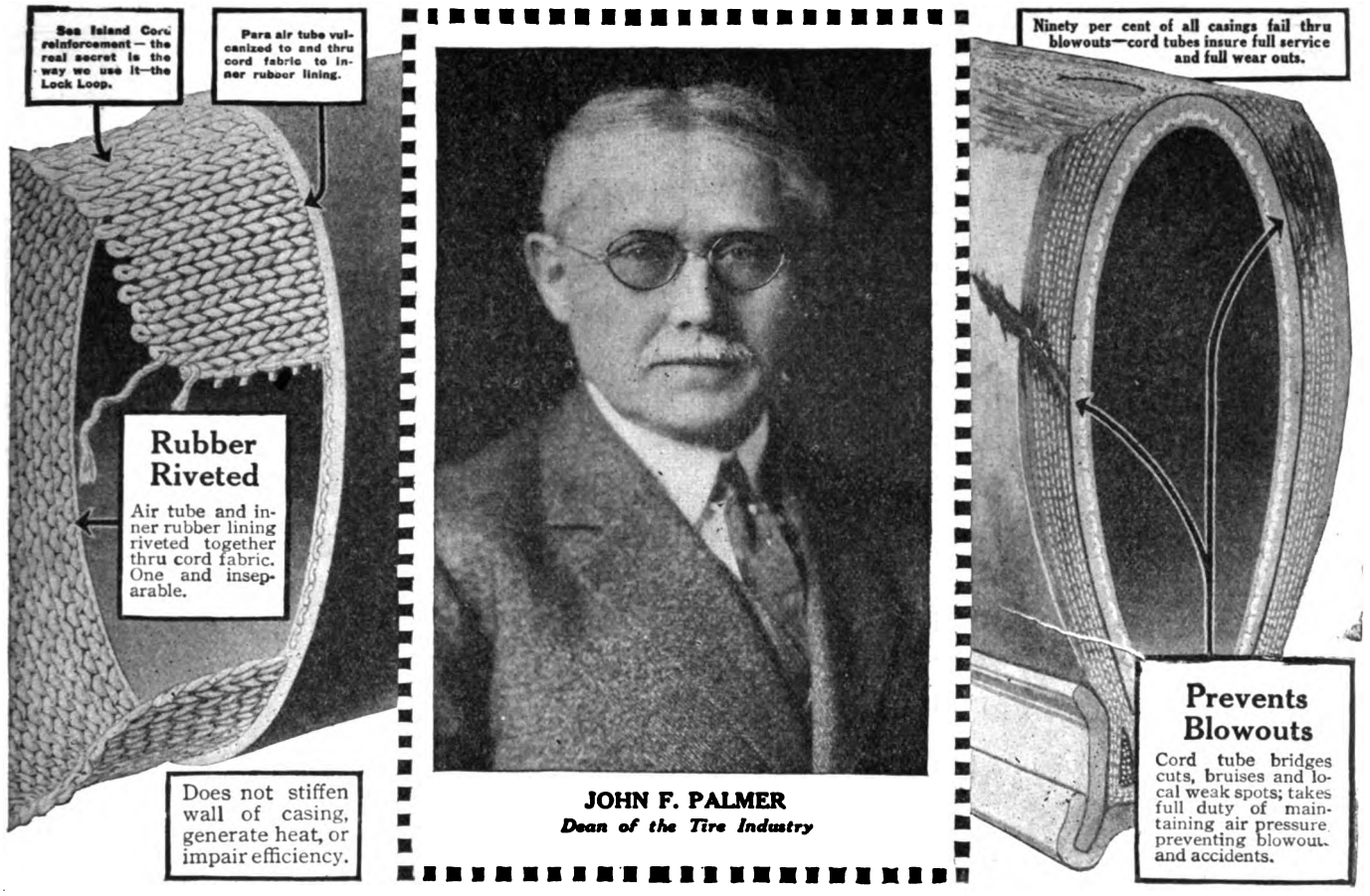
If you delay you may lose this exclusive proposition. Write or wire us now, saying: "Send Temme Spring Service Station proposition at once."

JOHNSON
Shock Absorber

This is to remind you of the new model of the famous Johnson Shock Absorber—made by us. The only cure for a hard riding car is a pair of Johnsons. Temme Spring Service Stations make good money on them. Write now for our new proposition.

TRIPLE ACTION SPRING COMPANY
79 East 28th Street, Chicago

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John F. Palmer Offers His Latest Tire Improvement

JOHN F. PALMER, better known as the Dean of the Tire Industry, has added another remarkable invention to his long list of tire improvements—the Palmer Safety-Cord Inner Tube.

This tube possesses properties that are found in no other tube. Blow-outs are practically done away with. Casings in which these tubes are used give, on an average, **of double their normal mileage.** These tubes are manufactured by Mr. Palmer's own company, a strongly and satisfactorily financed organization, which has been delivering its product on a steadily increasing scale of production for many months.

Unusual Sales and Profit Possibilities

Dealers whom the trade knows for the success and business judgment are selling Palmer Safety-Cord Tubes. The success they have had with them has surprised even those keen-minded business men. The motoring public has set its stamp of approval on these tubes.

We want more dealers of this type. We want men of exceptional standing in their communities to add to their reputation as distributors of quality merchandise by selling Palmer Safety-Cord Tubes. We are going to back up the efforts of these men with strong, sizable, convincing advertising in newspapers, magazines and trade papers. Advertising has already started. It will be continuous.

Write or wire for details of liberal selling proposition.

PALMER TIRE & RUBBER CO. St. Joseph, Mich.

Palmer Safety-Cord Tube

Lock-Looped Construction

A "moulded" tube carrying an inner cord structure, which gives it great strength without interfering with its resiliency. Cord structure is Lock-Looped on special machines, patented and used by us exclusively. Fashioned on a double curve it fits the cavity of the casing perfectly without stretch at the tread or wrinkle at the rim side.

Greater Tire Mileage

Cords carry a designed portion of the strain formerly carried by the casing alone. Thus relieved, it is obvious, casings will run further and give better service.

"Mothers the Casing"

The air tube proper is riveted through and moulded over these cords on similar curves. Inflated, Palmer Tubes have the same thickness of rubber on the tread as on the rim side. They are not thinnest on the side nearest the road.

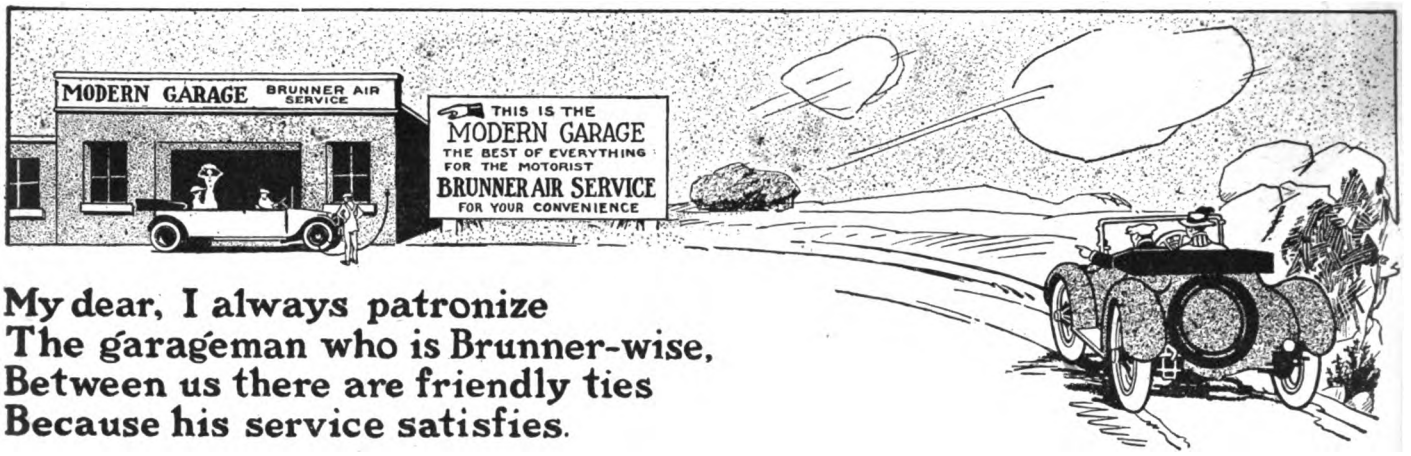
Lock-Looped construction of cords permits slight stretch in any direction, so that the tube is able to instantly conform to the myriad changes in the shape of the casing caused by load and road inequalities. This enables the tube to instantly bridge over a STONE CUT or BRUISE in the casing, preventing BLOW-OUT that would otherwise ensue, by assuming the strain at the very point needed and always "mothering the casing" against damage and deterioration.

Repairs

Repairs are made from the outside, exactly the same as in ordinary tubes. A cold patch or vulcanizing as you desire. It is not necessary to touch cord structure. Tubes do not stiffen the casing or impair its efficiency in any way.

PALMER SAFETY CORD TUBE

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My dear, I always patronize
The garageman who is Brunner-wise,
Between us there are friendly ties
Because his service satisfies.

Mr. Garageman, is your equipment modern? Are you securing your share of the motorists' trade, or is a large portion of the trade driving by your door simply because they do not know you are awake and on the job?

If your business is not what it should be, why don't you install a Brunner Air Compressor in your garage and advertise the fact that you are in position to render Brunner Service by displaying a Brunner sign on your garage?

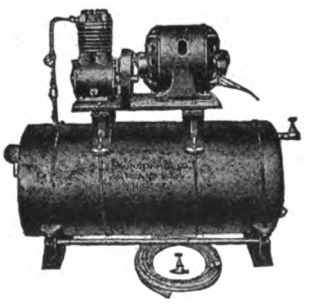
The Brunner Sign Attracts the Trade of the Brunnerwise Motorist



Because he knows that the garage displaying the Brunner Sign is always prepared to render him prompt and efficient compressed air service—he knows that when he pulls up under the Brunner Sign he never has to drive away disappointed. That is why the trade of the Brunnerwise Motorist follows the Brunner Sign.



Mr. Garageman, time was when you could "get by" with indifferent service, but the time is here when Brunner Service is essential if you desire the trade of the motoring public which does not patronize the garage which is merely "getting by"—we mean the Brunnerwise Motorist.



Mr. Garageman, your compressed air service is "your one best bet" and if it is not right up to the minute then you are behind the times and the Brunnerwise Garageman has something on you. The efficiency of your establishment starts at the end of your air hose. Your income is regulated by that efficiency.

INVESTIGATE THE BRUNNER AIR COMPRESSOR

Be honest with yourself and investigate the garage air compressor situation thoroughly before deciding on your new equipment. The Brunner will stand investigating and the more thorough the investigation the more certain will be your decision in favor of Brunner Service, because it not only insures compressed air efficiency of the very highest order, but it also insures that very desirable and liberal patronage of the Brunnerwise Motorist, which follows the Brunner Sign.

We will be glad to send you the name of the Brunner Jobber who covers your town, also our catalogue and Garageman's Handbook on Compressed Air—a book which every garageman should read carefully. They are all free for the asking.



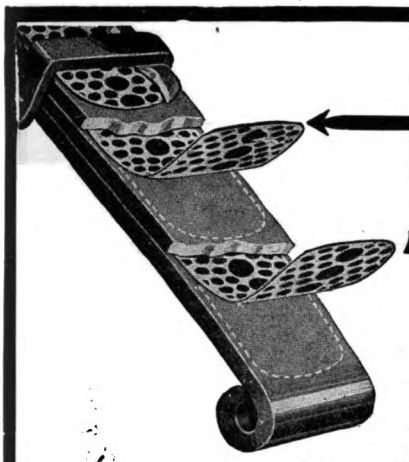
BRUNNER MANUFACTURING COMPANY

Main Office and Plant: UTICA, N. Y.

Cincinnati Branch: 419 First National Bank Bldg., Cincinnati, Ohio



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THIS BEARING

Between the leaves of all your springs from end to end ***reduces your tire cost*** and gets you a *Guarantee* for

1500 EXTRA MILES

on any new tire of standard make

"Easy Riding Guaranteed or money back"

"Greater Tire Mileage" "Stops Spring-leaf Squeaks"

"Greater Gasoline Mileage" "Reduces Vibration"

DANN INSERT

"The Lubricated Spring-Leaf Bearing"

"The saving on two tires pays the cost of Dann Insert."
Dann Insert can be installed in any make or model of car.
Our dealers give you the 1500 extra mile
GUARANTEE IN WRITING.

Write for interesting FREE Booklet.

Mail This Coupon Now!

DANN INSERT is standard equipment on the following cars:

Winton—Austin—Disbrow

THE DANN PRODUCTS CO.
1095 East 152nd Street, Cleveland, Ohio

"Demand DANN INSERT in the car you buy"

A. D. & R. July, '17

The Dann Products Company
1095 E. 152nd Street, Cleveland, Ohio

Please send me complete information relative to the above, as pertains to my requirements.

I am a { Car Owner. Dealer. Manufacturer.

Car.....

Model.....*Year*.....

Name.....

Address.....

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SUNDERMAN
Vacuum Carburetor

$5

F. O. B.
Newburgh

$6.50 for
other than
Ford or Metz

The dealer who has the Sunderman agency in your territory will have the jump on the other fellows—why don't YOU try for it?

Flexibility

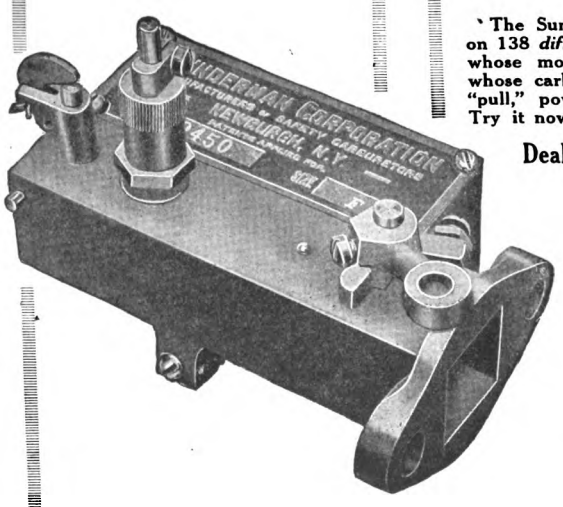
The longer a man drives a car the more anxious he is to have a flexible motor. He wants to "play" with it—throttle it down to a crawl in city traffic, make it leap out of the crowd a nose ahead of the livest car in the jam; he wants it to pick up rapidly, to give him a spitfire burst of power when there's a danger of taking the other fellow's dust. And when he reaches an open stretch of country, far from the traffic cop or the lurking country constable, he wants the roaring drive that spells speed.

THE SUNDERMAN CARBURETOR GIVES JUST THAT KIND OF FLEXIBILITY

It's all in the mixing principle—scientifically and exactly worked out in the Sunderman construction. Taking gasoline from the multiple jets as slowly or as rapidly as the motor suction demands it; drawing the air in at right angles, "fanning" the gas as it leaves the 45-degree nozzles, breaking it into inconceivably small particles before it reaches the manifold; giving as much or as little as the need indicates, the Sunderman Carburetor sends *gas* to the combustion chambers, where instantaneous explosion extracts the last atom of pep and punch from the gasoline, getting *more* power from *less* fuel.

Buy it now for Flexibility—
Get Power, Pick-up and Proved Economy as good measure

The Sunderman Carburetor has made good its every claim on 138 *different* makes of pleasure cars and trucks—"orphans" whose motors were ready for the junk heap, modern cars whose carburetors were anemic, trucks whose owners wanted "pull," power and economy. It will make good for *you*. Try it now.



Dealers: We want you to get the benefit of our advertising—write for territorial proposition

Sunderman Corporation
13 Chambers Street Newburgh, N. Y.

Western Office: 403 Kresge Building, Detroit

Digitized by Google

Chalmers dealers make money. Do you? If you are not thoroughly satisfied with the line of cars you are now selling and can show us that you have business and selling ability and ample funds, please write us.

Vice-President
CHALMERS MOTOR COMPANY

Maybe we can show you how to increase your profits. Write us.

CHALMERS MOTOR CO. Detroit, Mich. U.S.A.

Digitized by Google

Little Giant Trucks

Are You the Man?

We are looking for one man, a man of exceptional ability and initiative. Some one man, above all others in every community, has the particular ability we seek. When we find him, he will immediately begin to build, with our aid, prestige and profit for himself.

He will be the highly capable representative of a highly capable motor truck. Little Giant.

He will be backed by a world-spanning organization, that has 23 years' reputation and experience in the building of engineering tools and machinery. He will be backed by the record that thousands of their trucks have made in over 175 varied types of business endeavor. He will be backed by the proof of service that many of these trucks have given for over nine years. He will be backed by intensive local newspaper advertising over his name, in his territory. He will be backed by a truck, whose specifications set so high an efficiency standard, that it represents the most desirable hauling-equipment purchase that can be made by men who have things to move. He will be backed by a complete line—1-Ton, 2-Ton, 3½-Ton, and Convert-a-Car (Ford truck unit); and their extra exclusive cost-cutting feature—the Duntley Hydro-Pneumatic Gas Generator, which burns half kerosene and half gasoline, cutting fuel cost in two.

Write today, or better still, telegraph your belief that you are the alert, progressive, capable man we want; that you can ably represent in your community the Little Giant Trucks with the habit of heavy performance. Made that way by the $14,000,000

CHICAGO PNEUMATIC TOOL CO.

620 Little Giant Building **1615 Michigan Avenue, Chicago**

Digitized by Google



"Tug O' War"

MAKE this test. Take two Firestone Cementless Tube Patches and stick them together. Then try this "tug of war." Pull, yank. They will hold fast.

Here you have a practical demonstration of the strength and holding power in this Firestone accessory. It proves, with A.B.C. simplicity, that here is a motoring essential which you cannot afford to miss.

Small as they are, these Cementless Tube Patches are representative of Firestone "know-how" and care in building. They are hand-buffed and feather-edged; will not pucker or creep, and they hold indefinitely.

Dealers: Tie trade tight to you. Make the motoring public your everlasting friends by selling these big helps for little troubles. Our co-operation is always at your service. Write for information.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere

Firestone
ACCESSORIES

Digitized by Google

Grow with the fastest growing battery business

USL STORAGE BATTERIES

U.S. LIGHT & HEAT CORPORATION



USL Starter Batteries with exclusive Machine-pasted plates are making sales-records for hundreds of live dealers and garage owners.

These modern USL plates are making good under all conditions. Some USL Batteries are now working in their third year.

Every USL Battery is sold on a 15 months guaranteed adjustment plan. There are sizes for all cars.

Wherever we establish a Service Station we conduct a newspaper advertising campaign as well as supply profitable sales helps.

If there is no USL agency in your town, write us for our proposition.

U S Light & Heat Corporation

Drawer "G," Niagara Falls, N. Y.

Branches in: NEW YORK CLEVELAND DETROIT CHICAGO KANSAS CITY SAN FRANCISCO WASHINGTON, D. C.

Service Stations in Principal Centers

REFLEX SPARK PLUGS

mean dependability. Experienced motorists know that. One Reflex plug in the engine invariably means a whole Reflex-equipped motor. And why not?

—They are made with the hardest insulating known—Chromite Porcelain.

—They fire every drop of gasoline with a powerful explosion.

—They are built to shun carbon and short circuiting.

—They carry with them the strongest possible guarantee—satisfaction or a new plug for any one proving defective.

DEALERS:

Send us your name and model of your car and we'll send you a Reflex Plug free for trial.

THE REFLEX IGNITION CO.
1711 Payne Ave.
CLEVELAND
OHIO





"KEEP THE CAR ON THE GO"

Friction starts Grinding before Grease begins Lubricating

Common grease needs heat to soften it before it can lubricate. The parts grinding together must furnish this heat in the shape of friction. Meanwhile these parts get no lubrication. And Friction—getting a good start—is *never* caught up with by grease.

TRADE MARK REGISTERED IN
NON-FLUID OIL
UNITED STATES PATENT OFFICE

Lubricates Instantly—and Always

NON-FLUID OIL lubricates the second your car moves from rest—and every minute it is in motion. Doesn't give friction a chance to start. It never melts, never leaks out, is much purer and longer lasting than any grease you can buy.

If you buy lubricants on the same basis that you buy tires—purely on *service*—you'll ask for NON-FLUID OIL *every time.*

Get "K-00 Special" grade for gears; "K-000" grade for bearings. Sold at your dealer's in orange-colored cans only.

Write for a free booklet, "Lubrication of the Motor Car."

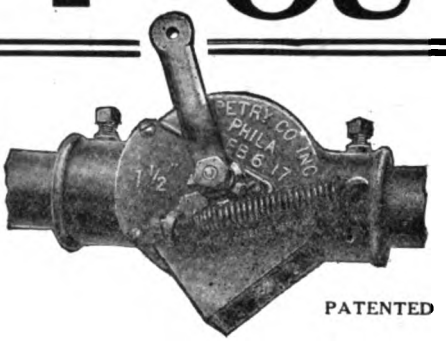
New York & New Jersey Lubricant Co.
165 Broadway New York City

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PETRY CUT OUT

"A **real** cut-out at last"—such is the opinion of every motorist who has tried the Petry.

Scientifically correct in every detail. Makes a **positive** cut-out through full-sized vent (the largest in the market) of megaphone shape, which materially increases the sound of exhausts. Positively no back pressure. Patented feature on control lever allows of seven adjustments, eliminating, in most cases, the use of pulleys. Easy to operate, easy to install. Spring so located as to be away from all heat. No strain on exhaust pipe. Each size accurately machined and fitted with set screw, making permanently rigid installation.



PATENTED

SPECIAL MODELS FOR FORDS, $3.50
(Including Pedal and Chain)

JOBBERS AND DEALERS: Write or wire at once. A handsome working counter display is sent with an order for 12 assorted sizes.

Sizes given are outside diameter of exhaust pipe

1½ inch to 1⅞ inch,	inclusive,	$3.50 each
2 inch to 2⅜ inch,	inclusive,	4.00 each
2½ inch to 2⅝ inch,	inclusive,	4.50 each
2¾ inch to 3 inch,	inclusive,	5.00 each

N. A. Petry Company, Inc.
1313 Race Street Philadelphia

DISTRIBUTORS:
Geo. L. Holmes, 1733 Broadway, New York City.
Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.
Hughson & Merton, Inc., San Francisco, Cal.; Los Angeles, Cal.; Portland, Ore.; Seattle, Wash.

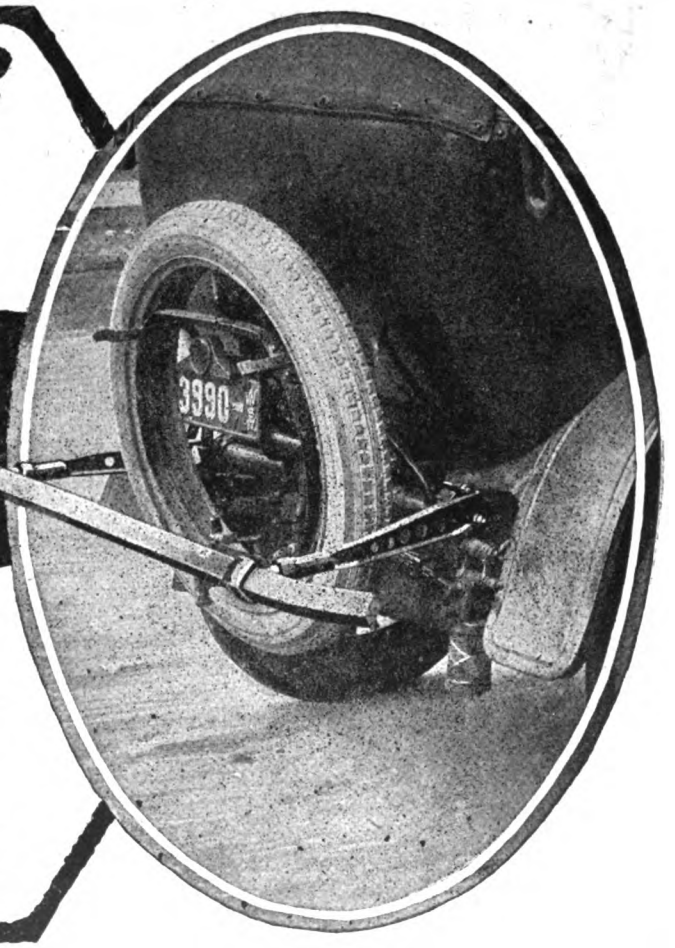
See That Bumper?

Let it double your bumper sales.

Every car owner knows that he's taking a big risk with the rear of his car if he hasn't a rear bumper. Sell him one.

Sell Him A

Gemco
MILWAUKEE
END THRUST BUMPER



for the rear of his car at the same time you sell him one for the front. Make two sales instead of one and double your profits.

Gemco Bumpers are built on the correct end thrust principle. Furnished in diamond or channel bars to fit all cars. Quickly attached.

Write to your jobber or direct to

GEMCO MANUFACTURING COMPANY
656 South Pierce Street MILWAUKEE, WISCONSIN
Popular Automobile Accessories

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THE most widely used and most satisfactory ball bearing in the world.

Materials and methods of manufacture far in advance of contemporaries, accuracy unequalled—secure this superiority.

Literature and mounting data upon request.

THE NEW DEPARTURE MFG. CO.
Conrad Patent Licensee
BRISTOL, CONN. DETROIT, MICH.

NEW DEPARTURE BALL BEARINGS

PYRAMID BRUSHES

For Starting Motors and Lighting Generators

Your line of automobile accessories is not complete if you do not carry a stock of Pyramid Brushes. There is a Pyramid brand brush for every starting and lighting outfit in use.

Are you prepared to equip your customer's car with a new set of brushes? Why not put in a stock and cash in on the profits?

Our new code list and special assortment sheets are ready for distribution. Copies will be sent on request. They tell you just what brushes you need for the cars that are popular in your vicinity.

NATIONAL CARBON COMPANY, Inc.
CLEVELAND, OHIO

It's Profitable to Fill Replacement Orders with Harvey Springs



It's decidedly good business to fill all orders for replacing broken springs with Harvey springs because you prove once and for all that you are giving the customer absolutely the best the market affords.

Men like to be put wise to a good thing and your recommendation of Harvey Springs makes a permanent friend of the customer—he'll come back to you again and again for other repairs and supplies.

The Harvey Patented Process of forming and tempering insures a quality that defies breaking or sagging. They are

Guaranteed from End to End Against All Defects

FREE

All Dealers, Garagemen and Repairmen should write for the Harvey Auto Spring Book, which contains a complete list of springs for all the leading makes and models of cars—gives sizes, weights, measurements, prices and other valuable information. We mail it free.

The Harvey Spring Co.
849 17th Street Racine, Wis.

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Reserve—

to meet that **extra strain** at a **critical moment**—or for a **sudden burst of power**—For the unusual punishment inflicted on Spark Plugs by the new type motor—This reserve is amply evidenced in

MASTER CALORITE SPARK PLUGS

Evidenced in the sturdiness of their construction—
In the new insulator built of Calorite, a powerful current-retainer and resister of crushing heat expansion or snapping cold contraction—
In the scientific design and thorough testing of every individual plug which provides positive protection against compression or electrical leakage.
In the high quality of all materials entering into their construction; tested and finally generously guaranteed to impress upon Jobber, Dealer and Motor Car Owner the **confidence and honesty of purpose** of the manufacturers of this plug.

Our Liberal Guarantee ["We guarantee Master Calorite Spark Plugs against all defects of material or workmanship and will replace free of charge any Calorite insulators broken by heat which are returned to us transportation prepaid."]

There is a Master Calorite Spark Plug for every variety of service—
And the retail price is amply justified by their quality and ability for service—

$1.00 and $1.25 Retail, depending upon the size

Dealers—Ask your jobber for full particulars on Master Plugs—
Jobbers—Let us co-operate with you in supplying your dealers' demands for this profitable line.

MASTER CALORITE SPARK PLUGS

Made in U. S. A. and guaranteed by

Hartford Machine Screw Company, 514 Capitol Ave., Hartford, Conn.



Master Calorite Spark Plug
Regular Length, $1.00 each

Parry Bodies

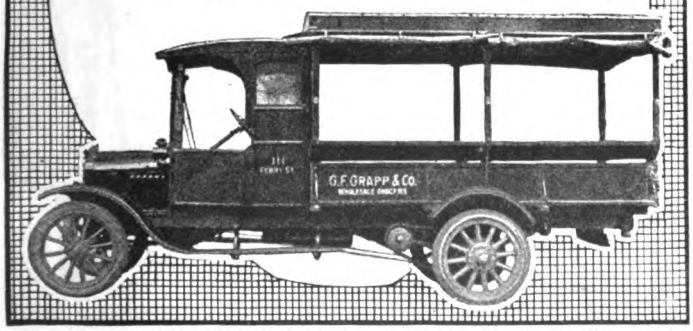
For Extension Chasses of Any Make

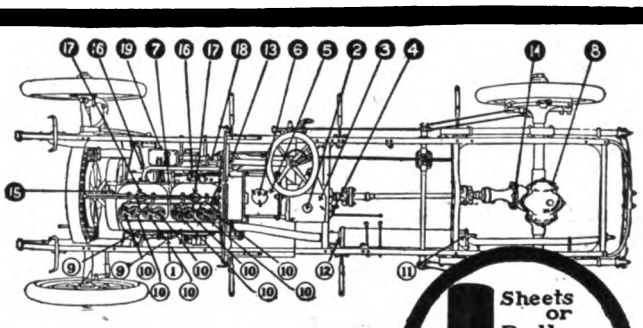
Parry Bodies are in service to-day in many lines of business over the country, on extension chasses of every known make.

Dealers have found the Parry Line a profitable one. And this for several reasons. The *complete* line is one; prompt shipment is another. And still another is the recognized combination of high quality and low prices.

There are yet a number of valuable territories open for a Parry dealer. Correspondence solicited from live wires. The Parry line is an excellent *side-line* to any sales agency or garage.

PARRY MANUFACTURING CO.
INDIANAPOLIS U. S. A.





Each Black Circle Means a Satisfied Customer

The growing sales of ENDURA—the water-tight, oil-tight, gasoline tight sheet packing—indicate that garagemen and dealers are feeling the good effects of putting *special-purpose* packing into cars where it is *needed*. And the fact that ENDURA weighs but *half* as much as other packings that *cannot do the same work as well*, suggests the profits and benefits arising from its use. Send this coupon for booklet containing chart, and free samples of ENDURA SHEET PACKING.

JOBBERS!
Many Jobbers stock ENDURA. Sign, check, and return this coupon for full sales proposition.

Jobbers Check Square ☐

ENDURA
Special-Purpose Sheet Packing

Name .....
Street .....
City .....
State .....

Endura Manufacturing Co.
6305 Eastwick Ave., Philadelphia

If you'll return this coupon, we mail the chart and samples

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U. S. Two-Stage Air Compressors U. S.

DEFINITE 14 ADVANTAGES

The following briefly described advantages of the United States Two Stage DE LUXE Automatic Air Unit place this outfit on a plane of refinement and superiority unequalled and unapproached by any other air compressor.

No. 1 *The Two Stage Feature.* Increases efficiency, requires less power and assures slow depreciation.

No. 2 *Intermediate Starting Tank.* Automatically permits motor to start against no pressure, thus eliminating the cause of burned out motors.

No. 3 *The Filtering Trap.* Extracts all moisture or oil, assuring pure, dry air, free from oil.

No. 4 *Automatic Control.* Maintains desired pressure in tank without any attention whatever.

No. 5 *Safety Valve.* Prevents overcharging of tank.

No. 6 *Intake Silencer.* Muffles the undesirable noise common to air compressors.

No. 7 *Inter-Cooler.* Prevents overheating of cylinders.

No. 8 *Cylinder and Crank Case En Bloc.* Assures perfect alignment and avoids leakage of oil.

No. 9 *Specially Designed Balanced Check Valve.* Makes an absolutely tight valve that will last practically a lifetime.

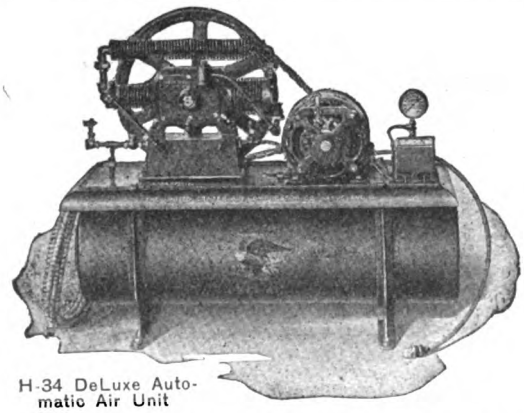
No. 10 *All Metal Base.* Cannot warp or split.

No. 11 *V Belt.* Quiet running, durable and eliminates use of idlers or belt tighteners.

No. 12 *Motor Adjustment.* Permits taking up any slack in belt by turning adjusting screw.

No. 13 *Outfit complete and ready to run* when pipe is attached and plug screwed into light socket.

No. 14 *An Unequalled Guarantee with every outfit.*

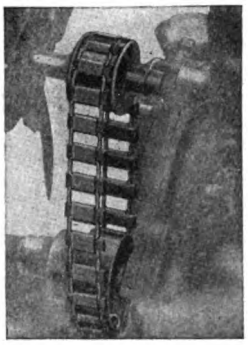


H-34 DeLuxe Automatic Air Unit

In addition to the air unit described above we manufacture a most complete line of air compressors of both Double and Single Stage. Literature on request.

The United States Air Compressor Co.
Carnegie Ave., Cleveland

U. S. Two-Stage Air Compressors U. S.



Walking on Your Uppers

If your shoe **soles** were made of the same material as the **uppers,** they wouldn't **last** very long—would they?

That's one reason why

Crowe Mechanical Fan Belts

will outwear any leather or fabric fan belts made—because the wearing surface consists of oak sole-leather blocks—the best that money can buy. Back of the blocks there is a steel chain - solid and firm, but smooth and flexible as a ribbon.

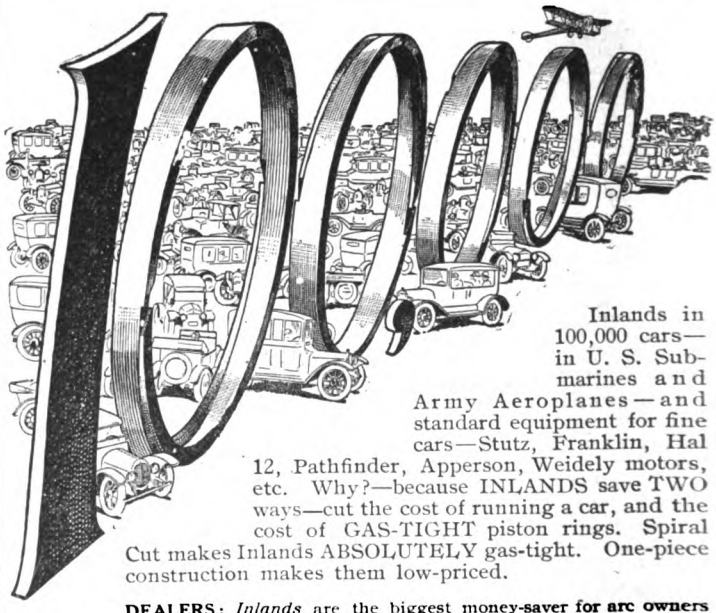
But there are many other reasons why CROWE FAN BELTS are better. If you are interested in keeping your engine cooler with less worry, time and expense, you ought to investigate at once.

Ford sizes $1.00 each

Free descriptive circular on request.

NOTE TO DEALERS—CROWE FAN BELTS are distributed through the legitimate Auto Accessory Jobbers and Dealers only. Let us tell you about our co-operative selling plan.

MECHANICAL BELT COMPANY
ST. JOSEPH, MISSOURI



Inlands in 100,000 cars—in U. S. Submarines and Army Aeroplanes—and standard equipment for fine cars—Stutz, Franklin, Hal 12, Pathfinder, Apperson, Weidely motors, etc. Why?—because INLANDS save TWO ways—cut the cost of running a car, and the cost of GAS-TIGHT piston rings. Spiral Cut makes Inlands ABSOLUTELY gas-tight. One-piece construction makes them low-priced.

DEALERS: *Inlands* are the biggest money-saver for arc owners and the biggest money-maker for YOU—write for proposition and for FREE Piston Ring chart, showing sizes for all makes and models of cars.

INLAND MACHINE WORKS
802 Mound Street St. Louis, Mo.



INLAND 1 PIECE PISTON RING

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The BEST that Money Can Buy



The majority of your customers will readily appreciate the difference between a *regular* tire pump and the numerous cheap makeshifts and cheerfully pay the extra price for the better article.

You can recommend the Imperial Wixon with the full assurance that it is big value for its price.

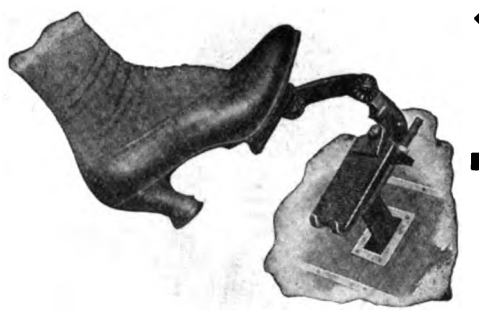
It pumps the *most air* with *least effort* and is made the Imperial way—right in every detail.

Every sale will net you a nice profit and make a satisfied customer.

Write today for prices and full particulars.

Imperial Brass Mfg. Co.
520 S. Racine Ave., Chicago

Imperial-Wixon Tire Pump



BRING THE PEDAL TO YOUR FOOT

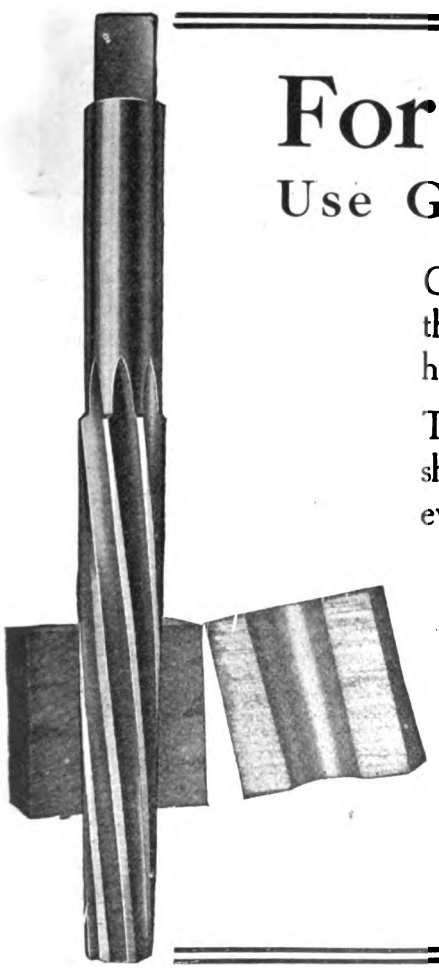
Why use a pillow to get the proper leverage on your brake and clutch pedals when PEDEX, the Pedal Extension, serves your want exactly.

Also, it does not interfere with the "longer legged" member of the family using the car, he (or she) uses the regular pedal as before.

10 DAYS' FREE TRIAL
When ordering—name the *make, model* and *year* of your car.

PRICE $5.00 PER SET

SLOCUM, AVRAM & SLOCUM LABORATORIES, INC.
AMERICAN CAR ACCESSORIES DEPT.
531 West 21st Street
NEW YORK CITY



For Smooth Reaming

Use G. T. D. Spiral Fluted Reamers

G. T. D. Reamers really *smooth* the walls of the hole because they are built with the left-hand spiral.

This construction causes them to produce a fine shearing cut and obviates all tendency to "hog-in," even when there are flaws and seams.

The result is a perfectly smooth, polished hole like that shown in the illustration.

This is only one of many G. T. D. tools. Ask for Catalog No. 37 showing complete line of Taps, Dies, Reamers, etc.

Greenfield Tap and Die Corporation
Greenfield, Mass.

New York, 28 Warren St. Chicago, 13 S. Clinton St.
London, 149 Queen Victoria St.
Canadian Factory, Wells Brothers Company of Canada, Limited, Galt, Ontario.

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IS SHE HEADED FOR YOU?

IN OTHER WORDS, DO YOU SELL

PIMBLEY'S AUTO-NEWER

Auto folks everywhere know and demand this unparalleled restorer of the auto's original finish.

Auto-supply stores, garages, drug and hardware stores can cash in on the reputation of **Auto-Newer.** Are **you** doing it?

It's not an oil, wax, polish or paste, but the master-renewer—and so recognized by an army of users. Retails at good profit for 50c and $1.00.

PIMBLEY'S AUTO-TOP-NEWER

is the supreme black, waterproof, weatherproof liquid for bringing back the youthful look to tops of leather, mohair and pantasote. Put on with a brush and stays on. Wonderfully good for leather seats, trunks, bags, and for axles, running board and other car parts. Retails at 50c—$1.00—$1.50.

WRITE US FOR OUR PROPOSITION.

PIMBLEY PAINT & GLASS CO.

Manufacturers **ST. JOSEPH, MO.**

Has Your Engine

the same operative power at all speeds, or is it handicapped by the ignition?



HIGH TENSION

SIMMS MAGNETOS

produce their most intense spark at low speeds in the retard and at high speeds in the advance—this means maximum efficiency and flexibility.

It's in the patented pole shoes.

Write for literature.



The SIMMS MAGNETO COMPANY

274 No. Arlington Avenue
East Orange, N. J.

MAXFER

THE WHALE FOR WORK

TON TRUCK

"DEPENDABLE"

Is what a dealer said when asked to name the MAXFER Co.'s new one-ton, worm-drive truck.

ELECTRIC STARTER
ELECTRIC LIGHTS
WORM DRIVE
BAILEY NON-STALL DIFFERENTIAL

The MAXFER Company will pay to any dealer **$100.00** who will suggest a better name than "*Dependable*" for this new one-ton truck.

Maxfer Truck & Tractor Co.

5025 So. Wabash Avenue **Chicago, Ill.**

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DON'T dislike the old car just because it looks its age. Give it new life with

"F-S" "Evernew" Auto-Body Enamel

It will give a bright, attractive finish that is hard and durable. Easily applied and doesn't show brush marks. Eight standard colors—special shades to order.

Send for color card

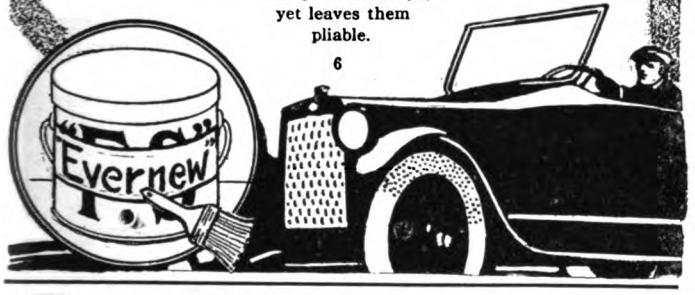
FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 North Fourth Street - Philadelphia

"Evernew" Auto-Body Dressing revives and waterproofs old tops, yet leaves them pliable.

6



PIERCE Governors

FOR FORD CARS

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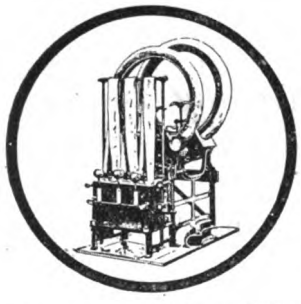
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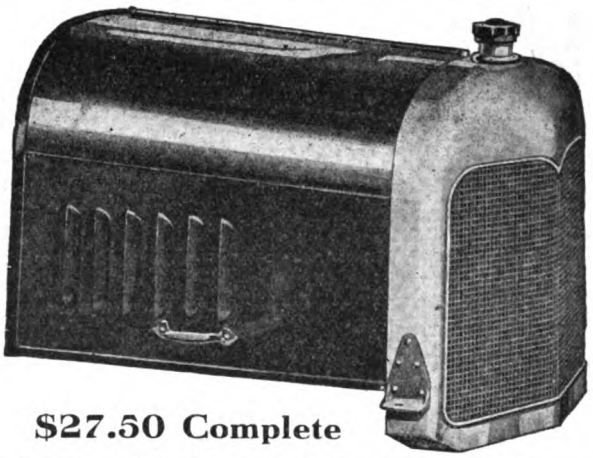
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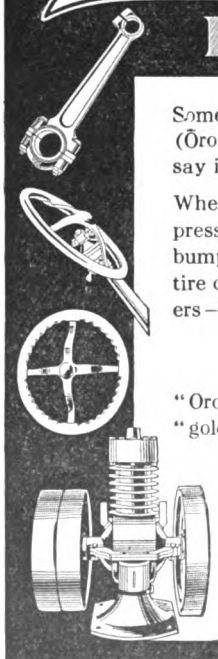
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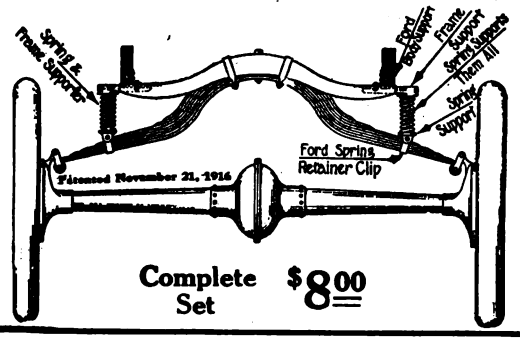
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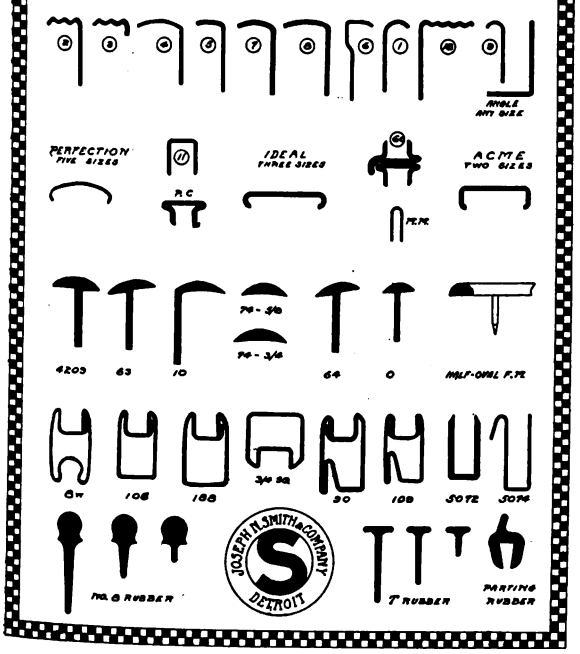
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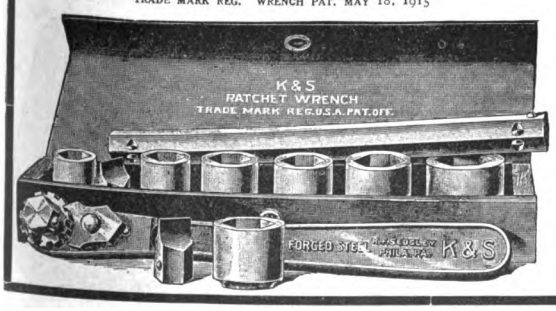
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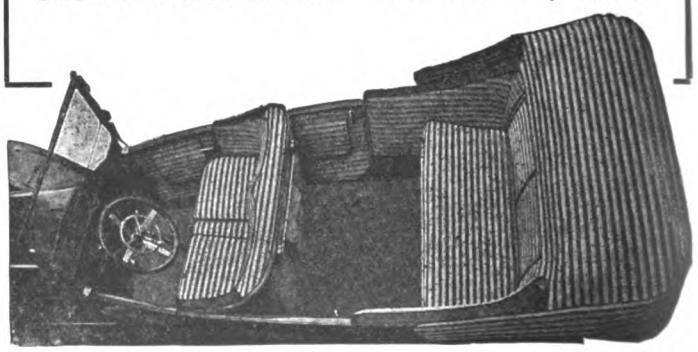
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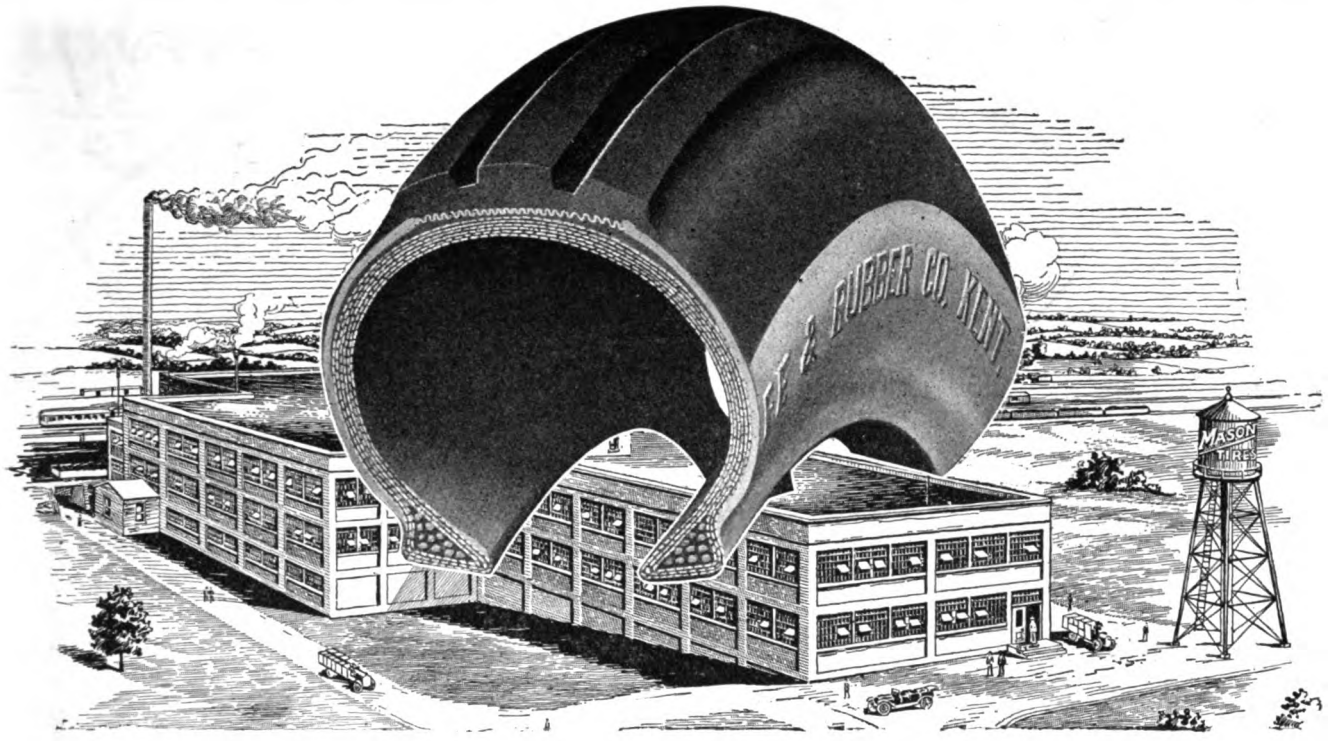
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Automobile Dealer AND Repairer

A JOURNAL OF PRACTICAL MOTORING

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BATTERY RECHARGING.

Lines of Force, Current, Coils, Speed and Variable Resistance.

BY SYDNEY F. WALKER, M. E.

No. 3.

Before going farther, it may be useful to explain as far as is possible what is meant by lines of force. As is well known, it was a conception of Faraday's, and he used the idea to enable measurements of different strengths of magnetism, and of magnetic fields to be made. He conceived that a number of lines were created in the neighborhood of a magnet, and inside the magnet, in which the power resided of causing minute steel magnets to turn in their direction, to lie along the lines of force; different strengths of magnets and of magnetic fields were to be measured by the number of these lines that existed in a given space. Modern electrical engineering has introduced very exact quantities, carrying out Faraday's idea. A line of force has the property of causing a minute steel magnet, the unit steel magnet, to lie along itself. When a current of electricity passes round a bar of iron it creates lines of force in the bar and in the immediate neighborhood, such that the minute steel magnets would be caused to place themselves at right angles to the direction in which the current is flowing. This means, of course, that when a bar of iron has a magnetizing coil around it, the lines of force are in the direction parallel with the length of the bar. As mentioned above, the number of lines of force is very large, and measurement is reached by supposing that a certain number of them from 10,000 upwards are accommodated in every square inch of an iron or steel bar, or any other part of a dynamo through which the lines of force pass, including the air space between the revolving armature and the field magnet poles.

Current for Lamps and Battery.

The problem is complicated by the fact that lamps require pressures of 12 volts or 6 volts, according to the system employed, while the current furnished by the dynamo for charging the accumulator might be 15 or 16.5 volts, or the corresponding figures for the 6-volt service. This part of the problem looks very awkward at first, and in the matter of train lighting plant, it has received special attention, an electrical resistance being always inserted between the dynamo, or the accumulator, and the lamps when the lamps are burning. With the automobile plant, in England at any rate, it has not been found necessary, the same properties of the shunt machine having overcome the difficulty, aided by special construction on the part of the lamp makers. The light is given out, in an incandescent electric lamp, by the Tungsten filament, which is raised to a temperature of 2,000 degrees C. odd. The amount of light furnished depends directly upon the extent of surface of the filament, and upon the temperature at which it is burning. An increase of pressure produces rather a rapid increase of light, because the increase of temperature is also rather rapid; the increase of temperature with a Tungsten filament lamp is at a lower rate than with a carbon filament, because the electrical resistance of the Tungsten filament rises with the temperature, and chokes back a portion of the current that would otherwise flow, while with the carbon filament the resistance falls with an increase of temperature, and so encourages a larger

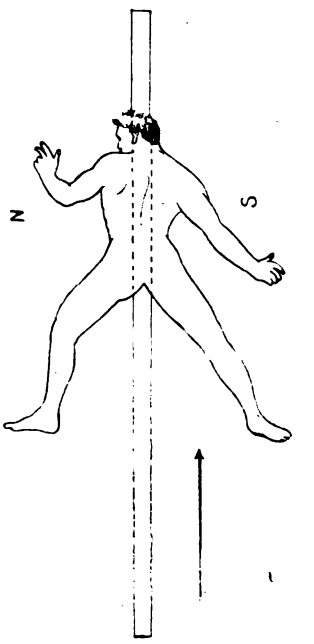


Fig. 12—Diagrammatic sketch showing how to tell in which direction a bar of iron or steel is magnetized, with a given direction of current flowing through the magnetizing coils. The experimenter is supposed to be swimming in the current, and in the same direction as the current is flowing; under those conditions the N. seeking pole is always on the left hand, and the S. seeking pole on the right.

flow of current. What lamp manufacturers had to consider was how to provide a lamp that would stand the pressures likely to rule at the brushes of the motor car dynamos without reducing its life, and without appreciably reducing the light given. The rapid increase of the temperature of the filament, due to increased pressure, seriously reduces the life of the lamp, while it increases the amount of light given, though only for a short time. As the writer understands the matter, the incandescent lamp makers have constructed lamps to run at 13 volts, or 6.5 volts, according to the system employed, and that, combined with the self-regulation of the shunt-wound dynamo, solves the problem. Supposing that a dynamo is charging the accumulator at the time the lamps are switched on; the increased current flowing through the armature will lower the pressure at the dynamo brushes, so that the pressure at

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the lamp terminals may not be above the 12 volts; if it is 12.5 volts, with lamps made for 13 volts, the life of the lamp will be considerably increased, while the light given will not be seriously affected. Under these conditions, too, the accumulator would commence to discharge, and to furnish part of the current required for the lamps, so that the pressure at the terminals of the lamps will be maintained at about the required figure. It should be mentioned that it is always wise to run electric incandescent lamps a trifle below the pressure they are made for, as it adds considerably to their life, while running them even a very small percentage above their pressure seriously reduces their life. From the moment current passes through a lamp, two actions commence, both of which tend to put it out of service; the filament itself tends to break up, minute portions of it being thrown off from its body, by the action of the current, and these minute portions are bombarded on to the inner surface of the containing globe. The result is, the substance of the filament becomes less and less, a smaller and smaller current passes through it, its surface being smaller and smaller, and therefore the light given by it being less and less; and the bombardment of the small particles of the filament upon the glass gradually obscures it, so that more and more of the light rays are absorbed by it.

In England 12-volt services are more the rule, while, the writer understands, in America 6-volt are preferred. So far as the incandescent lamp is concerned, there is a great deal to be said for the 6-volt lamp; the filament is shorter and thicker, and should therefore stand the vibration of the motor car better; on the other hand, the joint for a 6-volt lamp, though it is more easily made, may absorb more of the heat delivered by the current to the filament. One of the difficulties in the way of the manufacture of low-power incandescent lamps, to work with low pressure, is the fact that the two joints between the filament and the platinum wires leading to the lamp cap, and also the cap itself, absorb a considerable portion of the heat delivered by the current to the filament. It will be remembered that the filament is in mechanical connection with the joint, and with the lamp cap, and therefore there will be a flow of heat from the filament at the higher temperature to the joint and cap at the lower temperature. The cap will, of course, always be at a lower temperature than the filament, because it is dissipating heat to the surrounding atmosphere, and usually at a fairly rapid rate. Convection currents will be set up at the metal surfaces of the cap, which will carry off a considerable quantity of heat, and this will be intensified by the draught of air created by the passage of the motor car through the air. Of course, all this applies to the 12-volt lamp, but in that case the heat delivered to the filament is distributed over a larger area, and the mass of the joint is smaller.

Dealing With Variation of Speed.

In the writer's view, the variation of speed can be quite efficiently dealt with by the design of the shunt-wound dynamo; but a number of methods of handling the problem have been worked out, and he proposes to examine them in detail. The first method, and the one he believes to be more generally employed than any other, is the use of the "bucking coil." Like so many other expressive terms, it hails from your side of the water; and it means a coil of wire, consisting of a few turns of very much thicker wire than that employed for the shunt winding of the field magnets, the thick wire being also wound round the field magnets, but in such a manner that the action of the current flowing in it opposes the action of the shunt-field coils. The method is an adaptation of a very old device that has been employed in connection with continuous current dynamos, almost from the earliest period of their manufacture. When electric lighting was first introduced for buildings, etc., and separate dynamos were employed for the purpose, the shunt-wound machine was at first made use of; but the fall of pressure at the brushes, as the current furnished by the dynamo increases, made the arrangement very inconvenient. It meant that as lamps were turned on, the light given by each individual lamp became less and less, unless the speed of the dynamo was increased at the same time, which, of course, could not easily be done. To meet the case, a few turns of thick wire were wound on the field magnets, outside of the thin wire coils of the shunt winding, and the whole of the current flowing to the lamps passed through these thick wire coils. The thick wire coils were calculated to create a sufficient number of lines of force in the armature core, and the space in which it revolved, to make up for the drop in pressure at the brushes; that is to say, to bring the pressure at the brushes back to the normal figure. The magnetizing effect of the series coil, as it was termed, was also arranged to provide for the drop in pressure due to the charge for the passage of the lamp current through the series coil itself, the pressure at the brushes was made a little above the normal pressure, when the lamps were in use, so that the pressure on the lamp service remained constant.

It is obvious that the series coil can be made to reduce the number of lines of force in the armature core, etc., by causing the current flowing in it to act in the opposite manner to the current flowing in the shunt coil. Perhaps a little explanation may be of service here. When a current of electricity flows through a wire that is coiled round a bar of iron, such as the core of the field magnet of a dynamo, it makes one end of the core north seeking, and the other south seeking. There are many methods given in the text books for distinguishing which end of the core will be N and which S; but the following is the one the writer prefers. Imagine one's self to be lying on a wire through which a current is flowing, one's body if necessary being doubled round the iron core, and imagine the current to be flowing along the wire from one's feet to one's head, as shown in Fig 12; the N pole will always be on one's left hand and the S pole on one's right hand. In winding the coils of the field magnets for dynamos the wire is coiled on in exactly the same manner for both the core which has its N pole facing the armature, and that which has its S pole facing it; the current is directed in the proper direction to make one north and the other south, by connecting the ends of the coils so that the flow is in the direction required. In practice the coils fall into place without any difficulty, because they are opposed in position within the containing cylinder. It will easily be understood that by winding the coils of thick wire in the opposite direction to the thin wire

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coils, a portion of the magnetizing effect of the thin wire coils may be neutralized; it will be seen also that as the current flowing in the thick wire coils is very much larger than that in the thin wire coils, a comparatively few turns of the thick wire coils will do all that is required. It will be remembered that the magnetic pressure is measured by the ampere turns, the product of the number of turns of wire through which the current is flowing, and the strength of the current itself; thus supposing there are 1,000 turns on the shunt-wire coils, and the current flowing in them is 1 ampere, the magnetic pressure will be 1,000 ampere turns. If the current flowing to the accumulators and the lamps is, say, 10 amperes, it would only need 100 turns to completely neutralize the magnetic effect produced by the shunt coil. In practice, of course, only a few turns are employed, as the effect required is only sufficient to neutralize the surplus pressure, the surplus lines of force due to the surplus speed and the surplus speed itself. Ten turns, for instance, would

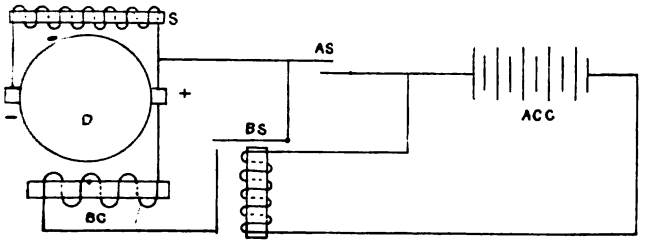


Fig. 13—Diagram showing the connections of the writer's proposed arrangement for bringing the bucking coil into operation when the pressure reaches a figure that would overcharge the battery. To fully complete the sketch a line should have been drawn down from the extreme left and along the bottom to the coil under the letters BS.

give a "bucking" pressure of 100 ampere turns, which would probably be sufficient for all purposes. But in the writer's opinion there is a serious drawback to the use of the "bucking coil" in the manner in which it has generally been employed, viz., with it always operating, from the moment the auto switch closes the outer circuit, connecting up the dynamo to the accumulator. A little consideration will show that if the "bucking coil" is always connected, it will be acting against the shunt coils from the moment the auto switch cuts in, and therefore the magnetic pressure produced by the shunt coils will have to be greater than would otherwise have been necessary, in order to allow for the neutralizing action of the "bucking coil." This means that the efficiency of the machine will be lower, and there is not much room for a lowered efficiency in these small machines; it is necessarily rather low at the best. And there is another point that may be rather serious; the magnetic pressure produced by the shunt winding of the dynamo depends directly upon the gauge of the wire, and nothing else; it increases as the gauge increases, and vice versa. Adding to the number of turns of a shunt winding does not add to the magnetic pressure the shunt coil produces, because the increased number of turns are balanced by the increased resistance of the additional length of wire used; it may happen also that an increased length rather lowers the magnetic pressure, because as it will be applied on the outside of the coil, its magnetizing effect on the core will be less than that of turns nearer the core, while the length of each turn will be greater than those nearer the core. In practice it is taken as an axiom that the magnetic pressure varies with the gauge; and if the "bucking coil" had any appreciable effect upon the magnetic pressure, it would mean that a larger gauge of wire would have to be employed for the shunt coil, taking a larger current, and lowering the efficiency of the machine. Incidentally, it may be mentioned that the bucking coil has been employed by firms in the United Kingdom who have used permanent magnets in place of shunt-wound field magnets for the dynamo. The permanent magnet is a fairly good equivalent, under certain conditions, of the shunt-wound field magnet; it is not such a good method of construction, in the writer's opinion, but it was fairly worth trial. The use of the "bucking coil" would render a larger permanent magnet necessary, if the bucking coil was always in operation. The writer believes that the permanent magnet method of construction of the small lighting dynamos for motor cars has not survived; it would have another somewhat serious defect, the magnetism tends to be gradually lessened with time. Modern permanent magnets, in which tungsten is employed as an alloy, are very much better than the old-time permanent magnet; they take magnetism much better, and, what is of more importance, they hold it better; but they do lose something, some portion of their ability to project lines of force into the armature core with time; and that would mean a lowering of the pressure. Also, except in special cases, dynamos made with permanent field magnets usually have to be larger and heavier than those made with wrought iron or special magnet steel for the armature cores and containing cylinders.

The writer suggests that the bucking coil would answer very well indeed if it were brought into operation, when the pressure furnished by the dynamo was too great for the accumulator, say, to prevent overcharging, and if necessary to prevent the accumulator receiving 2½ volts per cell when it only required 2.2 volts. In the systems of train lighting by electricity, an overcharge preventer is nearly always provided, but it is usually worked by reducing the current flowing in the shunt-field coils. In one system, however, one of the earliest on the market, the bucking coil is only brought into operation under certain conditions, to prevent the rise of pressure after a certain figure is passed. The writer suggests that by placing the bucking coil under the control of an electro-magnet, in a manner similar to that employed for the charging current of the accumulator, it might be made to do useful service. Fig. 13 is a diagram showing the connections of the suggested arrangement; the electro-magnet shown would be energized by a shunt current from the dynamo, or the accumulator, in a similar manner to that of the automatic cut in and out switch; but it would be set to operate at a very much higher pressure than the automatic switch does; say, at 2.5 volts per cell, and it would then connect the bucking coil to the brushes, and to the accumulator, the current flowing round it neutralizing the proportion of lines of force required to keep the pressure down. By this method the efficiency of the dynamo would be increased, and the number of turns of the bucking coil required would probably be less; the working of the system should also be very much more efficient.

Reducing the Current Flowing in the Shunt Coils.

This is another method which is rather a favorite; one form of it was described in the Automobile

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Dealer and Repairer of January, in connection with the North East Starting and Lighting System. In the early days of motor car lighting by electricity, another method employed was to throw in a resistance, into the circuit of the shunt field coils, by the aid of a centrifugal governor carried on the axle of the dynamo; the writer believes that that method has been given up, in common with that of regulating the voltage, by the aid of a slipping belt. It is perhaps interesting to note that the slipping belt is still employed in one of the systems of train lighting by electricity in the United Kingdom, the one that was earliest on the market, but that the bucking coil has been called into service to assist. Several of the systems of train lighting have methods of maintaining the pressure constant, by increasing and decreasing the resistance of the circuit of the field magnet coils. It will be understood that by inserting an artificial resistance in the circuit of the shunt field coils, the strength of the current flowing is reduced, and with it the magnetic pressure. Suppose, for instance, in the case given above, where the current in the shunt-field coils was 1 ampere, and the number of turns 1,000; if the current is reduced to 0.9 ampere, the magnetic pressure will be only 900 ampere turns; and if the speed has been increased 10 per cent., the pressure at the brushes should be maintained about normal. The working of a variable resistance, however, is exceedingly difficult, and particularly under the conditions ruling in a motor car, where the space is limited, and where it is not easy to arrange for the usual rheostat.

(To be continued.)

GARAGE AND REPAIR WORK.

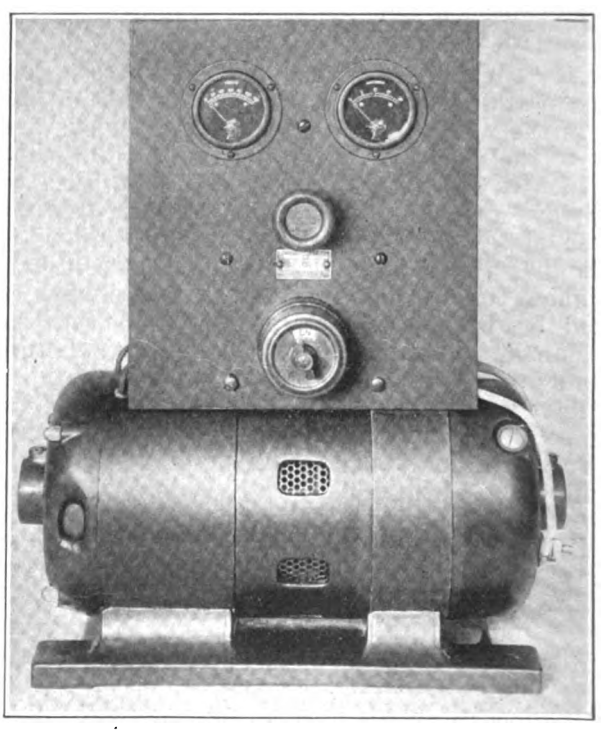
Electric Power—The Current, the Fire Risk, the Voltage and Speed Control.

No. 3.

From J. F. Springer, New York.—The writer has already treated the gasoline engine and the steam engine. Both have their fields, which partly overlap and are partly outside of each other. There is a third type of power unit suitable for the shop. This is the electric motor. Naturally, it has its advantages and disadvantages, just as we found it to be the case with the others.

One of the advantages of the gasoline engine is possessed by the electric motor in a still higher degree. The gasoline engine need run only when its power is being used. So also with the electric motor. But since we may, if we choose, divide up the total electric power required amongst several units, we are able not only to limit the expense of power operation to the period when power is actually required, but we can go a step further and limit it to a small group of two or three machines or even to the one single machine it is desired to operate. This is a very considerable advantage, especially in a repair shop where only one or two machines are likely to be needed at a time. In brief, we use up current on the job and not on running the whole line shaft. This may be very important. Then, again, it may have but little importance. It depends upon the conditions in the particular shop.

What is sometimes a disadvantage in using electricity is the fact that the motor must have current supplied to it. If there is a central power station in the neighborhood, then this often becomes an advantage, for the reason that no fuel has to be handled at or near the shop. There is no boiler fire, no gasoline ignition. However, many shops may have difficulty of getting current at the time of day they want it. For example, there may be a municipal electric light plant which is willing to sell current, but only has it on tap at night. The conditions are then severe. In many cases, perhaps most, the thing to do is to turn to steam, gasoline or something else different from electricity. But there are still other cases, where electricity will probably on the whole seem the most desirable thing. The current obtainable at night may then be stored for daytime use. The storing of electric power or energy is the function of the electric storage battery. By means of this piece of apparatus we may utilize the energy at any time we choose; but naturally it costs something to get this privilege. That is to say, when we put one kilowatt-hour into a storage battery we are not to count on getting that much energy out. We put in so much, we get out a less amount. It may or may not pay to do it. That depends on circumstances. The shop may be so situated that the cost of power is not the chief item. It may be permissible to pay a good stiff price in order to secure the advantages. We must not get the idea that storage batteries are used only for small matters like the lighting of lamps on an automobile, etc. Storage batteries are used in part for supply-



Type MIC Form D 750 Watt Battery Charging Set with 110 Volts 60 Cycle Motor and 72 Volts Generator Complete with Switchboard Panel.

ing energy for operating railway trains in the tunnels beneath the Detroit River. One of the electric light companies in New York City has an enormous storage battery ready to go into service the moment a breakdown of the ordinary plant occurs. Street cars are run by storage batteries. So, it is no wildcat suggestion that storage batteries may be very

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suitable for certain shop conditions. In considering the storage battery as a possibility, it should be borne in mind that we cannot employ alternating current when charging the battery. If alternating current is all that is available and a storage battery is to be used, then it is necessary to convert the alternating current into direct current. This may



Type KT-5 HP-1800 R.P.M.-440 Volt-3 Phase-60 Cycle Bd-2 Motor Driving Machine Shop of Main Cannery, Pacific American Fisheries, Bellingham, Wash.

be done by means of a mercury rectifier or a generator set.

In general, it will be best for the shop not to generate its own current. Ordinarily, it should buy current or use some other source of power. Usable current is of two kinds—direct and alternating. Motors are built, some to use the one, some to use the other.

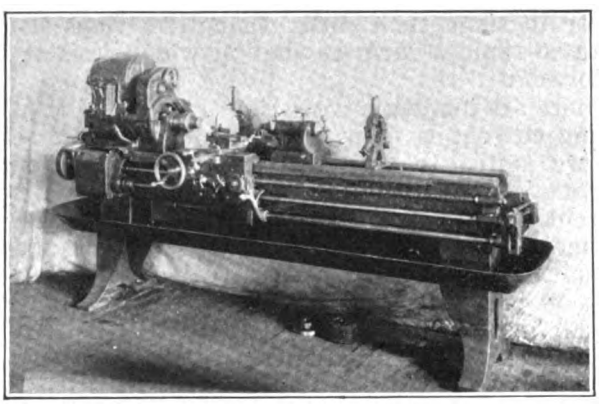
While it is generally inadvisable to generate the current for a small shop, there are one or two classes of exceptions. Sometimes, it may be that a good deal of current will be used, partly in the shop and partly in other service. The shop owner may want electric light in his own home and may in addition have opportunity to sell current for light or other services to people nearby. It may then be an economical thing to have his own generating plant, consisting, say, of a gasoline or steam engine, a switchboard and a generator. If the plant is to be run at a different time from that when the current is to be used, then a storage battery must be added. If the total amount of current that is going to be used amounts to enough to require 30 or 40 or more horse-power hours of power per day from an engine to run the generator, then it may be well to look into the possibilities and costs of generating current.

Before leaving the topic of the generation of one's own current, it will be well to have before us this caution: We should not adopt a low-voltage system unless the distance between generator and motor is short. The reason turns on the cost of transmission wire. If we were engaged only with the problem of running a few electric lights, we might easily do so with a 32-volt system. That is to say, if our generator produced current of this voltage, we should have a satisfactory way of running the lights, the distance of transmission being, say, not over 300 feet. If now we want to transmit energy enough to run turning lathes and the like, the wires will have to be greatly increased in size in case we use a 32-volt system. A higher voltage enables us to use moderate sizes of wire. Take an example: Suppose we want to transmit a total of 6 or 7 horse power. We can do it with a moderate size of wire, if we use a 100-volt current. If, on the other hand, we use the 32-volt current, this wire will have to have a cross-section nine times the area of the wire for the 100-volt current. If the distance is considerable, then nine times as much copper in one case as in the other means a serious item. However, a storage battery for the lower voltage would cost somewhat less than for the higher and thus create more or less of an offset.

As to the fire risk. Is there any substantial advantage favoring low voltage? It is claimed that there is not, the reason advanced being that the National Board of Fire Underwriters makes no distinction in their requirements as to wiring for 30-volt and 110-volt circuits.

A considerable argument in favor of the 110-volt system is that whatever equipment in the way of lamps, motors, etc., is employed is then standard equipment. If central station current becomes available later on, the change from the current from one's own generating plant to that from the station will be likely to be an easy one. Tungsten lamps for 110-volt current are now being made sufficiently rugged to meet the conditions on inter-urban street railway lines; so that one need have no fear of trouble because he sells 110-volt current to homes and stores.

Ordinarily, however, current will be bought. The thing that will have to be decided is whether a



Whitcomb Blaisdel 14" x 8' Lathe Driven by Type RL-53-1 HP 500/1500 RPM 250 Volt Motor

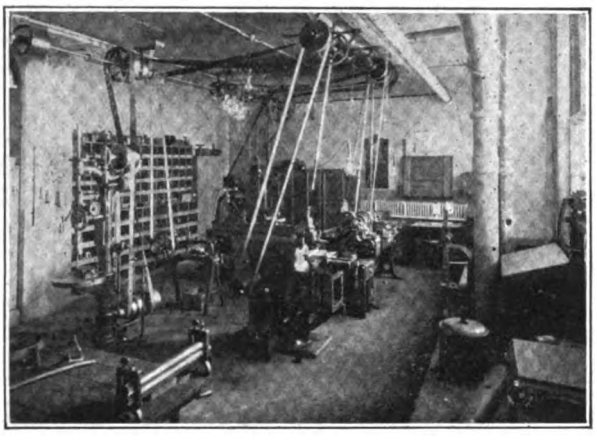
single motor is to operate the shop or whether smaller motors are to be used for individual machines and the like. The single motor is a very good thing, if the line shaft is not long and does not require much energy to rotate it. All we have to do then is to throw on the belt which will set the proper countershaft or proper machine in opera-

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tion. There are cases, however, where it will be better to install a motor for each machine or each countershaft. The floor space of a motor is a small matter. Sometimes they are mounted on the machine itself and do not stand on the floor at all. At other times the motor will be attached at the wall or even the ceiling.

There are quite a number of advantages claimed for the electric motor. I mention the following: Few parts to get out of order; just two bearings to watch; constancy of speed as compared with the gasoline engine; there is no water to freeze; as readily started up in cold weather as in warm; weight per horse-power capacity very small; obtainable in very small sizes. Where individual motors are used, we eliminate a good deal of belting. There are no belts from line shaft to countershaft, nor from countershaft to machine. There may, however, be a belt from motor to a drive pulley, depending upon the particular arrangements. In fact, a belt is not a bad thing to have somewhere. In case of an overload on the machine, the belt can slip. This may avoid breakage of cogs.

The fact that a motor naturally generates its power in the form of a rapid rotation may often be



Type KT 3 HP-1800 RPM Motor in Machine Shop of Burnham and Morrill's Canning Plant, Portland, Maine.

advantageous. As a rule, the smaller machines want power in some such form, though perhaps not in quite so rapid a form as that in which it is in the motor shaft.

There are numerous varieties of motors. If alternating current is to be used, then one must select motors suited to this type of current. If direct current is available, then one may choose a direct-current shunt-wound motor. This variety has the commendation of Professors F. B. Crocker and M. Arendt of Columbia University. They state in their book on electric motors in effect that the conditions of the individual machine tool is best met by a direct-current shunt motor, since the speed of such a motor may readily be controlled.

Speed control is an important matter, since in a turning lathe, for example, one should vary the speed as the cut being made gets closer and closer to the axis of the spindle. That is to say, as we cut more and more towards the center, it is permissible to rotate the spindle faster and faster, since the amount of metal removed in a circuit is getting less and less. With the feeds the same, we cut off just about half as much metal in a turn when we are half-way in from the circumference to the center as we do when cutting at the circumference. We shall be wasting time and opportunity if we neglect this fact. By properly increasing the speed we can keep the lathe up to its duty.

There is, however, another way of getting the lathe spindle to rotate faster. We may do this without changing the speed of the electric motor. That is to say, we may provide for the change, just as we do in the case where we use line shaft and countershaft, by means of the cone pulley and also by means of back gearing. We may, in fact, use the motor to operate the countershaft instead of the machine; or we may drive the machine through the agency of a gear box and thus get speed variations.

A word or two as to safety. Of course, the wiring and everything connected with the transmission of the current should be done in the most approved manner. As to just what is such a manner, one can depend very well upon the regulations imposed by the National Board of Fire Underwriters. These regulations represent what the fire insurance people think—that is, what they think in so far as fire hazard is concerned. While they are presumably not gotten up with a view to preventing personal injuries, still when liability to fire is provided for, we have at the same time a good deal of protection for people as well. But this is not enough. Note, then, in the case of a motor whose purchase is contemplated, whether the operator and other persons will be protected against the current. Raise this question, and do not be convinced unless good and clear reasons are set forth. We are living in a day when safety devices of all kinds and descriptions are in successful use. It is much better to prevent trouble than to try to cure it after it has occurred.

(To be continued.)

THE HIGH COST OF AUTOING.

It Will Be Largely Found in the Scattering of Junk and Bolts on Road and Street.

From H. C. Brokaw, Principal Y. M. C. A. Automobile School, New York.—If some of the auto owners and chauffeurs do not mend their ways, some of the city streets will be paved with a mixture of asphalt and auto parts. If you do not believe this, look at the pavement on the busiest streets and see what a collection of junk you will find strewn along, particularly at corners where many cars make sudden stops.

To illustrate, the other day I noticed a car stop and the driver wondered what was the matter that the engine had no power. He happened to be near a garage and called for a mechanic to look at the engine.

"A few minutes ago," he said, "the engine had so much power I couldn't stop it when I wanted to, and now I can't make it pull at all."

When the mechanic had given it a "once over" he said to the driver:

"Open your throttle."

"The throttle is open," was the response.

"Oh, I see," said the workman, and he went back to the garage, hunted up a small bolt with which he connected up the throttle linkage so that the lever and accelerator pedal would open the throttle when

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moved. What had happened was that through neglect the bolt had worked loose and dropped out, so that the lever did not move the throttle arm and advancing the lever had no effect.

The bolt probably is one of those to be found imbedded in the pavement somewhere about the city. An examination of the pavement of any of the automobile thoroughfares will reveal nearly all the 57 varieties of auto accessory parts in the asphalt. A great many of the bits of metal found there will be broken skid chain links, but I counted 26 different species of other lost parts in crossing Fifty-seventh street at Eighth avenue.

While I was counting them a driver came along and was unable to stop his car properly—the brake did not work and he had to use the emergency brake after nearly running over a pedestrian. He got out and found that a pin was gone in the brake linkage. A spring cotter had worked out or sheared off and the pin had rattled loose and dropped out.

Many of the stray parts are of a similar nature, nuts, bolts, washers, screws, cotter pins and the like which have worked loose because of neglect. Their absence will account, doubtless, for a good many of the rattles and squeaks which their former owner is now complaining of, and to replace which he will pay the garage man several times their value.

I have seen the pin holding in place the tie rod which keeps the wheels in alignment drop out, and in another case, hunting a knock found the cylinder loose on the base because the nuts had been without lock washers or cotter pins and had worked loose. They might, in time, have worked off entirely and then there would have been a "cylinder missing" for sure. I have also seen the entire engine loose on the frame so that it was doing a fox trot while being run.

The average instruction book given with a car will advise the owner to go over the car every so often and tighten up the bolts and nuts as a precautionary measure, but usually no attention is paid to this until the car stops or develops some unusual sound. Then a mechanic is called in and it takes him a couple of hours to find the cause of the trouble, while the owner stands around cussing the maker of the car.

Probably a good many of these parts along the road are due to careless mechanics who drop small parts in the dust pan and will not take the trouble to fish them out, or leave them on the running board and after a time they jar off to the street; but it shows there is a lot of carelessness among drivers when they even lose number plates and hub caps. I have a pair of brass hub caps picked up along the road which I have turned into ash trays.

The loss of hub caps allows grit to get into the bearings, and to prevent this as far as possible by making the driver take care of them, the manufacturers have made the prices of these parts entirely out of proportion to their real value.

Some of these lost parts are of such shape that they would very readily puncture a tire, so that they are not only a loss to the owner of the car from which they are dropped, but the fellow who follows picks them up for a punctured tire.

The owner should become so well acquainted with his car that he knows where the different bolts and nuts are. Many will tighten up all they know about, but do not bend their backs to get underneath where they can see the dust pan bolts and brake linkage bolts. If the owner knows where these parts are he should make it his business to see that every bolt and pin is locked with a lock washer or cotter pin. Then he should go over them at least once a month and tighten them up. He may be sure he will pay several times their value and a mechanic's time if they are lost, so that economy is involved as well as the inconvenience of having the car stopped on the road.

FUEL AND THE DRIVER.

How to Run the Car With the Least Possible Consumption of Gasoline.

F. C. Mock at the Midwest Section Meeting of the S. A. E.—It has been suggested that this paper discuss the subject from the standpoint of the carburetor engineer. It has been a peculiar development of automobile use that the carburetor builder is held continuously and directly responsible for the performance of his product, on whatever car it is placed, and his viewpoint is therefore closely that of the car owner. And since the ordinary driver's requirements of car performance are sometimes different from those of the automobile designer, a consideration from the former's viewpoint should be of definite value.

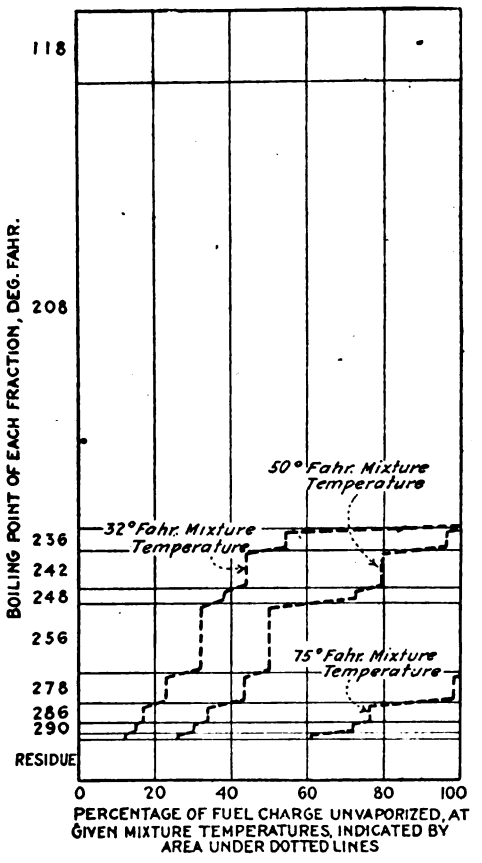


Fig. 1—Composition of 72-deg. B. "Straight" gasoline, paraffin base—from Pennsylvania District.

In the relatively short time of development of the automobile there have been many marked changes in the fuel use. In the early days, from 1902 to 1905, there was no fuel problem; gasoline was a by-product and so volatile that it only required proper metering with air to give efficient performance; with a normal running mixture the engines would start, cold, on the second or third half turn of the crank.

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It was about 1907 that we began to have some difficulty starting with the hand crank, and to find it necessary to make the mixture adjustment a little richer for easy starting. A short while later we began to notice that an engine would not run quite the same cold as it would after it warmed up a bit. About 1909 it began to be evident that there was something in the engine that seemed to demand a graduation of the mixture. Power and flexibility seemed to demand more gasoline in the mixture than was necessary simply to keep the engine running smoothly. We began at this time to have definitely more trouble with carbon in the cylinders. There was not much difficulty with intake manifold design until we commenced to use more than four cylinders. About this time it became common to water-jacket the carburetors.

By 1912 the fuel had grown so much heavier that the self-starter was a necessary feature. Practically all carburetors were fitted with some special device for giving a richer mixture for starting. Although the carburetor makers had now practically solved the problem of producing a uniform mixture it was found that this was by no means sufficient to make the engine run, and they began to develop devices for graduating the mixture according to the evaporating conditions in the intake manifold. For instance, means of making the high speed mixture richer than the low speed by the use of separate adjustments and of devices for giving more gasoline on acceleration. At this time we began to have marked difficulty in making the cars run properly in the winter time. We felt that this difficulty was not due to a defect in the carburetor, although the public generally did not agree with us.

The fuel conditions during 1915 and 1916 are recent in our memory. About this time the gasoline began to contain elements boiling above 350 deg. F. and nearly everyone commenced to have trouble with gasoline getting into the crankcase, thinning out the lubricating oil and cutting the bearings. These years also marked the beginning of a period when the automobiling public and automobile engineers generally began to appreciate the difficulties under which the carburetor men had been working. The importance of this subject became more fully appreciated and in the last few months there has been a great deal of improvement in the design of intake systems. Practically all new intake manifolds are hot-water jacketed or have the exhaust heat on some portions of their surface, while practically all carburetor installations provide for a warm air supply.

Unfortunately these improvements are difficult to apply to engines already built, and many cars four or five years old, in the best of shape mechanically, are unusable through six months of the year because they cannot handle the present fuel.

The fuel situation in the country as a whole is further confused because of the variation in quality. In some localities the gasoline is as good as that used say in Chicago fourteen years ago; in other places it is similar to that used there ten years ago. The variation is so great that one single design of fuel intake system can rarely give good operation in all parts of the country.

Essential Properties of Automobile Fuel.

These differences in operation are not due to any deficiency in thermal energy, because all these gasolines have nearly the same calorific value, but rather to a deficiency in volatility, which interferes with the method by which they are delivered to the firing chamber of the engine.

The force that drives the pistons of our engines is derived from the combustion of the oxygen of the air charge in combination with hydrocarbon vapor

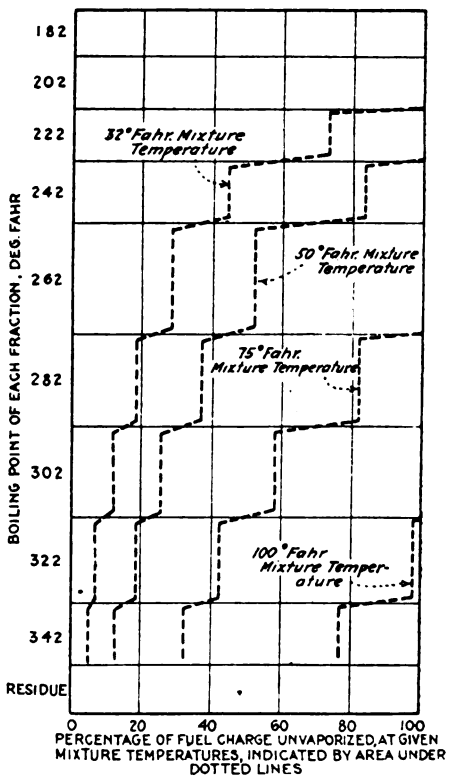


Fig. 2—Composition of 56-deg. B. gasoline used in mid-west auto section. Mainly paraffin base.

generated from the gasoline. The air is drawn into the cylinders by the suction stroke of the piston, from a common passage or manifold, while the gasoline is sprayed into this incoming air, at a chamber at the manifold entrance, which chamber we call the carburetor. Such parts of the gasoline as are sufficiently volatile evaporate into vapor and enter the cylinder along with the air. These volatile parts composed about 100 per cent. of the early gasoline, but this percentage has diminished until now, with our Mid-West fuels, only about 40 per cent. can be evaporated under the average operating temperatures.

The disposition of the unevaporated part of the gasoline depends on the velocity of the air carrying it, also upon the nature of the path along which the air must travel and, to a slight degree, upon the fineness of atomization of the gasoline drops. When the drops are small and the air velocity is about 20 feet per second, they are carried in suspension along with the air so that the effect is practically the same as if the gasoline were evaporated. When the velocity is lower than this, it is much easier for the drops to fall out. This collection or condensation is facilitated when there is a tee-bend or elbow in the manifold; the gasoline particles naturally proceed in their initial direction of motion until forcibly deflected from it by the wall on which they strike. As soon as the drops strike the wetter wall they are subject to surface tension and from then on they

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cling to the wall of the intake manifold and pass along in a stream. If the air velocity at the bend is sufficiently high, about 50 feet per second, it will wipe much of this liquid part off the walls again and carry it along with the air.

Whenever the gasoline is carried in suspension with the air, it is easy to get good operation with any of our gasoline fuels. When the gasoline is not carried by the air we have trouble. For engines that run at a constant speed it is easy to design the intake manifold to have the requisite air velocity at that speed. With an automobile engine, however, the air velocity at the highest speed is about twenty times that at idling speed, and it is impossible to select an intake manifold size that will be equally efficient under all conditions.

What Gasoline Actually Is.

"Gasoline" is not a liquid of fixed and inflexible composition such as water or benzol, but is more nearly a trade name applied to whatever components obtained in the refinement of crude petroleum as are deemed possible to use as an automobile fuel. The crude petroleums obtained in different parts of the world are greatly different and this difference extends to the composition of the gasoline derived from them. When the heavier products are "cracked" to make lighter ones, still further variety is found. All these, however, are capable to complete combustion in an automobile engine if properly vaporized, and further have nearly the same number of heat units per pound.

On account of the extreme difficulty of accurate chemical analysis it is common to judge the composition of these fuels by the process of progressive distillation. A measured quantity of the gasoline to be tested is put into a flask and heated. As the temperature rises a point is reached when the liquid begins to boil. The boiling continues, with nearly stationary temperature, until all of the elements that boil at that temperature have been converted into vapor, which is conducted away from the flask and collected in a condenser where the quantity can be measured. If the temperature is then raised another boiling point will be found and another portion distilled off, and so on.

Figs. 1, 2 and 3 show the proportions distilled off at different temperatures in three samples, which are typical of the fuel commonly used in different sections of this country. The diagrams have been made in such a form that they can be conceived as representing what would happen in a barrel of gasoline if it were possible to separate the elements according to gravity. The lighter elements are at the top, the lower ones at the bottom and the included area represents the relative volume of each present. It will be noticed that the Eastern gasoline and the Mid-West gasoline are quite closely graded as to the percentage of each element present, while the Western gasoline contains an extremely large percentage of the element that boils at about 280 deg. F.

The exact boiling point and the exact proportion boiling off at each temperature are difficult to measure, because the values obtained vary greatly according to the speed with which the distillation is conducted and the nature of the apparatus. In making these distillations we endeavored to rise from one boiling point to another as quickly as possible, but held the boiling points.

A carburetor adjusted for Mid-West gasoline will operate very satisfactorily with 72 deg. Eastern gasoline. For some reason the Western gasoline (I understand that the Texas and South-Western gasoline is about the same as this) does not operate nearly as well and requires an entirely different carburetor adjustment.

The percentage of gasoline evaporated and its rate of evaporation further depend greatly upon the position of the throttle, or, more specifically, vary closely with the vacuum in the intake manifold.

Vapor Tension Apparatus.

Fig. 4 shows an apparatus of the kind commonly used to demonstrate vapor tensions, consisting of three glass tubes connected to a common mercury vessel. The upper ends of the tubes are sealed, and contain nothing above the mercury but liquid gasoline and vapor. In one tube is shown the 208 deg. F. fraction obtained from the California gasoline whose distillation fractions are shown in Fig. 3. The second tube shows the 342 deg. F. fraction taken from our Mid-West gasoline, while the third tube contains common kerosene.

If this gasoline or kerosene were not present, these tubes would be simply barometers and would

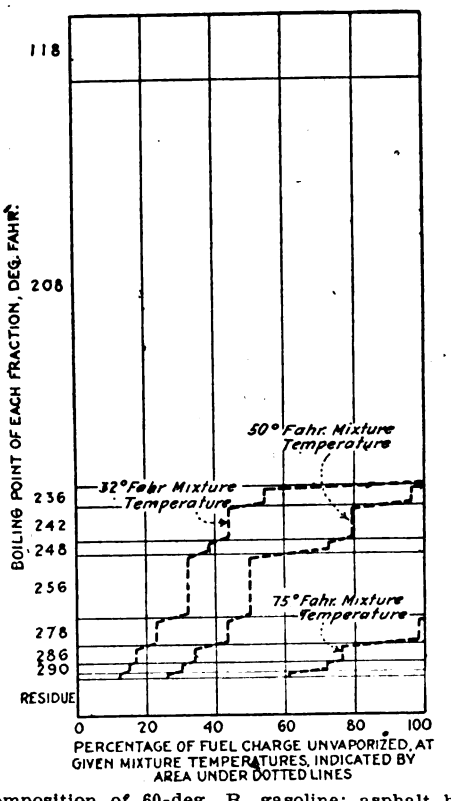


Fig. 3—Composition of 60-deg. B. gasoline; asphalt base, from California District.

remain absolutely full of mercury until the level of the mercury in the vessel was lowered more than 29½ inches below the top of the tube. If the vessel was lowered further than this the mercury would follow the lowering of the vessel to show the atmospheric pressure in this room, and there would be an absolute vacuum above the mercury.

The space that now exists above the mercury in the tubes is filled by a small portion of liquid gasoline and by the gasoline or kerosene vapor from it. The space occupied by the vapor of the 208 deg. fraction is about three times as great as that occupied by the kerosene vapor, while the space

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occupied by the 342 deg. fraction is about 20 per cent. greater than that occupied by the kerosene vapor; this indicates the great difference in vapor pressure and density that accompanies the difference in boiling point of the gasoline elements.

The heating of the upper part of the tubes to a temperature of about 120 deg. F. causes the space occupied by each vapor to increase to nearly twice that occupied at the room temperature of about 72 deg. With this increase the amount of liquid gasoline above the mercury will decrease perceptibly, showing that more has been evaporated.

Factors in Evaporation.

There are two very important points that can be shown with this apparatus. As the mercury vessel is raised and lowered, the level in the tubes keeps the same distance above the level in the vessel; but although the vapor pressure or tension remains the same when the mercury is lowered to give more space in the tube, the amount of vapor increases with the volume of this space. This is shown by the decrease in quantity of liquid gasoline standing above the mercury column. For instance, if the mercury is lowered until a 12-inch space is shown in the 208 deg. gasoline tube, the liquid gasoline evaporates altogether. This corresponds to the change of conditions that we have in our intake manifolds when the throttle is opened. At any given engine speed, as we close the throttle we feed less gasoline, but we leave the same space for the vapor to occupy, with the result that a much greater percentage of the gasoline can be converted into vapor during the closed-throttle condition. This fact, in conjunction with the preceding ones, gives the reason why we have difficulty in handling our present-day heavy fuels at wide-open throttle and low air-velocity.

The second point of importance is that when the mercury is lowered to allow room for the increased evaporation, the change in state occurs at once. Within a second the gasoline evaporates to fill the space available. This shows, what we have believed from experience, that the predominating factors in determining the actual evaporation of gasoline in the intake manifold are the vapor tension of the various elements and the temperature, and that we do not have to allow time for the gasoline to evaporate; in other words, the gasoline evoprates, as much as it can, almost immediately upon passing the throttle.

In recent years we have helped engine operation by preheating the air charge or by heating the intake manifold, but the heavy elements introduced into the gasoline lately are so non-volatile that their complete evaporation requires heating the manifold and entering air above the boiling point of water, and to so high a temperature that the amount of air charge, and consequently the power of the engine, is perceptibly reduced.

In some recent experiments we directed an atomized supply of gasoline into a bent elbow, through which air was being drawn, and noted the condition of the issuing mixture when the elbow was heated at different temperatures. Although the spray was very fine indeed, so that it would change into a mist and then disappear when the jet was directed into the air of the room, in the elbow the action was very bad. The gasoline would strike on the far wall of the bend and drain back out of the elbow in a steady stream, while only a few particles would issue from the mouth of the elbow. This was at temperatures of the elbow from 70 to about 220 deg., with the entering air at about 70 deg. When the elbow was heated to about 250 deg. conditions were better. With engines of the present design we can almost use satisfactorily our better Mid-West gasoline, provided we make a few practical allowances. It is possible that we can develop further our engine and thus allow us to use still heavier fuels. I am sure however that we cannot use heavier fuels than the engine will stand without great trouble in average use. For instance, a great deal of gasoline sold contains a perceptible amount of kerosene. With the average carburetor on the average car one to three years old, the driver would be much better off, get better service and equal mileage for his money if after buying this gasoline he could separate, remove and throw away this kerosene fraction. It does no good and does do harm.

In the face of conditions such as I have described, it is impossible to set any definite limit or requirement for gasoline standards. I believe however that if we adopt any convenient standard of graduation, the situation will solve itself on an economic basis, as each automobilist will buy the cheapest grade of fuel that he can use. When he buys a new car he will naturally select one that will handle the heavier fuels. This will make it a definite object for the car manufacturer to use a heavier fuel and will promote this development faster than any other way.

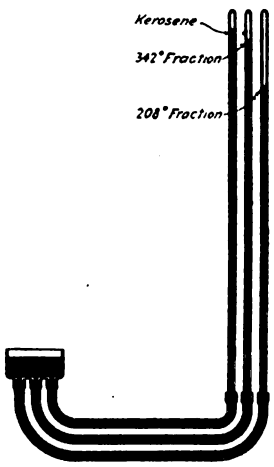


Fig. 4—Demonstrating vapor tension.

Use of Heavier Fuels.

Until a very short time ago we had not seen in operation any system that would use kerosene without there being so many disadvantages that it gave no promise for automobile use. In fact, kerosene is scarcely satisfactory even on engines running at constant speed, where there is no limitation as to intake air velocity or as to the amount of heat available. We have recently found by following a cycle whereby the kerosene is vaporized at a very high temperature, and then mixed with a charge of air at low temperature, that the resulting fog can be kept in complete suspension in the air stream. This should do away with the troubles previously described, so far as they relate to conduction of the fuel to the cylinders. There remains the further difficulty of obtaining a vapor in the cylinders, so

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that the spark can be carried away from the spark-plug points. Such trouble can probably be overcome by mixing the kerosene with some of the elements now found in gasoline: this is also desirable as a step toward economical use of our fuel resources, because such a blend corresponds more nearly with the composition of the natural petroleum product.

AMONG INDIANA SHOPS.

Welding a Big Gear Wheel and How to Take Care of Expansion and Contraction.

BY JAMES F. HOBART, M. E.

The garage man seems fast becoming a village "Citizen Fixit" and all sorts of jobs find their way to his shop, particularly if he has an oxy-acetylene welding outfit. Recently I sat in a nice little automobile repair shop and saw a farmer bring in a piece of a windmill pump to be welded. Another farmer fetched a broken chain, bringing it to the welder instead of to the blacksmith next door. The farmer wanted a broken link closed. The garage man did it in four minutes. The smith would have been forced to throw away the broken link and make a new one which contained sufficient metal to make up for the waste in welding.

Before the farmer had gotten away with his mended chain, a team drove up with a big cast steel gear, 48 inches in diameter, with a big hub bored for a four-inch shaft (3 15/16 inches, to be exact) which had been broken in one of its arms, close to the hub as indicated at A in the illustration. The gear weighed several hundred pounds and was a load for two men to handle. A fall of about 15 feet had broken the arm and had also badly bent the rim of the gear. So badly in fact that the garage man was unable to straighten the rim and had to send the gear to a neighboring machine shop where it was heated and the rim straightened under a steam hammer.

The garage man had in the shop a large portable forge, the cast iron top of which was a little more than four feet across, and upon this forge the straightened gear was placed for preheating before the welding operation was commenced. The broken spot was placed directly above the fire and coal was piled in and around the hub until the latter was well covered. The preheating was commenced in the early morning as soon as the shop was opened for the day and the heating was continued until about three o'clock in the afternoon, when the welding was done. The bends in the rim were at E and F, and these being satisfactorily straightened, no further attention was paid to the rim, but the preheating was all done between C and B, the parts A and B being red hot when the welding was commenced. In order to make the heating more even, pieces of sheet iron were placed underneath the gear wherever it projected beyond the edges of the forge and forge dirt and ashes were spread liberally over the pieces of iron so as to better hold the heat of the fire. Pieces of asbestos board about ¼ inch thick were placed on top of the gear and then other pieces of sheet iron were placed over the asbestos, closing in the gear so well that not much heat was wasted by radiation. The fire was handled well. Every few minutes the blower would be given a few turns, brightening the fire, after which it would be let alone for a time, then another turn of the blower would be given. In this manner the fire was kept going all the morning and the gear hub and roots of the arms were heated very slowly and evenly until a deep red was reached, when the welding was done, the flame of the torch being used to cut away the corners of the break. This was done by the welder in preference to chipping the corners off of the broken edges.

The writer, who heretofore had been a silent onlooker, visiting the garage several times during the forenoon while the heating was in process, now took the garage man one side and quietly made a very strong protest to him in regard to the manner in which the preheating was being done.

"What the h—— do you know about it?" was the reply made by the garage man, who went ahead, welded the gear with the hub preheated as described. Then he replaced the gear upon the forge, covered it carefully with the sheet iron and asbestos, and also placed a lot of dry dirt on top of the sheet iron in order that the gear might be a very long time in cooling.

In the morning, when the team came for the gear, the garage man uncovered it preparatory to loading it upon the customer's wagon, and there was the crack again, at A, same as it was before the welding had been done! The garage man thought he knew how to weld a gear, and he did know how to perform the actual welding operation, but he did not know how to take care of contraction and expansion, and these were the forces which pulled the arm apart again at A.

After this, the garage man really did some thinking, and began to realize the fact that what the writer knew about welding a gear might be something after all. This matter exemplifies the saying of the old man who said "The boy thinks the old man is a fool, but the old man knows the boy is one." The garage man then replaced the gear upon the forge, heated the broken part of the arm at A, heating along the arm at C, and into the hub as little as was possible and have break A well heated. Then the rim was heated at E and at F, a couple of big kerosene blow torches being used for heating those portions of the gear rim.

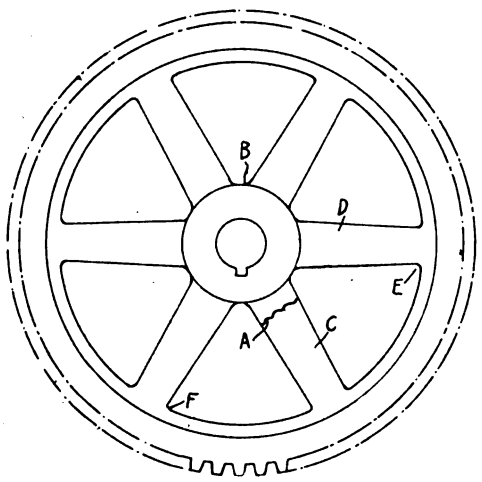
The heating of the rim was pushed until the crack at A opened to twice its width and the rim heating was kept up during all the time of welding. In order to make the blow torches have better effect, the rim at E and F was covered with bits of wood—pieces of board—and the blast from the torches directed upon the metal through openings between the pieces of board. The wood surfaces were soon charred, then actually converted into charcoal, which, becoming ignited and glowing hot, caused the rim to be heated much better and quicker than was possible with the blow-torches without the wood.

The object of heating the rim until break A was open double its width while cold was to take care of the expansion and contraction of the heated metal at the break, also of the expansion caused by preheating the hub and the arm at C, something necessary but not at all desirable. This job could have been done without preheating the hub and arm C at all, and by doing it in that manner would require less heating at E and at F, but would require a greater expenditure of gas, both of oxygen and of acetylene for the reason that much of the heat

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applied to break A by the welding torch, would have been absorbed by the cold metal on either side of the break. Preheating the hub and arm C lessened the gas consumption and that's about all it did, save perhaps to lessen the possibility of a "cold-shut" in the middle of the weld where the welder perhaps would have failed to let the jet of gas play long enough to melt the cold metal clear down to the very middle of the arm-section. To be sure, preheating the broken place is always desirable, but bear well in mind that the more heating that is done to hub and arms, the more expansion must be given to the rim at E and F in order to take care of the contraction which is coming to both the weld and to the preheated hub.

It is not always easy to tell how much the arm of a gear or of a pulley will contract after it has been welded, and good judgment, backed by experience, is necessary to give the welder a knowledge of how much any broken part should be preheated. There is not much danger of preheating the rim too much. If that should be done, however, the result would be to make the gear slightly eccentric



Broken 48-inch gear wheel.

—oval in fact—but it would not cause the rim to break because the contraction there cannot exert a direct pull upon any piece of metal as is done when arm C is welded and grows shorter as it cools. Were the rim to be heated too much and crack A opened more than the amount it would close during the cooling, then the rim at E and F would simply bend a very little and arm C would be left a very little too long, forming a bunch or a high spot in the rim of the gear, and that would be all the ill effect caused by heating the rim too much at E and B. But, as stated, there is very little danger of thus heating the rim too much, so no one need worry over that matter.

The garage man in doing this job of welding—and, by the way, the second time he welded the gear, after following the writer's instructions about heating the rim, the weld did not break—did a whole lot of unnecessary work in preheating precautions, also in cooling the gear again after the welding had been finished. The covering of the gear with sheet iron, asbestos and dry dirt after the first welding was absolutely of no use and did not a particle of good. It is not always necessary to cool welded parts slowly. Sometimes, and usually, they may be allowed to cool quickly and naturally in air, but sometimes it is necessary to cover the weld so it will cool slowly while the preheated parts are better if cooled as quickly as can be done with safety. Again, it is sometimes necessary to hold back the cooling of the parts heated for expansion, while the weld may be allowed to cool quickly.

In fact, the whole thing comes down to this: Cool both the weld and the expanded parts, A and E F, Fig. 1, according to their thickness. If both parts are of the same section thickness, and would cool equally fast, then there is no benefit whatever to be derived from covering the parts with hot sand or ashes, or of packing the article in dry lime to cool slowly over night.

But whenever one of the two parts is very heavy and the other very light, it may be necessary to cover the thin section in order to keep it hot longer so that it may become cooled in the same time that the thick portion requires to lose its heat. In case of the gear shown by Fig. 1. There is no sense or reason in covering the hub and arm C in order that the cooling may be slow. In this case it would have been better to cover the rim at E and at F in order that the comparatively thin rim section might hold its heat longer and cool in exactly the same length of time required by the thick hub to get rid of its heat.

Welded or preheated parts should never be cooled with water, unless in case of a hardened tool. Neither should the heated parts be exposed to heavy drafts of air, but both the weld and the expanded parts may be cooled as quickly as normal air temperatures can take away the heat with no danger, provided both the weld and the expand be cooled in the same length of time. That is the one thing to be watched. Cool each in the same length of time and the weld will hold, be that time one hour or one week.

Another welding fallacy is that it is necessary to be all day in heating or preheating an object which is to be welded. It is only necessary to give time enough for the heat to properly diffuse itself through the mass to be heated. Heat travels at a pretty good rate of speed through a large mass of iron. It is only necessary to take time enough so that the parts to be welded are uniformly heated, and that is usually a matter of minutes rather than of hours, therefore it is probably only once in a hundred jobs that half a day or more is necessary to be spent in preheating.

Using Too Small a Tip.

The welder who has never worked upon large pieces of metal, usually makes the mistake of using too small a tip, thereby thinking to save a little gas which otherwise would be wasted by using a large tip which consumes more gas than the smaller one. But often it will be found that far more gas is required to do a given amount of welding with a small tip than with a larger one.

The reason for this seeming paradox is that with the small tip the welding flame is necessarily smaller and far less powerful than with the larger tip and the mass of metal being large, conducts away heat nearly as fast as the small tip can supply it, thus making the welding operation occupy so long a time that more gas is actually consumed than would be

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required to operate a larger tip for the shorter time necessary to make the weld with the larger tip.

This matter of the size of tip to use is a matter which must be decided by actual experience, by trial and by the use of horse sense on the part of the welder. Doing a good many jobs is one way of obtaining this experience, but there is another way of acquiring the necessary knowledge and that way is by means of a number of trial welds. Procure some iron bars, either iron or steel will answer, and cast iron is as good as anything. Let the bars be all the same size and shape. Place two bars with their ends in contact and weld them with a certain size of tip, taking the time necessary to make the weld and noting the actual gas consumption.

Before proceeding to the actual welding operation, make up some "pills" of beeswax, tallow or some similar substance which will melt readily at a low temperature. Place a row of these "pills" upon the bars an inch apart in either direction from the place to be welded, and after each weld is made with the different size of tip, note how many of the "pills" have been melted on either side of the weld.

The above tests will enable the inexperienced welder to form a pretty good idea of the proper size of tip to use for any weld he has to make. Particularly will this be so if the above noted experiments be carried out upon bars of various sections in order that the heating and time effect may be compared both with regards length of time and size of masses welded as well.

After the welder has repaired several pulleys and gears, he will have observed that those with curved arms were not as apt to break through careless handling as regards contraction than were those with straight arms similar to the gear shown by Fig. 1. This is a fact, and it was for the purpose of taking care of contraction stresses while the gear or pulley was cooling in the foundry that caused curved arms to be first used in pulleys or gears. A foundryman observed that the arms in certain gears and pulleys almost invariably broke, sometimes many, or even all the arms being sure to break. With other patterns, few or none of the arms broke and this led to the making of curved arms where the lack of proportion between the section of metal in hub, arm and rim, caused the arms to be pulled apart when the rim cooled first. With curved arms, the dead tensile pull is changed into a bend which the curved arm can stand without being actually pulled apart endwise.

But, Mr. Welder, whether the arms be curved or straight, just remember when you make a weld, that the stress is there just the same, and that it is right up to you to figure out where and how you must heat the rim in two or more places in order that its cooling may equalize the cooling of the weld and thus prevent the weld you make from being pulled apart by uncared for contraction.

A Big Automobile Order.

The Canadian Pacific Railway reports from Calgary, Alberta, that a Lethbridge automobile dealer has ordered a million dollars' worth of automobiles for the Southern Alberta trade, mostly farmers. Southern Alberta has had two immense crops and expects a record yield again this year, with the result that farmers are buying automobiles.

BALL BEARINGS.

Their Proper Construction, Operation, Care, and How They Should Be Fitted.

From H. Wickland, the Hess-Bright Mfg. Co., Philadelphia.—Grit and other foreign matter must be absolutely excluded from a ball bearing. Grit will quickly grind down a bearing at a rate depending upon the sharpness of the grit and the constancy of operation.

Grit may enter a bearing in various ways. After the bearing is taken out of its cardboard box it may lie around on a dirty bench and pick it up in this way. For this reason a bearing should never be taken out of its box until the shaft and housing are ready to receive it. If it is necessary to unpack it before this time, care should be taken to see that foreign matter does not work its way in. If the bearing should pick up foreign matter it can very readily be cleaned out by washing in clean kerosene. In many repair shops the can used for this purpose has also been used for cleaning gears and other parts, and often contains dirt and metallic particles. Attempting to clean a bearing in this will manifestly result in making the bearing dirtier.

The presence of small particles of grit in a bearing can be easily detected, since the bearing will run with a "catchy" or "sticking" motion; in other words, it will not run smoothly. The remedy is to spin the bearing in a bucket of clean kerosene, which will wash out the grit or other foreign matter.

Before a bearing is assembled in its housing, the housing should be absolutely clean. Those parts of castings not machined should be examined to see that no sand adheres. All turnings or borings should be carefully cleaned out. Tapped holes for grease or oil cups should not be tapped after the bearing is assembled in the housing, since the drillings and chips from the tapping operation will fall into the box and ultimately work into the bearing. This may seem like a warning against an improbable occurrence, but it has happened in a number of cases.

Foreign matter may be introduced into a bearing through the lubricant used. See that the lubricant is clean. Do not use greases containing foreign matter, such as mica, talcum, sawdust, ground cork, etc. All of these substances are injurious to ball bearings, since the balls must roll over the solid particles like a stone crusher, and as the running clearance between the balls and grooves is slight, injurious wedging is bound to result.

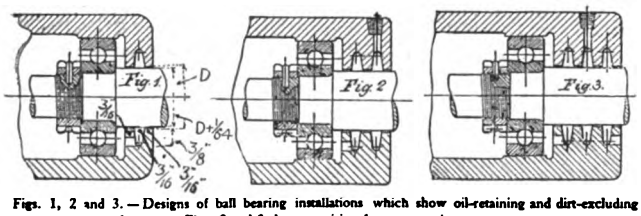
Finally, the housing may be of such a design as to admit foreign matter. Figs. 1, 2 and 3 show oil retaining and dirt excluding designs which have proven very satisfactory. In particularly dirty locations many constructors prefer to fill the grooves with felt packing or a stiff grease. This is desirable. Figs. 2 and 3 show provision for compression grease cups to keep one groove filled with a semi-solid grease that makes a definite, frictionless packing. In all cases the lips should have sharp edges and should be bored out not over 1/64 inch larger than the shaft.

A ball bearing must be of suitable capacity for the load, speed, and conditions of service under which it works. An overloaded bearing will not be worn in the ordinary sense of the word, but the surfaces

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of the balls and grooves will be destroyed. This will show first by minute pin holes and later by flaking. A large ball will take more than its share of the load and may, therefore, bring about all the appearances of an overloaded bearing. To avoid this, no ball must vary more than 0.0001 inch from its fellows in the same bearing. It is on this account that bearings should never be dismembered by the user, since otherwise balls are likely to be mixed. Neither must remaking the bearing be attempted by adding balls to a set. Such remaking should be undertaken only by the bearing manufacturer where full sets of even size balls are available.

Rust is absolutely destructive to a ball bearing. It is very readily recognized. Even in a bearing which has been cleaned so that no red rust is to be seen, the presence of more or less pronounced pits and excoriations, not only on the race surfaces, but also on the other parts of the bearing, is clear evidence. These pits are very distinct in appearance from those due to overload; aside from that, overload pits are necessarily confined to the balls and



Figs. 1, 2 and 3.—Designs of ball bearing installations which show oil-retaining and dirt-excluding features. Figs. 2 and 3 show provision for compression grease cups

grooves. The remedy for rust trouble is to see that the housing is of such design as to prevent the entrance of water or moisture from any source whatever. If the operating conditions are such as to make it necessary to locate the bearing housing in a damp location, see that an excess of lubricant, enough to force out at the closure, is employed, and if the moisture is excessive provide a stuffing box design of cap for the housing.

Although to many the presence of acid or alkali in many lubricants is well known, its destructive effect is not generally conceded, but is attributed to rust and overload. Nevertheless it is a very serious menace with some lubricants. Its ravages are clearly enough distinguished from overload because they are found elsewhere than on the balls and grooves. The marks are also quite distinct from rust marks. The acid marks often are pits, but always show also clearly defined irregular etchings, similar to, though less pronounced, than those produced by acid etching of damascened gun barrels.

Do not use lubricants containing acid or alkali; use a neutral grease or oil. In the oils, free acid, or the possibility of its development, must be guarded against. Hence, vegetable and animal oils should never be used, since these become rancid and develop free acid with age. Mineral oil is the only satisfactory oil for ball bearing lubrication. In the greases, free alkali is to be guarded against, since its action is the same as that of an acid—to etch and pit the races and balls. Make certain that the grease you use is of neutral, chemical composition, that it does not whip out too thin in service, and that it is one that will not dry up appreciably over an extended period of time, since in many instances the bearings are only lubricated at intervals of from three to six months.

Distortion or pinching of the outer race may occur where the bearing is mounted in a split housing, although it can be brought about by mounting the bearing with the outer race tightly fitted in a housing out-of-round. A bearing which has been distorted or pinched in the mounting is easily recognized, since the outer race groove will show a widening out of the path of wear at two diametrically opposite points, these points, of course, being on the reduced diameter. If the distortion has been sufficient, flaking of the outer race grooves will show at these points, and flaking and breakage of balls, as well as breakage of the races can also occur.

The outer race of a ball bearing should have a neat slip fit, free from shake in the housing—what is termed a sucking fit. This fit will enable the race to have a slow intermittent creep under the slight vibrations of the load, and hence the wear in the outer race groove will be distributed all around the groove instead of being localized. It is absolutely necessary to make certain in any split housing job that the outer race has this sucking fit, since then it will be known with certainty that the bearing is not being distorted or pinched.

Tight fitting of the outer race will also result in noisy operation and undue wear in the race grooves. All bearings must have a certain running clearance—a bearing with too little running clearance will run with a "singing" noise. The inner race being a light drive fit on the shaft, uses up some of this running clearance between the balls and grooves, and if the outer race is also tightly fitted in its housing, the probabilities are that all of the running clearance will be used up with resultant noisy operation and undue wear.

The necessity for having the inner race of a ball bearing a light drive fit on the shaft, is generally understood. A reliance on a drive fit alone is not sufficient, as that may be destroyed by an occasional dismounting. Then, again, the fit of the inner race may be only on a few high points, particularly with soft shaft material and ordinary lathe or file polish fits. When such a condition exists, the continued action of the load, concentrated on the short shaft length corresponding to the bearing width, will tend to peen down the shaft and cause the bearing to become loose. In many cases, this results in a serious cutting of the shaft. The fact that an inner race has been a loose fit on the shaft is readily recognized by the highly polished condition of the bore. From the above it will be seen how necessary it is to have the inner race a light drive fit on the shaft and securely bound endwise between a substantial shoulder and a well-set-up nut with provision for locking. About the best way to explain how an angular bearing may be subjected to excessive end thrust is to give the fundamental mounting principles for two or more bearings on a shaft, and to show why these principles should not be disregarded.

When two or more bearings are used on a shaft, one bearing only, preferably that carrying the lightest load, should be used for locating the shaft endwise and carrying such thrust as is incident thereto. This bearing should have a clearance of 0.01 inches each side of its outer race with shoulders in the box. All of the other bearings on the same shaft should have ample clearance on both sides of the outer race, so that they can float endwise, assume their proper position, and carry nothing but radial load.

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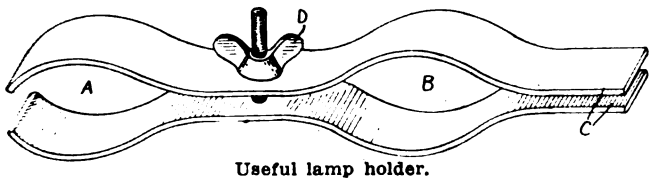
Automobile reciprocity between New Jersey and New York States was the subject of a conference recently between Francis Hugo, Secretary of State, and William L. Dill, Commissioner of Motor Vehicles, of New Jersey. To all who have been in the habit of motoring between these States the subject under discussion is a vital one. Mr. Hugo explained to Commissioner Dill that he was ready and willing to extend a longer reciprocal period than the fifteen days if it were possible for New Jersey to return the privilege.

It is realized, however, that the present fifteen-day reciprocal agreement between the two States must continue so long as there is a clause to that effect in the New Jersey statutes. While no immediate action could be taken, it was conceded by those present that the conference will have a beneficial effect in promoting better relations between the authorities in the neighboring States, who are charged with the enforcement of the motor vehicle laws. The idea is that each State should do its utmost in promoting pleasurable operation of all cars within its boundaries, consistent with the proper enforcement and observance of the laws of each.

A Trouble Lamp Holder.

In the illustration shown is a home-made holder for a trouble lamp or a flash light. It will be found a useful addition to the automobile equipment repair outfit.

When using this holder the main feature is that both hands are free, as the lamp or flash light is placed in the circular opening A, and the other circular opening B, is placed around the spoke of the wheel if such be the case or around the manifold when a repair is necessary. The flat ends C, are for

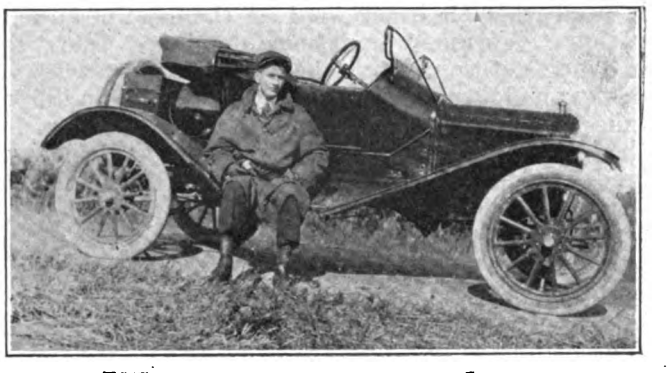


Useful lamp holder.

use in such cases when it is necessary to attach the lamp to the chassis frame or some other flat surface of the car when doing repair work. The holder is made of spring steel about ¾x3/32 inches, at the center between the two circular openings is a thumb nut D, to allow for adjustment. The holder can be bent and shaped over a piece of 1-inch pipe while held in the vise. The illustration is one-half the actual size.

A Remodelled Ford Car.

From H. C. Mertz, New York.—In your February issue Mr. Farrar of New Hampshire, shows a cut of his remodeling a 1910 touring car (Ford). I enclose herewith a photograph of my 1911 Ford roadster. The changes are as follows: 30x3½ tires all around, tank moved ahead 4 inches to suit case trunk on rear, capacity two cases, tire irons and tires on rear, top lowered 4 inches making a neat appearance when up. Cowl dash and doors, clear vision ventilating wind shield made of ⅞ gas piping, lengthened hood, bullet head lights fitted with dimmers, current from a six-sixty storage under seat, enlarged water capacity extension on inside and a rounded front holding 5 gallons instead of 3, this we find very efficient. Large steering wheel, foot accelerator, instrument dash with all light switches, speedometer and oil gauge. The car is fitted with shock absorbers (H and D),



Mr. Mertz and his Ford car.

Dann insert anti-rattlers throughout and a starter. The body is a deep wine color, also the wheels, while the fenders and gearing are black. This combination makes a neat job. I hope this will be of some benefit to readers and Ford roadster owners who wish to remodel their machines.

Speed and Comfort.

Disguise it as we may, to secure the utmost health, comfort, pleasure and economy in driving the speed should not be more than 15 or 18 miles an hour. Here are some remarks from an exchange that will be endorsed by all save the speed maniacs:

Tires last about twice as long on a car that is driven at 15 miles an hour as upon cars driven at 30 miles an hour. Speeding generates heat, which is an enemy to rubber.

Driving a car around a sharp corner at 25 miles an hour does more damage to the tires than 200 miles of straight road work. Excessive side pressure on tires may pinch the tubes, and it always strains the side walls of the casings.

High speeds are likely to cause skidding and breakage of springs and steering gear, any of which are dangerous when speeding.

In proportion to the mileage obtained, high speeds require more gasoline and oil than a moderate rate of traveling.

Driving a car at excessive speed, especially over rough roads, subjects the bearings to enormous strains.

High speed may cause crystallization of rapidly moving metal parts that are subject to strain and these may break at any time without warning.

High speeds interfere with the accuracy of steering, as is shown by the number of reckless drivers who have gone over banks and into ditches, especially on curves.

How Much Ford Makes.

The Ford Motor Company makes a profit of $21 on every car it sells. This was brought out by Vice-President Klingensmith, testifying in the Dodge-Ford suit. He stated that it cost the Ford company $260 to make a car; the price to the dealer is $281. He said further that the Ford company aims to earn 12.01 per cent. gross on $250,000,000 business in 1917.

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LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Lack of Road Attention.—In Utica, N. Y., one woman was killed, and two men and one woman injured when their car went off the edge of an excavation. Workmen had been employed there, but had not yet completed the repairs under way. A detour had been arranged, but this party did not take it, and went right ahead through a fence into the excavation. The car turned over twice and landed bottom side up at the foot of a 25-foot chasm.

Did Not "Stop, Look or Listen."—One man was killed and another probably fatally injured and two others slightly injured when a train struck an automobile in North Hampton, N. J. The party in the car was evidently entirely oblivious of the approaching train.

Result of Skidding.—Three men were killed and buried beneath an automobile wreck in Doylestown, Penna., when a car overturned owing to the bad condition of the road while undergoing repair. The car encountered mud, and skidded, and before the driver knew, it suddenly overturned.

Throttle Caught in His Sleeve.—In Lynn, Mass., a boy lost control of the car he was driving because his sleeve caught in the throttle in some way. The lad was thrown several feet into the air, and the car was badly wrecked when it struck the sidewalk.

A Deadly Grade Crossing.—Five persons were killed near Los Angeles, Cal., when a freight train demolished an automobile at a grade crossing. A row of trees shut out the outlook, and instead of stopping and making sure that the road was clear, the car was driven upon the track. It was a fearful tragedy, even the family cat, which was being carried in the car, having been killed.

Car Hit a Baby Carriage.—In Boston, Mass., a woman who was driving a car lost control and it struck a baby carriage after mounting the sidewalk. The child was tossed to the sidewalk and the baby carriage smashed to atoms, but no one else was especially hurt, although they were all very much frightened.

Crashed Through Stone Wall.—In Weston, Mass., a man was instantly killed and two women and three men injured when their automobile crashed through a stone wall and over a six-foot embankment into a ditch. The driver of the car was arrested on charges of manslaughter and drunkenness. He did not have a registration card. He apparently lost control of the car and the machine left the road at a sharp corner.

An Unskilled Driver.—In Salt Lake City, a boy was run down by an automobile while playing in the street. The car zigzagged, through a crowd of children, but one failed to get out of the way and he was dragged under its wheels. The driver stopped and picked the little boy up, but he was dead. He was a novice at driving, and says he did not realize how fast he was going.

This Happened After Dark.—A woman was killed on Long Island, N. Y., and a man injured in a collision with an unidentified car going in an opposite direction. The car that caused the accident sped on and disappeared in the darkness. The impact was so terrific that one woman was hurled several yards away, striking head-first on the macadam road.

A Pathetic Scene.—In New Orleans owing to the failure of a car driver to blow his signal horn a woman was run over and almost instantly killed. Her husband was near and threw himself across her prostrate form, kissing her again and again, and muttering a prayer.

While Inspecting the Rear Lamps.—In Philadelphia while a man was tinkering with the rear lamps his car suddenly backed up, and the man was jammed against the side of a trolley car. His skull was crushed, and his body otherwise mangled.

A Drinking Joy Ride.—One girl was killed and two others badly bruised at Tenafly, N. J., while they were riding with two men. The police are of the opinion that the party had been drinking, and the driver failed to notice where the street ended. The automobile was capsized and the driver has been committed to the county jail on a charge of manslaughter.

Due to a Slippery Pavement.—A woman was killed and her husband seriously injured at Napa, Cal., when the car in which they were driving skidded, and the driver lost control of it. It dashed into a wooden foot bridge, turned a complete somersault, and landed upside down in the bed of a creek.

Hit a Rut in the Road.—Near Pittsfield, Mass., a car struck a rut in the road and overturned. One person was killed and four were badly hurt, and hoists had to be used to the car to release one woman from under the machine. The car itself was badly damaged, having gone over an embankment at the side of the road.

CARBON DEPOSITS.

How to Remove Them and How to Avoid Getting Them.

"Carbon is one of the worst ailments of the engine and the most insidious," says William H. Stewart, Jr., president of the Stewart Automobile School. "Its presence is not suspected and the evils which follow are attributed to many other than the real causes. The motor seems to be sluggish, does not respond readily to the throttle, particularly on a hill, and the driver blames the gasoline, the carburetor, the cooling system—even the manufacturer. He gets out the starting handle and cranks the motor over to try the compression. He finds it weak and blames the manufacturer for making an engine which cannot hold compression a reasonable length of time.

"Before long the engine begins to miss explosions and he blames the coil or the spark plugs. He opens the switch after a long run and the engine refuses to stop. Then he remembers that he heard a distinct knock which he thought might be a loose bearing, but now he knows there is something wrong inside or the engine wouldn't overheat so badly after the careful handling he had given it. So he condemns the car and all its kind and asks his friends what the trouble is that so many ills can occur to one engine at one time.

"Carbon is the answer. It gets under the exhaust valves and gums up the piston rings so that the motor loses compression. It short circuits the spark

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plugs and the engine misses explosions. It accumulates in masses in the head of the cylinder, gets red hot and fires the mixture before the proper time. This causes knocking, which is especially pronounced on a hill. When the switch is opened the motor keeps on running, as it was not using the electric spark at all.

"There are many causes of carbon and one must be on his guard against all of them. The usual trouble is too much oil, but the wrong grade of oil will give carbon as will a poor grade. Too rich a mixture from the carburetor is another cause. If the piston rings are badly worn oil will be drawn up into the combustion chamber on the suction stroke—more carbon.

"The remedy is to avoid the causes given above. Use oil made by the manufacturer of established reputation and use the oil he recommends for your car. See that oil level is correct and that mixture from carburetor is right. If red or yellow flame is shown at compression cocks the mixture is too rich. In spite of the best care, however, carbon will persist in forming. To help keep this down inject a small quantity of kerosene in each cylinder once a week. Have motor hot when it is poured in so that the kerosene will vaporize. Close compression cocks and crank engine over a few times, either by hand or self-starter. This compresses the vapor and forces it into the carbon. The effect of the kerosene vapor acting all night is to soften the carbon so that some of it will be ejected when the motor is again started.

"If such precautions have not been taken and cylinders are found to be carbonized, the deposits may be too thick to be affected by kerosene alone. The old method was to use scrapers which were inserted through the valve openings. The carbon was scraped off, but fell in masses on the head of the piston. Unless blown out it was carried into the muffler. If not thoroughly removed ridges of carbon were left which became red hot and caused preignition just the same. The best method, aside from removing cylinder head and positive scraping, is to have the cylinders burned out with oxygen. This can only be done when special apparatus is available. The engine is started and the gasoline supply is shut off. The engine stops, having used up all the explosive mixture in the combustion space. This is to avoid an explosion when the oxygen is first introduced into the cylinder. The plugs are then removed, a burning match dropped into the cylinder and the stream of oxygen turned on. This spreads to all parts of the combustion space, burning the carbon. As long as sparks are coming out the workman knows that there is still some unconsumed carbon. This process is quick and quite efficient, dismantling of motor being unnecessary."

Care in Washing a Car.

"Care in washing the motor car cannot be emphasized too much, for a presentable appearance after a year of service rests wholly with the attention that is given the body finish", says C. L. Hedges, manager of technical service for the Haynes Automobile Company, Kokomo, Ind., in a recent bulletin. Mr. Hedges' advice is applicable to any car, and for that reason worthy of the attention of every automobile owner. He writes in part as follows:

"The high gloss on a new car, in many instances, is lost in a short time because it is irreparably marred in the first washings. The varnish on a new car requires a month as a minimum time in which to properly set. In warm weather it is often advisable, with a newly purchased automobile, to shower the body, hood and fenders with clear cool water. This will aid in hardening the varnish coating and so reduce the danger from scratching and abrasion. The life of the finish on any car does not depend on the polishing action that is given in washing, but on quite the opposite. The body should not be rubbed any more than is absolutely necessary. In case the car is muddy, it is always well to remove the foreign substance as soon as possible to avoid spotting. This should be done with clear running water, first thoroughly soaking the mud, and then washing it off. On account of its scouring effect, water under pressure should never be used for this purpose.

"Perhaps the greatest enemy a high body finish has is a sponge in which sand or grit has collected. Even in the case of dust, it is better to remove this with slow running water. Dusters, which are employed by many owners, seriously affect the paint by turning the dust into an abrasive. When the body surfaces have been well cleaned off by running water, they should be gone over with a new sponge, care being taken that the sponge is always moved in a straight line. Following this treatment, the finish is to be thoroughly rinsed and then dried with a chamois skin, which should be thoroughly washed and wrung out during the drying process. This action, as well as the sponging, should be carried out with a straight-line movement. In most cases, the running gear and lower parts of the fenders should be washed first, as they are the dirtiest parts of the car. If grease and oil are present, the under surfaces should be soaked with a solution made by dissolving soap in warm water. The suds from this solution react on the finish and should be washed off immediately. Treatment of this kind, however, should never be employed on the body proper. The hood of a motor car should never be washed while it is warm since the rapid drying of the water deadens the finish."

Care of a Motor Car Top.

When a motor car top is folded for spring and autumn driving, the material is sometimes pinched by the bows or top fasteners and the fabric stretched out of shape. This can be avoided by care in lowering the top. An occasional brushing, inside and out, will keep the top in good condition and prolong its life.

The top may be washed with soap and water to remove the accumulation of dust and grease spots. Gasoline, however, should never be used to clean the rubberized cloth. It dissolves the waterproofing preparation.

Must Stay by Car on Ferries.

Motorists who drive onto ferryboats about New York City are notified by the deckhands to see to it that the driver remains at the wheel. This is because of a new law in New York State requiring such attendance when a motor vehicle is being carried on a ferryboat to or from a city of 500,000 or more population. Violation of the law is a misdemeanor. It became effective June 1.

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A. A. HILL, Editor

F. R. WHITTEN, Advertising Manager

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK JULY, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

A WRONG TENDENCY.

The increasing tendency of manufacturers to establish grocery and other supply stores for the exclusive use of their employes speaks well for their hearts but not so well for their heads. The idea is to carry a line of goods which are sold at cost, and of course a manager and a force of clerks are necessary to take charge of such establishments.

There is no reason whatever why workmen should not earn enough to be able to buy their groceries at the regular stores, and the idea of private retail stores is uneconomic and blighting to the retail trade to whatever extent it is practiced. The self-supporting grocer deserves just as much consideration as the employe or any one else. Suppose, for instance, that all big firms were to install retail stores for their employes, and that small employing firms were obliged to follow suit so as not to be handicapped in the remuneration of their help? Suppose the plan were widened until all employes were to buy not only food but all other things in this way? Of course, if the plan is a good one it will thus develop. But what of the general retail trade under such circumstances?

And if the retail trade is to thus take the new channel, why should not some good-hearted firms take the agency for automobiles and accessories or other manufactured goods in order to supply their help with them at less than the ordinary retail prices? Why not employ doctors and lawyers thus? Why not cut out altogether the retail trade from those who have learned it and who are getting their living by it, and at that under the sharpest kind of competition? Why not, in fact, turn the entire business world into a general eleemosynary system? Would the general welfare be thus promoted?

Something like this provision for inadequate wages has been practiced in Germany and in England for years, with not the slightest diminution of poverty, but with a narrowing rather than a widening of moderate welfare.

This is the first years of the 20th century. Anything in the nature of charity or benevolence, except in the case of "the lame, the blind, the halt and the sick"—those whom Christ said we should have with us always—is disgraceful. Give the people a chance to earn a living and provide against the needs of old age, and want will be unnecessary. Nothing would be a greater spur to industry than this, and those who are not impelled by this advantage to be industrious and thrifty deserve nothing better than the gutter.

THE GLITTER OF SUCCESS.

The public often charges great industries with making too much profit, and not because they know so much concerning these industries but because they know so very little. The critics are usually those who are half informed concerning the thing they criticise, rather than those who are fully informed. It is the old aphorism of "Fools rush in where angels fear to tread." This is the case with small business as well as large.

Take the automobile business, for illustration. There are more newly made graves in that cemetery of the departed than in any other industry of which there is any record, unless, indeed, it be the publishing business. According to one of the automobile directories, 718 companies failed or went out of business since 1912, and of this number 133 car manufacturers failed during the past two years. But in addition to this, other statistics show that more than one-half of our automobile manufacturers are breaking even only, and very few are making more than 10 per cent. annual profit on their investment. Of course, "all things are possible," but any one who imagines he can be successful in manufacturing a car of conventional construction today in competition with those already on the market lacks both business judgment and experience.

Just at the present time the cry of "robber barons" seems like a fetish running wild all over the country. No doubt there is a basis of fact for this complaint. When the demand for anything exceeds the supply high prices and unduly large profits must be expected unless the natural impulse of human nature is curbed in some way. But there are two sides to this question of curbing, and nothing should be done about it without full consideration of the fact that high prices invariably reduce the consumption of such articles, and often times to such an extent that the price raiser is sufficiently punished without adventitious interference. Take the case of potatoes, for illustration. This morning we note reports of prices being not more than one-third what they were two months ago. Now this falling in price is not due so much to increased production as to decreased consumption. Many families have stopped eating them altogether since the price began to soar upward. Demand and supply

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have a far greater effect upon prices than cost of production, unless, indeed, the price of things is to be generally controlled by the government, which, except in case of absolute monopolies, heaven forfend us!

The talk of wonderful profits of the automobile business has led many an individual to part with his hard-earned dollars, never to see them again. The same conditions exist in the retail and "middleman" trade. There one would think from reports that profits might be picked up as easily as if they were berries. But there is absolutely nothing to prevent any one from embarking in such business. The required capital is not great, and nothing else is needed save industry and ordinary judgment. But the blasted hopes of the thousands who are constantly failing in each channel of enterprise are both instructive and melancholy.

Great successes glitter and flash out brilliantly, while failures slink away unseen and in silence. But the glitter of success is too often like the ignis fatuus, dragging on its victim to his destruction.

THE WHILOM JITNEY.

The jitney automobile service went up like a rocket a few years ago, but it bids fair to come down like a stick. Not that it could not easily be made to pay if the cities where it exists would confer upon the service the same favors it gives to the electric street car service—the right to use railway tracks and the right of way upon such tracks. Such tracks do away with the necessity of pneumatic tires and their comparative heavy expense, and a smooth track with hard tires will permit about twice the load for a given amount of power as when applied to ordinary traction.

But the jitney is otherwise handicapped just now by the high cost of gasoline fuel. In Louisville, Ky., the jitney service has recently ceased to operate. The thirty-four members of the Louisville Jitney Bus Co. have agreed to acquiesce in the will of the majority that business be suspended in July. The high cost of gasoline, which has increased from 9 to 24 cents a gallon since the buses started about two years ago, and of tires and accessories are blamed.

But in interurban districts the case is different. There, both passenger and express traffic will continue to increase and thrive.

FINDING MEN.

Men who are thoroughly competent to undertake the responsibilities of present day affairs and grow into the affairs of large concerns still are as hard as ever to find. Said one who has had long experience in the creating and filling—and keeping filled—of important organizations, "I have read five hundred letters of application for this one job and found only one applicant worth paying freight on for inspection. He didn't pass."—Exchange.

Nonsense! The failure to find suitable men is usually due more to the incompetence of the seeker of them than to the incompetency of the sought.

Lincoln was inefficient when he kept a grocery store. Grant was inefficient when he hauled cordwood. Graham Bell was inefficient when he was a deaf mute teacher. But neither failed when the responsibility came. Most of the successful men at the head of great business find no more difficulty than would be expected in finding competent men.

Any one who imagines that out of 500 applications for a job more than a very small per cent. will be thoroughly competent, is wofully lacking in common sense. It is the incompetent that are out of a job usually, and who are looking for work rather than the competent. And yet, on the other hand, the writer of this has in the past received applications for employment from men with threadbare collars and pantaloons frayed at the bottoms who were far more competent than himself, and yet he was obliged to "turn them down."

There are scores and perhaps hundreds of men employed in great industries who have the ability to manage them and possibly better than some of the men who are already at their heads. Henry Ford would have been called incompetent as long as he was a poorly paid machinist.

The men fitted for opportunities are as one hundred to one compared to the opportunities awaiting the man. We can never tell what a man is until an emergency calls out his reserve, and he cannot call out an ounce more than he has stored up. Moreover, he is the wisest and best man who puts the highest, not the lowest, esteem upon others.

NEW FLAG LAW.

Now in Force in Some States and Soon May Be in Others.

The law passed by the Texas Legislature to prevent and punish the desecration, mutilation or improper use of the flag of the United States or the Texas flag, became effective recently. The act prohibits the use of the United States flag for advertising purposes, and makes the improper use or desecration of the flag a misdemeanor, punishable by a fine not to exceed $100, or by imprisonment for not more than thirty days, or both.

Similar laws are already in effect in several States, this law having been copied from the Iowa and Nebraska statutes. Its provisions and penalties, specified in Section 1 of the act, are as follows:

"Sec. 1. Any person who, in any manner, for exhibition or display, shall after this act takes effect, place or cause to be placed, any word, figure, picture, design, drawing or any advertisement of any nature upon any flag, standard, color or ensign of the United States, or State flag of the State, or ensign, shall expose or cause to be exposed to public view any such flag, standard, color or ensign, upon which, after this act takes effect, shall have been printed, painted or otherwise placed, or to which shall be attached, appended, affixed, or annexed, any word, figure, mark, picture or drawing, or any advertisement of any nature, or who shall, after the first day of September, 1917, expose to public view, manufacture, sell, expose, give away, or have in possession for sale, or to give away, or for use for any purpose, any article, or substance, being an article of merchandise, or a receptacle of merchandise or article or thing for carrying or transporting merchandise, upon which, after this act takes effect, shall have been printed, painted, attached, or otherwise placed, a representation of any such flag standard, color or ensign, to advertise, call attention to, decorate, mark or distinguish the article or substance, on which so placed, or who shall publicly

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mutilate, deface, defile or defy, trample upon or cast contempt, either by words or act, upon any such flag, standard, color or ensign, shall be deemed guilty of a misdemeanor, and shall be punished by a fine not to exceed $100 or by imprisonment for not more than thirty days, or both, in the discretion of the court, and also forfeit a penalty of $50 for each such offense, to be recovered with costs in a civil action or suit, in any court having jurisdiction, and such action, or suit, may be brought by and in the name of any citizen of this State, and such penalty, when collected, less the reasonable cost and expense of action or suit or recovery, to be certified by the County Attorney of the county in which the offense is committed, shall be paid into the Treasury of this State; and two or more penalties may be sued for and recovered in the same action or suit.

"The words flag, standard, color or ensign, as used in this subdivision or section, shall include any flag, standard, color or ensign, or any picture or representation, of either thereof, made of any substance, or represented on any substance, and of any size, evidently purporting to be, either of said flag, standard, color or ensign of the United States of America or a representation of either thereto, upon which shall be shown the colors, the Stars and Stripes, in any number thereof, or by which the persons seeing the same, without deliberation may believe the same to represent the flag, colors, standard or ensign of the United States of America.

"The possession, after this act takes effect, by any person, other than a public officer, as such, of any such flag, standard, color or ensign, on which shall be anything made unlawful at any time by this section, or of any article or substance or thing on which shall be anything made unlawful at any time by this section, shall be presumptive evidence that the same is in violation of this section, and was made, done or created after this act takes effect, and that such flag, standard, color, ensign or article, substance or thing, did not exist when this act takes effect."

THIS HAS THE PUNCH.

The War Situation and the Pressing Need of an Able Fool Killer.

From Homer McKee, Advertising Manager of the Premier Motor Corporation.—A fool can stand on the beach and let a little spray hit him in the face—and right away he wants to write a book on navigation. America's first battle in this war will be with the fools right here at home. A tongue without a brain behind it is as dangerous as a gun in the hands of a drunken Indian. This war is so big and so complex that a fool oughtn't to be allowed to monkey with it.

We keep cranks away from our powder factories and, by the same token, why shouldn't we keep fools away from our presses? Better still, why shouldn't we muzzle them and interne them till after the war? Here's what the fools are doing to us:

President Wilson, in his wisdom, exhorts the people to conserve their food stuffs. And he appoints this man Hoover, who, by the way, is the most expert food conservation specialist in the world, to help the people raise their truck and to make their truck go farther—all of which is wonderful generalship.

But the fools, who can no more fathom a deep mentality like that of President Wilson than a canary can whistle the Anvil Chorus, miss the whole idea and just manage to catch on to the tail end of the word "economy." So right away they want to go on a nation-wide hunger strike, start a bread line, and raise Cain in general.

Secretary McAdoo asks the people to buy some perfectly good, 3½ per cent. government bonds, non-taxable, the best investment that any sane man could make—because it is the safest. Right away, the fools shout, "Uncle Sam wants you to GIVE him your money." Fortunately, wise men are in a vast majority in this country, and the Liberty Bond issue went over with a bang. It was the wise men, though, not the fools that did it.

Some other fool shouted: "Let's all wear cotton!"—thoroughly ignorant of the fact that we need all the cotton we can get to make high explosives out of, for ourselves and our allies. If the so-called "Wear Cotton" propaganda had gone over, we would have had to fight this war out with fire crackers, or soda crackers, or pea shooters. That was a fine idea—wasn't it?

All of which goes to prove that we had better let the experts in this country—heaven knows we have enough of them—carry out the President's ideas. And the rest of us can find plenty to do keeping the fools from throwing wrenches in the gearset.

Right now the fools are busier than ever. Some of them are holding peace demonstrations down in Boston; and the rest of them are sitting up nights trying to work out new stunts for putting business on the "Fritz."

President Wilson, after conferring with delegates from the nations that have been in this war from the beginning, tells us that the all important thing for us to do is to KEEP OUR INDUSTRIES GOING.

In spite of this counsel, the fools are shouting at the tops of their voices: "Don't buy any automobiles!" "Don't buy any new clothes!" "Don't spend any money with the laundries—turn your collars wrong side out and wear them two days!" "Keep your wife away from the department stores!" "Don't let your children go to the movies!" "Don't do anything that will keep our factories and our stores and our places of amusement running!" "Close up everything and—pay the expenses of this war out of the excess profits of bankruptcy!"

The fools of this country might as well be made to understand right now and right here that we are not going to play into the Kaiser's hand by listening to their monkey chatter. We know just how serious this war is. But we know, on the other hand, that our fools are even more serious. We also know that no one ever won a war in sackcloth and ashes.

We must have business in this country. We must keep our heads up. We must preserve our prosperity, because America's wealth is her biggest gun. Shall we let the fools take the wheel at this dangerous turn in the road? Please, you 99 7/10 millions, answer in chorus—

"We will NOT!"

An Aluminum Racer.

The Frontenac car, with which Louis Chevrolet finished first in the 250-mile Speedway race at Cincinnati, doing 102.18 miles an hour average, is an example of the extensive use of aluminum. The

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motor is almost wholly aluminum alloy, which weighs approximately one-third as much as cast iron. This includes cylinder block, clutch, housing, engine base, etc.

The whole power plant, including engine, flywheel, clutch, exhaust and starting crank, weighs only 490 pounds, and the entire car tips the beam at a trifle less than 1,600 pounds, or about 300 pounds less than the weight of any other car in the race. The Frontenac was built by Chevrolet on the idea that most racing cars were much heavier than they needed to be.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2172 Will Not Throttle Down.

From John J. Berberick, Nebraska.—I have an Oakland 30-1910 car. It has a Remy magneto and coil and it has good compression. I put on a model D Schebler carburetor but can't throttle it down. The engine must run like sixty or as soon as I shut off the gas a little it stops. I have the spark retarded as far as I can. It seems to run pretty good at about 25 miles an hour, but when I shut off the gas it stops. I thought it was timed too fast. I think if I can retard the spark a little it would run slower. When I run the car 25 to 30 miles I do not have to advance the spark at all. I have tried it. I advanced it clear up and the car would stop. Now what can I do to slow down the engine when she runs idly? Is there no way I can make the drive pinion and bevel ring mesh a little deeper on this car? There is no way to adjust it. Could I put the washer on one side of the differential to make it mesh deeper?

Reply.—It is doubtful if an early spark causes your trouble, but it will be well to check up and see that it retards about one-third as far past top center as it advances before top center. It is more likely that the carburetor is not adjusted right for low engine speed. Other possible causes are,—an air leak through worn inlet valve stems; defective gaskets between the manifold and cylinders or where the carburetor joins the manifold; the magnets may be weak so that a good spark is not obtained at low speeds. To check this latter up, try decreasing the gap between the spark plug points. The bevel gears may be made to mesh deeper by placing a washer on one side of the differential, as you suggest. No doubt you will find a washer on the opposite side that may be removed or made thinner.

2173 Bothers About Starting.

From C. R. Dubia, Connecticut.—I have a 1913 Buick touring car. It has not a self-starter and bothers me about starting when I first crank it for a journey. After it gets warmed up and I stop it and start it again in a little while it starts easy. The car runs good after it gets started. Seems to me that the gasoline does not vaporize in the manifold. What do you think causes this trouble, and how can I remedy it?

Reply.—Starting is sometimes made difficult by late ignition. Check up the spark and set the lever so that it occurs on top center or very slightly after. This trouble has often been traced to too wide or too narrow spark plug gaps. A wide gap is desirable for easy starting, but sometimes the spark generated is weak, making a narrow gap necessary. We would suggest that you make sure that you are obtaining a good spark and then experiment with different length spark plug gaps. Worn inlet valve stem guides admit air and make starting difficult. A little experimenting will bring out the fact that the engine starts best with the throttle lever set at some certain position. A closed choke valve in the air intake of the carburetor also helps to make starting easy. If attention to all of these points fails to accomplish the desired result, we would suggest installing a gasoline primer on the inlet manifold or combination spark plugs and petcocks, so that a small quantity of gasoline may be introduced directly into the cylinders.

2174 Carburetor Trouble.

From Richard J. W. Krebs, Ohio.—I have a Ball & Ball duplex 2-stage carburetor on my King eight-cylinder car. The carburetor spits when it is running below 15 miles per hour. If I give it more air it does no good, nor does it if I cut it down and give it a real rich mixture. Can you tell me where my trouble is? My car has a single dry plate type of clutch which slips. I cannot adjust it, so that it does no good. Will you tell me how to fix it? Do you think it needs a new disc? If so, give me instructions how to put in a new disc. The car has only run 4,000 miles.

Reply.—Your trouble may be due to a small amount of water in the carburetor or to a partially clogged primary spray nozzle, or if the popping back occurs as the throttle is being opened, the plunger in the pick-up tube may stick. Remove the four plugs in the bottom of the carburetor so as to drain out any possible water or dirt, and inspect the primary spray nozzle. Also see that the pick-up plunger moves freely. If the trouble does not prove to be in the carburetor, examine the inlet valves for a possible leak and test for a weak valve spring or a sticky valve. Sometimes a valve will stick open at low speed and not at high, especially if the spring is weak. This clutch may be adjusted by removing the square cover on the rear of the fly wheel housing underneath. There are two cap screws set in curved slots in the clutch cover. These may be observed by having the engine turned over slowly by hand. To increase the tension, have the clutch pedal pressed down, back off on the cap screws slightly, move them to the right and then retighten. Sometimes oil works into the fly wheel case and gets into the clutch. In this case adjusting will do no good. It will be neces-

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sary to remove the entire oil pan from the bottom of the motor and unscrew all of the cap screws on the clutch cover about 3/16 of an inch. Then squirt gasoline into the clutch housing to wash out the oil. Drain out all the oil in the fly wheel compartment of the oil pan and inspect the partition between it and the crank shaft compartment for leaks.

There are a number of automatic decarbonizers on the market, most of which do the work in good shape. About two tablespoonfuls of kerosene introduced into the cylinders twice a week when the engine is hot, will keep them fairly free from carbon. It is best to turn the engine over a few times with the ignition off and let it stay in over night.

2175 **His Oakland Six.**

From M. Irvine, Maine.—1.—I have an Oakland Six, Model 32-B, and it has three-quarter elliptic springs on the rear. Could I have cantilever springs installed in place of the above springs, and would it be advisable to do so? How much would it cost to have it done, and also where could I get the cantilever springs? If so, what size springs would I want to order? 2.—There is also a clicking noise I think in No. 1 cylinder, and the spark plug in this cylinder carbons up awful bad. Do you think there is a piston ring broken? Also when I run the car up to 20 or 25 miles an hour there is a chafing noise somewhere in the engine. It sounds like two pieces of sand-paper rubbing together. I have not run this car over 2,000 miles and the chafing sound grows louder all the time. If I throw out the clutch and let the engine run it has the same sound. Can I remove one of the pistons without taking off the top of the engine?

Reply.—1.—No doubt it is possible to make this change, but we do not believe the improvement would be great enough to warrant the expense. The Harvey Spring Co. of 849 17th St., Racine, Wis., or the New Era Spring & Specialty Co., 871 Woodward Ave., Detroit, Mich., could doubtless advise you as to the size of spring necessary and the probable cost. 2.—A broken piston ring would give this sound and might score the cylinders so that the oil would work by the piston. This might also account for the chafing noise, although from the description, this noise might be due to the passage of air through the carburetor or to a dry fan bearing. The piston may be removed through the crank case.

2176 **Certain Inquiries.**

From A. E. Sears, California.—1.—My small pinion is chipping the teeth on the fly wheel quite badly when using the self-starter. Is there any way to remedy this? 2.—Does running an engine for a time on pure kerosene have any effect on carbon? 3.—What is the cause of a valve click? 4.—I was told by a demonstrator that the Delco system of getting a spark from the generator was the same as a magneto, which I do not credit. 5.—Will some reader tell me how to shift gear from high to second, on Model 83 Overland? I have never been able to do this without a bad clash.

Reply.—1.—If this starter employs the Bendix automatic meshing device, it may be found that the spring attached to the pinion and motor shaft has a kink or bend in it, which sometimes happens when the engine kicks back. This does not allow that required action when the gears are meshing and the teeth of the hard pinion striking against the soft teeth of the wheel, chip them. This may also happen if the gears are out of alignment or if they mesh too deeply. In other cases where cast-iron fly wheel gears have been used, it has been found necessary to leave the meshing face of the fly wheel teeth blunt, and chamfer off the back part of the tooth of the driving pinion so that the meshing face of the tooth is a sharp point. This allows for greater strength to the soft cast-iron tooth, and prevents chipping. We presume that you do not refer to the Delco starter mentioned in question 4, as this type has either no gears or a series of gears. 2.—Running an engine on kerosene would, no doubt, increase the carbon deposit. A small amount of kerosene injected into the cylinder and allowed to stand for several hours, would loosen the carbon, which would be blown out through the exhaust port when the engine was started. 3.—A valve clicks when it strikes its seat. It may also click from too much play between the valve stem and the push rod. The push rod should be adjusted as close as possible without holding the valve from its seat when the engine is hot. Another so-called valve click is due to a worn push rod guide that permits a side movement in the push rod when the cam passes center. 4.—The Delco ignition system is very similar in principle to the magneto system which uses an external coil, the only difference being that the Delco generator gives a direct, practically constant voltage current so that the spark may be taken off at any position of the armature, while the magneto generates an alternating current with considerable variation of voltage so that the interrupter points must open when the armature is in certain positions in order to procure a good spark. The quality of the two sparks is very similar. The self-contained, true high tension magneto is different in many ways from the Delco system and generates a much heavier or thicker spark, which would not jump quite so great a gap. 5.—The gear may be shifted from high to second on any car in good condition, provided the car speed is reduced to eight miles an hour, the clutch fully released and the shift made quickly. The shift may be made at higher car speeds by releasing the clutch, shifting to neutral, engaging the clutch, accelerating slightly, disengaging the clutch and shifting to second. Will some reader tell how he does it with this car?

2177 **Carbon Removing.**

From Wilbur F. Hastings, Massachusetts.—Will the injection of a small quantity of water into the cylinders immediately after running have the effect of breaking up the carbon deposit so that it can afterwards be blown out by inserting the nozzle of the tire pump through a valve port? I have heard this was a good idea and effective as a carbon remover.

Reply.—We would not advise this method as effective. Water has little or no effect upon carbon deposit. Moreover, it might result in an injury to the piston if the water came in contact with it when the piston were hot and the water were cold. It would of course, generate some steam, but in our opinion it would have no effect whatever on the carbon. Preparations are made which have a loosening effect upon carbon so that it may be removed easily. One such

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carbon remover is being advertised in this magazine and it is guaranteed to do what is claimed for it. It is called Johnson's Carbon Remover and is made in Racine, Wis. Why experiment with doubtful methods?

2178 **Starter Trouble.**

From William Cheesman, New Hampshire.—I have a 1914 Model B-25 Buick touring car equipped with Delco starting and lighting system. I have run it about 7,800 miles. My trouble is this: When I press the starting lever the gears of the starter wheel will not mesh with gears of fly wheel. To turn motor over I often have to open the hood and turn the starter wheel a little to have them mesh. I took it to a battery service station. They said the armature would have to be turned down and the mica cut so that the brush would hit the copper, and that was done but made no difference. Then the service man said the coil had gone bad, so put in a new coil with the same results. Then he said the cut-out relay in the generator was bad, so I had a new one put in and still the same trouble. When I first got the car its gears did not mesh. I would let up on the starting lever and the position of the little wheel would change, but now it won't stir unless I turn it by hand.

Reply.—If the battery does not become quickly discharged, the generator armature and cut-out relay must be all right. There is a small arm with a plunger backed up by a spring, which closes the points on the cut-out relay when the starting lever is pushed down. This arm is operated by the rod that slides the starting gears into mesh. It is quite likely that the spring has become weakened or the plunger stuck down so that the cut-out points are not pushed closed. This would prevent the armature from revolving slowly in order to make the gears mesh easily. As there was difficulty in meshing the gears even before the armature stopped operating, it is likely that the small gear meshing with the fly wheel meshes too deeply. This may readily be overcome by setting the generator a little higher. Trouble with meshing gears might also be caused by depressing the starting lever too quickly. The movement should be made slowly in order to give time for the armature to turn over before the gears are meshed.

2179 **Ignition or Carburetor Trouble.**

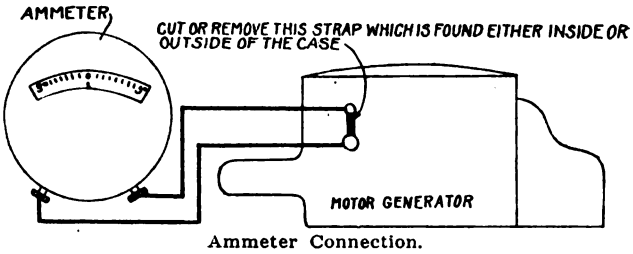
From Theodore Stremme, Colorado.—I have a 1915 4-cylinder Velie and do all my own repair work. I don't know much about cars, but I can do as well as the garage men in this town do, as they never have a good repair man. I also wish to ask you what you think the trouble is, whether the mixture is too rich or too lean. I have never changed my carburetor, which is a Stromberg G-1. The exhaust is awfully strong and makes your eyes just burn when I run the car into the garage, and pump up a tire with the engine pump. I don't quite understand it, as it didn't use to do that, and I haven't changed the carburetor at all. And when I first start the engine it snaps and seems to explode in the exhaust manifold. My engine heats up much quicker than it used to. I have cleaned the engine and radiator out in good shape but that doesn't seem to help the overheating any. If you can tell me what the trouble might be I will be very grateful to you.

Reply.—The trouble described might be due to faulty ignition, rather than faulty carburetion. A poor spark, due to dirty interrupter points or other causes, would give all the symptoms you describe. On the other hand, the quality of gasoline has probably changed enough in the past two years to make adjustment of the carburetor necessary. We would suggest that you check up the ignition, examine the carburetor float for a leak, and then adjust the carburetor for a leaner mixture. Also, examine the valve push rod adjustment to see that the clearance is not too great, and drive with the spark as far advanced as possible without causing the engine to knock.

2180 **Ammeter for the Dash.**

From Robert C. Ford, Michigan.—Will you please tell me how I could wire a dash ammeter to a 1914 Buick car?

Reply.—If it is a B-24, 25, 36 or 37 there is a metal strap connecting the two terminals on the motor generator. If the strap is found on the outside of the casing, it may easily be removed or cut.



Ammeter Connection.

Some of these machines have the strap on the inside, in which case it is necessary to disassemble the motor generator to remove it. After this has been done, connect ammeter as shown in the accompanying diagram. If the car is a Model 54 or 55, the red wire leading from the No. 4 terminal on the starting switch to the No. 2 terminal on the cut-out relay should be disconnected at the relay end. This end may then be connected to one terminal of the ammeter and another wire run from the other terminal of the ammeter to the terminal on the cut-out relay from which the red wire was disconnected. It is not possible to have the ammeter show the current drawn by the lamps in this case.

2181 **Starting Motors.**

From James Laurie, Pennsylvania.—Please tell me about how much power the ordinary small electric starting motor will develop. I know of one that seems to easily crank an engine that can not be turned over by hand, but I can't see where it get its power from.

Reply.—A small electric motor can develop much power for a short time providing it has a large and well charged battery to draw current from. Possibly some of these motors may give as much as a half horse power for a very short time. Such a motor is not made to give a large output for any length of time.

2182 **Clogged Radiator.**

From Dr. Z. W. Seibert, Ohio.—What makes my radiator get too hot on one side and the other side

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stays cool in my Buick D-44? The pump seems to work all right. Taking off the filling cup while engine is running, the water seems to circulate all right. Have washed it out with soda solution. What is the remedy?

Reply.—Apparently, the radiator is clogged on the side that stays cool. We would suggest that you take the radiator off, turn it upside down with the filler-cap off, and feed water from a hose under pressure into the outlet pipe at the bottom of the radiator. This may force back any stoppage. If not, it will probably be necessary for a radiator repairman to take it apart.

2183 **Compression and Batteries.**

From K. E. Hillestad, Colorado.—1—If compression is weak and too much carbon forms in combustion chamber, continually fouling the spark plugs, is this not a sign of poorly fitting or worn piston rings? And if so, would not a good type of leak proof rings remedy the trouble? Would you recommend a full set of leak-proof rings or just one or two to each piston, and what type of ring do you recommend?

2—A storage battery fully charged should show a specific gravity test of 1.280. Mine are down to 1.200—one cell as low as 1.150—but seem to work all right and start the car properly. I asked my garage dealer about this, thinking they ought to be recharged up to the standard test, but he informed me that this was not necessary so long as they started the car properly regardless of what test they showed. Perhaps he was busy and did not want to bother with a small job like this when there was plenty of other work in sight. What is your idea in regard to this matter? Kindly explain fully.

Reply.—1—Poorly fitted piston rings will give the troubles described; however, with well-fitted rings the same results may be expected if the oil level is too high so that too much oil is fed to the cylinders. Sometimes leakproof rings installed in the top groove or the two top grooves often will help, but properly peened standard rings will do just as well provided the cylinder is not worn out of round or scored; in which case neither type of ring will do much good and it will be necessary to have the cylinders rebored or ground. 2—A cell is usually considered to be fully discharged when the specific gravity of the solution tests 1150. Although the battery in question will crank over the engine it should have immediate attention, as further discharge will sulphate the plates of the low cell to such a point that it will take extra coaxing to bring the battery back into shape. It is unfortunately the usual practice to discharge the battery until it will no longer do the work required of it and then give it some attention, but it is much less expensive and more satisfactory in every way to have the battery recharged just as soon as the specific gravity drops to 1150 in any cell. When recharging, care should be taken to have all three cells brought up to the same specific gravity, and if the cell which is now low does not hold its charge as well as the other two cells, it should be taken apart and examined for an internal short-circuit.

2184 **Leaks Grease.**

From F. C. Ostrander, New York.—The differential of my car leaks grease to the extent that it gets on the fiber, and I have difficulty in getting up the steep hills or starting in bad places. Being a rural letter carrier, I have to start from the ditch about ninety times per day. I have tightened the bolts in the differential until I have spoiled the threads, and have put in new bolts, yet it will leak grease.

Reply.—As you do not state the make of the car or just where the grease leaks through, it is impossible to give specific directions. This trouble may usually be overcome in any case by installing felt washers around the shafts or felt gaskets at any of the joints. Perhaps you use too light a grease or too much of it. The grease should be fluid but not thin and just enough to allow the gear to dip about two inches will be found sufficient if checked up often.

2185 **Radiator Boils.**

From L. A. Brown, Florida.—I have lots of trouble keeping water in my 1915 Baby Grand Chevrolet car. I can fill the radiator and before I have run any distance hardly it is boiling and I have to fill it about every ten miles. Please advise a remedy.

Reply.—In the first place run your car with the spark advanced as far as possible without causing the engine to knock. Retarding the spark causes overheating as does too much play between the rocker arms and valve stems. Fill the cooling system with a strong solution of washing soda in water and run for several hours. Then drain off the solution and flush out the system with fresh water by disconnecting hose connections and feeding water from a hose into the top of the radiator and the water pipe at the top of the cylinders. The fan belt of this car must be kept very tight to have the fan revolve at its full speed. A rich mixture would also cause the engine to overheat and it may be advisable to get a smaller spray nozzle for the carburetor, if the Zenith type is used.

2186 **Gear Changing.**

From a Subscriber, Pennsylvania.—Please state in your next issue if there is more than one way to make a silent gear change from high to second on cars requiring to drop to or below ten miles per hour.

Reply.—The best way to change the gear from high to second is to slow the car to a speed which permits a silent shift with the clutch fully released and a very quick movement of the gear shift lever. This speed will range from five to fifteen miles an hour in different cars. There are times, as in climbing hills, when it is desirable to change the gear when the car is traveling at a higher speed so as not to lose momentum. This may be done by setting the throttle slightly open so that if the clutch were released the engine would speed up slightly but not race excessively, and then shift with the clutch partly disengaged. To shift the gear from high to second at very high car speeds, release the clutch, move the lever from the high speed notch to neutral, engage the clutch, accelerate, disengage the clutch, and move the lever to the second speed notch. The two last methods require considerable

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practice before the novice can successfully carry them out, therefore, we advise the first method.

2187 **This Peculiar Motor Trouble.**

From J. H. Ewing, Tennessee.—The writer has a Dodge Bros. car which he has had for about two years. I took it to our garage man here and he has made a test of the compression and the spark plug cutout, and when he "shorts" any two of the plugs the other two carry the motor over and hit in proper time, but as soon as he releases them the motor goes to missing. When I am on a pull it takes hold and develops well and seems to have plenty of power. If you can enlighten me in regard to the above trouble I will greatly appreciate it.

Reply.—This seems to be a case of what is known as "the engine running away from the gas." With the engine throttled down, the compression is low and the gasoline and air are not well mixed. This makes ignition uncertain. Short-circuiting two sparks is equivalent to running the two live cylinders under load, and they will fire all right. But when all four cylinders are operating, the engine speed developed without load is sufficient to cause the missing described. Widening the spark plug gaps or slightly enriching the mixture or both will, no doubt, overcome the trouble.

2188 **Motor Not Pulling Good.**

From M. E. Richardson, Tennessee.—I let the oil run low in my Ford car. I ran it until I noticed that it was not pulling good, and when I examined it, there was only one pint of oil in it. I also found some small pieces of metal in draining out the oil. After draining out the oil I refilled it and cranked it up, and it seems to run as well as ever. But at times I can hear a knock, that is, when the engine is running slow, and not pulling. Please advise me in your next issue if it is all right to run it as it is or should I have it examined.

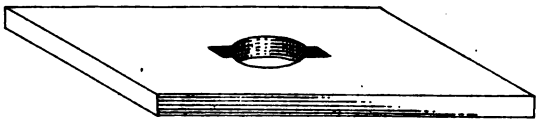
Reply.—It is quite likely that when you ran the engine without oil one of the crank pin bearings became burned or partly melted. If the pieces of metal found in the oil were any larger than dust, it is evident that the bearing is breaking up and may suddenly go to pieces at any time. The engine, by all means, should be taken apart and the bearings carefully examined.

That Back Lash.

From George A. Lippincott, New Jersey.—I have read No. 2169 in your June issue and have had the same trouble with my Chandler Chummy roadster, model 17. Have had it to all of the garages in this section of Long Branch and none of them could locate the trouble. So I took it upon myself to locate the trouble. My car would work all right in high speed, but when I slowed it down there would be a "back lash," so I came to the conclusion that it must be in the low speed adjustment of the carburetor as it worked all right in the high speed. I took my car on the road and kept adjusting the low speed and the first thing that I knew the back lash was gone. I was not satisfied with that, so I adjusted the low speed back again and the "back lash" appeared as before, so I was satisfied that the trouble was in the adjustment of the carburetor. I have adjusted several Chandler cars that have had the same trouble as mine, and they are all right now. If you think well of my suggestions you can try it and I would be pleased to hear of your results.

Right-Hand Screw Plate, Left-Hand Thread.

When left-hand screws are desired and only a right-hand screw plate is available, the left hand plate shaped as follows will, upon a pinch produce fairly satisfactory threads. A screw is first cut with the right-hand die, and a tap made from it by cutting away the threads on two opposite sides of the metal as shown in the accompanying illustration. The tap should be tempered and a hole of the



Left-hand Plate

same diameter as the body drilled in a piece of steel of the proper size. The tap is then placed in the hole and turned to the left while applying considerable pressure. The tap should be turned slowly and the pressure applied steadily in order to ensure a clean cut. If necessary the plate thus made can be shaped and slotted, after which it should be tempered. The screws cut by this plate will not be quite perfect, but will do in an emergency.

Oiling Automobile Springs.

From J. O. Hess, Missouri.—In a recent issue I find an article on oiling automobile springs. Now prying the leaves apart with a chisel, screwdriver or other such instrument to oil the spring seems like giving it a harsh and unmechanical treatment. There are devices on the market that obviate the necessity of such methods. But if one does not happen to own one of them, or is unable to pay the price asked for it, he might adopt my own method, which is as follows: I make a wooden pin ½ inch round, long enough to reach the side of the spring in a vertical position. I have some common yellow soap, worked and kneaded to about the consistency of stiff dough. I put the ½ inch round stick against the spring so that the lower end of the stick comes to the upper edge of the lowest plate in the spring. I now plaster around the sides of the stock and lower end with soap and then withdraw the stick, which leaves a pocket across the side of the spring. I fill this with lubricating oil; capillary attraction does the rest. The oil will penetrate through clear to the other side and clear down to the points of the leaves, oiling the spring completely. I do this of an evening, Next morning I take off the soap oil cups, wipe off all surplus oil and it is wonderful how much easier this spring will ride and keep the unsightly rust off. If I have occasion to take a spring out, I clean all the plates and go over them—first with a coat of paraffine and then dust on flake graphite.

Who Can Tell?

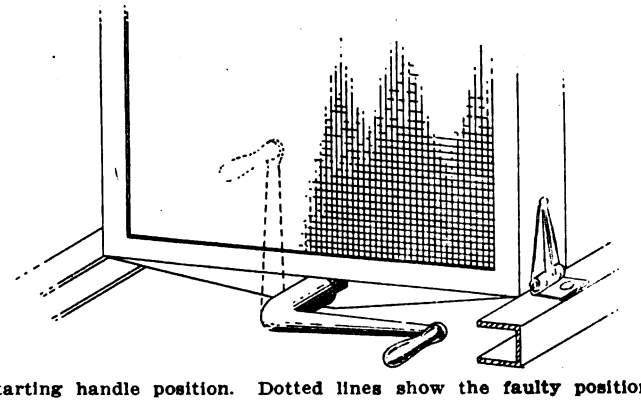
From B. H. H., Pennsylvania.—I have a Crow-Elkhart, model 30, year 1916. I have broken three axles, three pinion gears, one ring gear, one universal joint, all on account of the clutch. It is a dry disc, Raybestos lined. Now if you loosen this clutch it will not pull the car and when you tighten it you nearly always break something. I wrote to

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the Crow-Elkhart people and they admitted that the car would do this, but said that they had a clutch attachment that they would send me that would remedy this. I tried this, but I find that it is no better. The repair man that does my work says the trouble is that they drive the car from the rear springs and that as the transmission is on the rear, when you start there is enough play in the springs so they force the drive shaft and all forward in to your clutch, causing it to grab. Now when you go to back up, this does not happen. Could you tell me how to remedy this, or maybe some other reader has solved the problem and will tell all your readers how.

The Starting Handle.

From Geo. Norton, Delaware.—The idea that the starting handle should be in a vertical position with the grip uppermost is not a good one. In the event of a collision, no matter whether this were more or less serious, the starting handle grip would probably receive a blow, and as a result, the lever would be



Starting handle position. Dotted lines show the faulty position.

driven back into the radiator and cause damage to it. In my opinion, therefore, the best position to fix the starting handle is so that the grip is not in front of the radiator, but rather in front of the chassis cross-member, so that the latter would take the force of the blow if the handle itself should be knocked back. The alternative positions are indicated in the accompanying sketch.

"Pleasure" Not the Right Word.

From Advertising Manager Chevrolet Motors Company.—Let's start a movement to eradicate the word "pleasure" from the automobile vocabulary. It hasn't any place in it. It is this same word that has caused so much glee in Washington lately. Each Congressman I have heard has put special emphasis on the word "pleasure." It is meaningless. It is not correct. Let us cut it out of every catalogue, of every advertisement, from every printed statement.

Let us all start using the word "passenger." That is the word to use, and it is the proper one. The automobile used on the farm isn't used for pleasure purposes. The automobile used to save patients' lives isn't used for pleasure purposes. The passenger car used on any business errand isn't used for pleaure purposes. And so on indefinitely. Let us wipe out the word "pleasure" as applied to an automobile.

A GALLON OF GASOLINE.

And How to Get as Much Service Out of It As Possible.

With the price of gasoline going up every change of the moon, says H. C. Brokaw, principal of the Y. M. C. A. automobile school, New York City, with the increased cost of tires not only possible, but probable, and the tariff for everything else needed for automobile upkeep on the ascent, it is time for the owner to consider his expense and renewal costs. And when it is considered that repairs and labor have pirouetted skyward along with other things, it behooves the owner to consider ways of decreasing running expenses, and to learn how to get as much out of a gallon of gas as possible, not to say every mile out of his tires they can be coaxed to give.

There are many little expenses about running a car which total a considerable sum. The Scotchman puts it: Mony a mickle makes a muckle." A nickel, a dime, a quarter, a dollar, do not seem much at the time, but they pile up the cost per mile frightfully. Not every one can be like a friend, who, when cautioned about the way his chauffeur was running up the cost of his several cars, replied:

"I don't want to know what my cars cost. If I did, my business instinct would doubtless make me dispose of them all, and I do not want to do this. The cars are a luxury and I don't want to know what they cost."

A car which lasts, with ordinary care, one or two years, if given intelligent care by the owner might be made to last three to five years. This means taking extraordinary care and a thorough knowledge of the working parts and how to keep them in condition, and it means doing faithfully and persistently the things necessary to keep everything in order.

When it is considered that, with real war at hand, it may not be possible to get a new car as often as it has been in the past, it might be as well to take care of the cars we have, rather than let them go to rack and ruin for lack of care. We are howling about food waste by the American people and it is about time we hear something about waste of automobiles. A good many automobiles are wasted more than they are used. In some cases this is due to carelessness and in others by lack of knowledge of what to do and how to do it.

Take tires, for instance. The cost due to neglect is often greater than the cost of actual wear. Some of the things which cause excessive wear and deterioration of tires are: driving into holes in the street, or in deep cuts; turning corners at too high speed; stopping the car so quickly with the brake that the wheels slide on the pavement; and a harsh clutch which jerks the car suddenly from a standstill, causing needless wear. Then there are such things as letting the front wheels get out of alignment, so that they do not run parallel, or nearly so, the action being that the tire is slid instead of being rolled over the road. There should be a slight toe in, for mechanical reasons, but if this is allowed to go beyond the proper limit it costs money.

Adjusters tell us that a very large percentage of tire failures is caused by under-inflation, which allows the tires to flatten and breaks the side walls. Every tire should be tested with a gauge and not

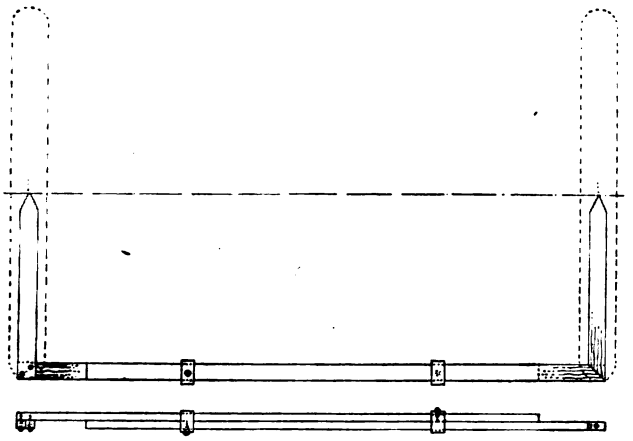
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with the eye or hand, and kept to the pressure named by the tire maker.

To get the greatest life out of a tire it should be watched continually for small cuts through the rubber to the fabric. Most tires will be found after a short service to have from two to a dozen such cuts. These will allow sand to work in and loosen the rubber and then moisture gets in and rots the fabric. There are preparations with which these cuts may be healed in a few minutes; serious cuts, especially where the rubber is loosened from the fabric, should be taken at once to the vulcanizer.

While oil and grease of good quality cost money, their proper use will save many times their price in replacement of parts. On the other hand, a waste of lubricant makes unnecessary expense. Especially with a new car, oil and grease should be watched carefully until the bearings have had time to work in. That is the time when expense for replacement of bearings is most likely.

It is not generally realized that a large number



Method of checking up wheel alignment.

of things enter into the economical use of gasoline. To get the most out of a gallon of gasoline all moving parts must work properly. This means proper lubrication. The brakes should not drag; each cylinder of the engine should fire properly; the clutch should not slip; and the carburetor should be in proper adjustment. It is not well to adjust the carburetor unless sure it is at fault. Excessive carbon in the cylinder causes a decided loss of power, due to back pressure on the piston, and the partial clogging of the muffler indirectly consumes extra gasoline. The importance of keeping the muffler free is not usually understood.

Some time ago I was riding in a car that could hardly make headway against a strong wind blowing. This meant frequent use of the second speed gear, which in itself causes an undue use of gasoline. I found on experimenting that the muffler cutout pedal could be used in place of the accelerator pedal; that is, when the muffler cutout was open the engine had considerable more power and immediately speeded up. The fact is that we kept that cutout open most of the way home and had no more trouble in bucking the headwind. It led to the discovery that the muffler was almost totally clogged with carbon.

To insure each cylinder getting its proper power without waste, the engine should be driven with the spark lever advanced as far as possible without causing back pressure. The spark plug gaps should be adjusted properly to insure a thorough ignition of the charge; the spark plugs should be kept clean to prevent the loss of a charge of gas through non-ignition, likewise the interrupter points and the distributor should be kept clean and properly adjusted.

To use all the gas that is taken into the cylinder there should be no loss of compression through leaky valves, or weak valve springs, or poor gaskets on spark plugs or valve caps; and it is equally important that pet cocks, cylinder head, where there is one, and piston rings are tight, so that gas will not waste.

It is not safe to leave these things to the chauffeur and the garage man. The owner should learn how himself and see that everything about his car is adjusted right and he ought to know how to keep them in order. If he gets this knowledge inside his thinking machine he will find that his propelling machine will work better, and that he will not only have more use and pleasure out of it, but he will save a very appreciable part of the cost of upkeep.

THE LEGAL ASPECT.

It Will Pay Every One Interested in the Automobile to Read This.

Liability for Injury to Guest in Car.—The Louisiana Supreme Court holds that the driver of an automobile is not liable in damages for personal injuries inflicted upon his guest in the car as a result of an accident, where the facts are as follows: The driver had inquired about the condition of the thoroughfare before entering it and was informed that it was all right; the car, while traveling at a moderate speed on a prominent street in a city, ran into an open canal extending across the thoroughfare, without any guard rail, barrier, red light, or other warning of danger; the glare of an electric light between the driver and the canal prevented his seeing the danger until it was too late to stop his car while going at an ordinary speed; the driver had never traveled over that route before and had no knowledge of the dangerous situation; the guest in the car had traveled over that route several times before and was acquainted with the situation, but did not warn the driver or complain of the speed.—Jacobs v. Jacobs, 75 So. 992.

Liability for Acts of Adult Daughter Driving Car.—A member of a real estate firm which owned a motorcar allowed his family to use the car when it was not needed for his business. His adult daughter, without his express consent, took the car on Sunday for a pleasure trip, on which she collided with another car, whose owner sued her father. The Mississippi Supreme Court holds, Woods v. Clements, 74 So. 422, that the defendant's daughter was not his servant in the operation of the car, and he was not liable for her negligence under the doctrine of responsibility of a principal for the acts of his servant or agent.

Construction of Contract to Sell Automobiles.—A dealer's contract with an automobile manufacturer to sell only a restricted territory was secured by deposit with the manufacturer and provided in terms that it should apply to machines in the dealer's possession upon its termination. The Kansas City Court of Appeals holds, Coleman v. Ford Motor Co., 193 S. W. 866 that the deposit may be forfeited where

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the dealer sells outside his territory after the termination of the contract by the manufacturer. A contract may provide for the rights and liabilities of the parties upon its termination.

Automobile Insurance.—The New York Appellate Division holds, in an action on an automobile insurance policy, Callahan v. London & Lancashire Fire Ins. Co., 163 N. Y. Supp. 322, that the fact that plaintiff's automobile was stolen from a garage owned by a corporation of which he was president, the caretaker of the garage being implicated in the theft and subsequent wrecking of the car, did not establish its damage by a person in insured's employment or service within the non-liability clause of an automobile theft insurance policy. Under an automobile policy insuring against theft, etc., the insurer is liable for the total value of a car wrecked after being stolen.

Measure of Damages for Breach of Warranty.—In a suit for the purchase price of an automobile used by the plaintiff for several months before it was returned to the defendant, the measure of damages, if any, for breach of warranty was held to be the difference between the purchase price of the car and its market value on the date of the purchase.—Cook v. Robinson (Ga.) 91 S. E. 427.

Care at Railroad Crossings.—The Kansas Supreme Court holds that the rule that it is negligence as a matter of law for the driver of an automobile to attempt to cross a railroad track without stopping, where without doing so he cannot assure himself that no train is approaching, does not apply where, as the automobile approaches the crossing, the train is standing still, the rear end being near the highway, and a collision results from a sudden starting of the engine. In such a case whatever risk he runs is that the engine may suddenly start up, and stopping his car and going upon the track to look would not give him any additional information as to the likelihood of that taking place. It holds the question whether ordinary prudence forbids his attempting to cross the tracks without further investigation is a fair one for the jury.—De Hardt v. Atchison, T. & S. F. R. Co., 163 Pac. 650.

Knowledge of Right of Way Ordinance.—The Colorado Supreme Court holds that where an ordinance gave one driving an automobile the right of way across an intersecting street and required him to look to the right, one approaching on the intersecting street on a motorcycle with his view unobstructed was bound to know that a vehicle on the other street had the right of way, and his failure to make an effort to look for an approaching vehicle resulting in a collision is contributory negligence so proximately connected with the injury complained of that but for such negligence the injury could not have occurred, and which will bar recovery.—Livingston v. Barney, 163 Pac. 863.

Construction of Contract to Deliver Automobiles.—Under a contract by a manufacturer of automobiles to deliver cars on orders from a dealer f. o. b. Detroit, to be paid for on or before delivery, the Federal District Court for the eastern district of Pennsylvania holds that the dealer could not recover damages for failure to deliver, without proof that it gave shipping directions, and of its readiness to make payment, or of waiver of such condition.—Weinstein v. Studebaker Corp., 238 Fed. 963.

Contracts Between Manufacturer and Dealer—Lack of Mutuality.—A manufacturer of motor cars by written contract granted the right to a dealer to sell its cars within a certain territory for a certain period, and the dealer agreed to purchase a stated number of cars each month during the term of the contract, but the contract did not obligate the manufacturer to furnish the cars, and further provided that it might be canceled by either party at any time on 15 days' notice. The Federal District Court for the northern district of Georgia holds the contract is void for lack of mutuality and unenforceable by the dealer or his representative.—Ellis v. Dodge, 237 Fed. 860.

Breach of Conditional Sale of Automobile—Measure of Damages.—K. sold an automobile to E., taking in payment part cash and notes for the balance and retaining title to the automobile until the purchase price should be paid in full. The notes provided that in default of payment or in case of alienation of the property by the maker of the notes the payee should be authorized to take possession of the property. In an action of replevin for the automobile by K., the Florida Supreme Court holds, Evans v. Kloepfel, 73 So. 180, that upon default by the purchaser to pay one of the notes at maturity K. could maintain the action without previous demand and was entitled to possession of the property and damages for the wrongful detention, and that the measure of damages was the value of the use of the property as estimated by the market price of such use during the period of unlawful detention.

Evidence as to Condition of Car Sold.—An automobile was sold for part payment in cash and notes for the balance, the notes being secured by a chattel mortgage on the car. One of the notes being due and unpaid the seller took possession of the car for the purpose of foreclosing its mortgage. In an action of replevin by the purchaser for possession of the car the plaintiff claimed that the seller breached the sales contract in not delivering an automobile in good condition. It was held that evidence covering the repairs to the car for some 18 months after the delivery was inadmissible. The seller only agreed to have the car in first-class shape when it was delivered to the buyer, and not to keep it so, and the trial court should have confined the evidence to this point. Testimony that the car was of a kind and make of little inherent value was held incompetent, and testimony that it was not of the value placed upon it by the seller when making the trade was immaterial.

The buyer gave the seller an order for new automobile parts, which the seller advised the buyer would have prompt attention, and that it carried a full line of the parts ordered, but later it advised him that it could not ship them for three weeks because the factory was not able to supply them sooner. It was held that the seller was not liable because the buyer meanwhile lost possible chances to sell his machine.—Stanley v. Weber Implement & Vehicle Co., (Mo.) 190 S. W. 372.

Automobile Insurance—Larceny by Trick.—The New York Appellate Division holds, Delafield v. London & Lancashire Fire Ins. Co., 164 N. Y. Supp. 221, that a policy insuring an automobile against theft does not insure it against larceny by trick, the commission of which involves as an essential element

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the deception of the insured by obtaining possession of the automobile through a device of a written agreement to sell it for him, since "theft," as used in the policy, does not include all forms of larceny recognized by law.

Complete Contract of Sale not Variable by Parol Evidence.—The buyer of an automobile signed an instrument covering an order for the car, a list of the equipment included, the price agreed upon, the time of delivery, and the time and manner of payment, and the writing was also signed by the seller. In an action by the purchaser for damages for alleged breach of warranty, the Vermont Supreme Court, Hebard v. Cutler, 99 Atl. 879, held that the instrument evidenced a present agreement of the parties, covering the essentials of a valid contract, and containing nothing to suggest that there were other stipulations which the parties did not intend to include in the writing, so that testimony tending to establish the making and breach of a parol warranty was inadmissible as varying a writing. Judgment for the plaintiff was reversed.

NEW YORK AUTO LAWS.

Relating to the Glare of Headlights and to Driving Rules in New York City.

After August 1 all headlamp glare in New York State must be suitably controlled or deflected so as to avoid any danger of dazzling the eyes of those approaching an automobile from the front. In amending the present laws regarding length of beam or distance at which objects must be illuminated, the newly signed law provides that at a distance of 75 feet directly in front of the car, the beam of light shall not be more than 42 inches above the ground. Further, at a distance of ten feet in front of the lamp, an object ten feet to one side of the direction of the beam must be clearly illuminated. The law applies also to other lights such as windshield spotlights.

Other legislation affecting automobile interests relates to driving conditions within New York City. After August 1, all drivers regularly living or driving within the city must have a separate driving license, which is to be secured from the Secretary of State's licensing bureau at a cost of $1. Professional chauffeurs are not affected by this measure, as they are already required to have a license to drive. Owners, members of their families, all who may properly come under the class of private drivers are required to have such a card, the purpose of which is to register each driver, and by such means to control reckless driving. Drivers from without the city, who have complied with local automobile laws, or those from other States, may drive within the city without such a card for a limited time.

No examination is required to secure a card, and in fact, the secretary's office is arranging to mail out a circular with the necessary forms inclosed that applications may be received and cards issued through the mails.

Keep watch on the spokes of the wheels, especially if the car is an old one. If spokes can be shaken, tighten the bolts on the fingers of the hub. If they are still loose, consult a wheelwright, as your life may be endangered by the breaking of a wheel.

Fire in the Carburetor.

From W. H. Stewart, New York.—When gasoline takes fire it is a serious matter, but the most dangerous accessory to a fire is the one you least expect, namely, panic.

The average person has such an unreasoning fear of gasoline that he loses his head completely. The first few fires will leave one completely unnerved for a time, but after a little experience in fighting them panic disappears and self-control is gained. This does not mean that one should delay or move any more slowly, but should know what to do and do it quickly.

The novice stands aghast as the first burst of flame comes from the carburetor. The experienced man jumps for the nearest preventive. At least one small fire extinguisher should be on every car. The large chemical devices are too bulky and cannot be laid in any position, whereas the ordinary instrument may be stowed away in a small space. The best place is beneath the hood on the carburetor side. This is where the fire starts and may be reached by raising the hood. Some carry them on the running board, but this is objectionable on account of theft liability. If placed under the seat or secured by a lock they are not readily placed in service, and the machine may be badly damaged meanwhile.

Always turn off the gasoline at the tank to stop feeding the flames. Ordinarily there is not more than two ounces in any float chamber and this will not last long. All the parts about the carburetor are metal and not easily harmed. It is well also to use the self-starter to turn the engine. This will draw flames into the manifold. Quite often the whole fire may be extinguished if this is done in time.

A greater danger arises from permitting an accumulation of inflammable material in the drip pan. Once this becomes fully ignited, the situation requires prompt and efficient action. The work of extinguishing should begin right here, leaving the carburetor till the last. Otherwise the burning gasoline at the bottom will continue to ignite that at the carburetor.

So, remember, always start at the bottom and work upward. If there is a flame on the ground beneath the car, use the self-starter with gears in mesh to move to another position. Sand is good if available, but never throw sand on the carburetor or any other parts of the machine. It falls away leaving gasoline free to burn and also gets into the mechanism, doing incalculable harm. On a flat surface sand is excellent, or any other dry powder. Even flour has saved many a home where gasoline has been used carelessly. The old method of covering the fire with a rug or carpet is good, but the extinguisher is better. This covers the fluid with a layer of heavy non-inflammable gas which smothers the flame. Finally, be cautioned never to throw water on burning gasoline. It is heavier than gasoline and tends to spread the flame.

Do not neglect a slight leak in the gasoline line because it isn't leaking very fast. The vapor, being colorless, accumulates without your seeing it, and a disastrous fire may result. If tightening the joints does not stop the leak rub some soap in the threads.

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ADVERTISING IS NOT A WASTE.

Figures Show Low Percentages of Costs When Compared With Gross Receipts.

The favorite plaint of the business man who has fallen asleep by the wayside is that advertising is a huge economic waste; that millions of dollars are spent and wasted in artificial attempts to stimulate selling, to the ultimate injury of both buyer and seller. At first glance, and to the man who has not really studied the subject, this argument may appear logical. The only trouble with the logic is that it does not square with the facts. Most people know more things that are not so about this subject than any other under the sun.

"Let us see how much the big advertisers spend," says Alan C. Reiley, president of the Association of National Advertisers, in discussing this matter. "The average man hears talk every day about the millions and millions spent for advertising and he finally gets the notion that somehow or other the buyer has got to pay for it. I wonder if Mr. Average Man ever stops to realize that those millions spent in advertising sell hundreds of millions worth of goods—goods that could never be sold so cheaply in any other way. And it is this immense saving in selling cost that helps to make lower-priced goods.

" 'Millions spent for advertising' sounds big, but 'hundreds of millions worth of goods sold by advertising' makes the actual amount spent for advertising look small.

"What is the exact ratio of advertising to sales, anyhow? I am glad to be able to tell the public. The Association of National Advertisers has collected some valuable facts and figures on this subject. Listen to a few of them:

"The advertising of one of the leading paint manufacturers of the country averages 3 1/3 per cent. of their total sales. In other words, for every dollar's worth of paint they sell, they spend 3 1/3 cents in advertising. This is about equivalent to the price of a postage stamp and a cent's worth of paper for every dollar's worth of goods sold. Another big paint and varnish manufacturer spends from 3½ to 4½ per cent.

"Next take clothing. We have obtained figures concerning two of the biggest clothing manufacturers in the country. One spends 1½ per cent.; the other 2 per cent. An equally prominent shoe manufacturer spends 1½ per cent. 'But shoes and clothing are necessities,' you may say. 'How about the luxuries?' All right! Take one of the most popular luxuries in the world—candy. One of the best known candy makers in the country and one of the biggest advertisers spends 5 per cent.

"Then take the big automobile and tire manufacturers with their full page and double page spreads. Surely now the percentage figures will begin to jump. Will they? You will be surprised when I give you the figures for two of the most famous automobile builders in the country. One is 2 per cent; the other is 3 per cent. Also two of the leading tire manufacturers; one spends 2 per cent, the other 2 per cent. And all four rank among the biggest advertisers in the country. These figures are authentic, and when you consider the enormous volume of the automobile and tire business you will see that the small percentages are ample to provide for the wonderful publicity.

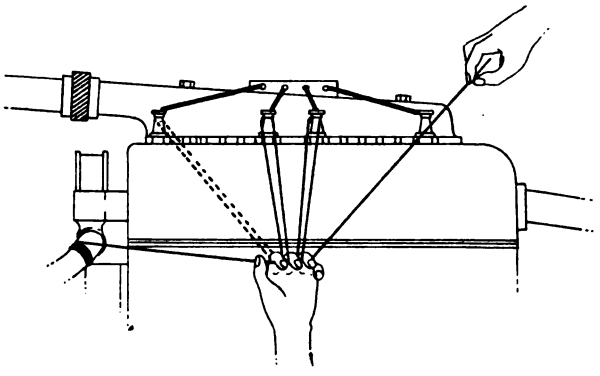
"And then we come to the big department stores—where at one time or another every buyer buys. You can see them fairly eating up the newspapers with their big spreads. But if you expect to find big percentage figures here, again you will be agreeably disappointed. The figures possessed by the Association of National Advertisers show that the average department store's advertising does not cost more than 3 per cent of its total business.

"The fact is that the great majority of all nationally-advertised articles—articles which are famous for their quality as well as their immense distribution, belong in the 5 per cent or under class.

"And let this final point be remembered. Even if this advertising represented a direct advance on what the buyer would otherwise have to pay, this would make little difference in the price of the goods. But it does not. And why not? Because advertising is the most efficient method of marketing ever developed by business enterprise—therefore its effect is to decrease and not to increase the sum total of selling cost. This is a simple fact about advertising that every buyer of advertised goods ought to know."

To Test Spark Plugs.

Take about 4 feet of any ordinary thin wire available. Fix it securely to any metal pipe, nut, bolt,



Shorting the plugs.

rod, etc., in metallic contact with the engine. Now, with 3 feet of uninsulated wire in your bare hands you may take a turn round one, two, or three plug terminals, without shock or, indeed, any knowledge of a high-tension current being present, provided you do not actually touch a plug terminal with the fingers. The detail of the arrangement of the shorting wire is made quite clear in the sketch.

This is an ideal method as you "loop" about as you please, and can quite simply pass the wire round, say, No. 1 plug, back round a finger, round another plug, back again round another finger, and obtain any combination without fastening anything, or using any apparatus except the wire.

There is a spice of excitement the first time you try it, as the average owner-driver does not realize that the high-tension current vastly prefers a wire, however small, to himself. The only points for care are not actually to touch a plug terminal and to see that the end of the wire is firmly fixed or bound to the "earth" point, because if it does come off it will prove a valuable advertisement for the heavily insulated variety of fitments usually employed!

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Millions Saved for Car Owners.

The full significance of the victory won by Firestone in the Perlman Rim patent case is beginning to be appreciated by the motoring public as well as by the car manufacturer. Through this fight made by the Firestone Tire & Rubber Co. the makers and buyers of automobiles are relieved of an unlooked for and unjust royalty tax amounting to between $1,500,000 and $2,000,000 annually.

It was in February, 1916, that L. H. Perlman in a suit against the Standard Welding Co., had his patent sustained. Up to that time anyone had made demountable rims without restrictions. The Firestone Company, for instance, have been making demountable rims since 1908. The Perlman patent, not issued until 1913, was made operative by Perlman swearing that his invention dated back to 1903.

With the sustaining of that claim the automobile industry faced the situation of Perlman having a practical monopoly on all forms of demountable rims. The factory of the Standard Welding Company was closed and all rim manufacturers notified to discontinue making rims.

At the recent trial Perlman was put on the stand and testified to a completion of his invention in 1903, introducing exhibits and documents alleged to substantiate his claims. During the cross-examination of Perlman, he was led into contradictions and evasions and after several hours questioning very interesting facts were brought out as to his business activities. At the end of the cross-examination, the attorneys for the Perlman Rim Corporation moved to dismiss, thereby shutting off further disclosures by the Firestone Co., which they stated would have been startling. Judge Hand allowed the case to be dismissed, although he stated that it was against his wishes, but he was bound by a long line of precedents.

The thing of importance to car manufacturers and the public is that the Firestone search-light has exposed a scheme which had fastened onto the industry a useless drain of millions of dollars. Needless to say Mr. Firestone is delighted at the outcome of the trial as it puts everybody on an equal footing again where merit and efficiency are the measures by which all will be judged.

Opportunities in Russia.

Russia today is the "land of opportunity" for American manufacturers, because the Russians admire America and like American goods. Freed of oppression, Russia during the next fifty years will rival America in progress, thus opening up an export field of vast proportions. Henry H. Wesener, special representative for the Firestone Tire & Rubber Company, just returned from a year's stay in Russia, thus sums up the commercial aspects of the revolution. Mr. Wesener witnessed the stirring scenes that brought about the downfall of the Romanoff dynasty just before sailing for America. His sojourn gave him opportunity to make a close study of industrial and political conditions in the troubled nation.

He strongly urges American manufacturers to "get busy" immediately in this new export field, providing they are willing to give it the attention it deserves. They should not wait until after the war, he says, because England, France, Sweden and other European countries will have become too firmly intrenched.

"American manufacturers wishing to obtain their share of this vast export business," said Mr. Wesener, "should establish distributing depots, put them in charge of experts from the home factory, men imbued with the home spirit and loyal to the home organization. It isn't essential that he speak Russian because good interpreters are available, but a knowledge of French or German is a great help. They will bring much more satisfactory returns than foreign agents, who are only interested in commissions and take little pride in the product or the organization back of it.

"To obtain the best results at the least possible expense, an exporters' association, controlled by the government if necessary, is advisable. Through it, unscrupulous concerns could be kept out of the field, thus protecting legitimate American manufacturers. Such an association could also supply necessary information, such as proper methods of packing, routing, etc., which if collected by manufacturers individually would be almost prohibitive in cost.

"And last, but not least, the establishment of a strong, substantial merchant marine is necessary to success in the export field. Without it America cannot hope to compete with other countries for the commerce of Russia or any other nation. It behooves every business man to urge upon Congress the necessity for a merchant marine.

"The time may come when this country will be compelled to seek larger export fields or else curtail production at home. The latter course means internal disturbances, labor troubles and a general weakening of our commercial system. Larger export fields mean greater prosperity and a greater nation.

"Never before was such an opportunity offered as there is in Russia today. Russia is just beginning to awaken after years of oppression. Its people have marvelous latent qualities for progress and expansion. It is a country three times as large as the United States, has vast natural resources, such as coal, iron, lumber, petroleum, etc. Eighty per cent. of its population of 175,000,000 people are engaged in agriculture or kindred pursuits. The country offers marvelous opportunities for development along transportation and industrial lines."

Mr. Wesener also emphasizes the importance of liberal investments in entering the export field, American exporters, he says, have been impatient to realize quick returns and have made only small investments.

Don't Postpone Buying.

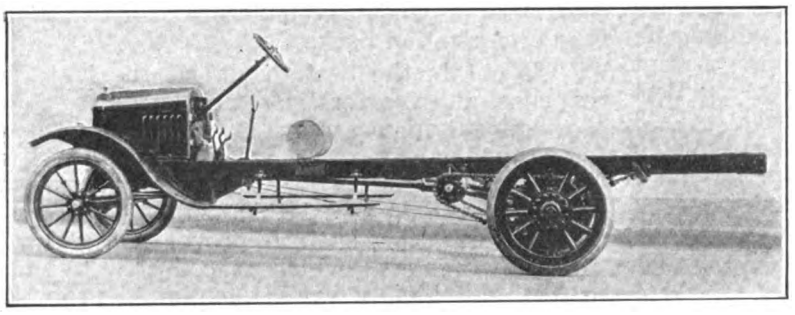
The business man or farmer who has planned to buy a car, because he needs it in his business, by all means should go ahead with his purchase. If buying is postponed, it is only cutting down the effectiveness of the business concerned. The people who are sitting "tight" are standing in the way of the prosperous financial conditions they are asking for. Money invested now in a motor car will do its good in keeping the wheels of industry moving, and faithfully serve the buyer in time of urgent need. Moreover, prices are likely to be higher.

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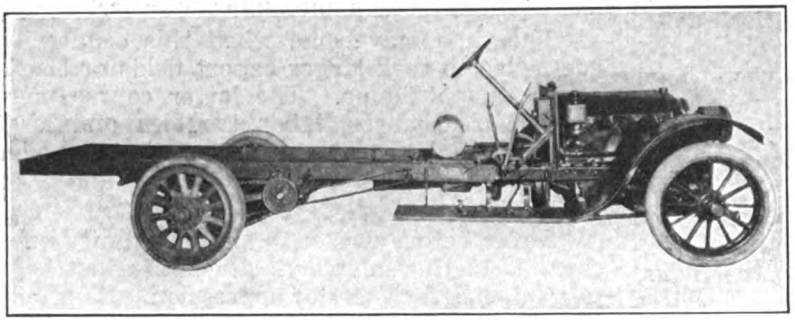
NEW AND INTERESTING THINGS IN MOTORDOM

New Dearborn Truck Units.

Illustrated herewith are two 2-ton Dearborn truck unit attachments, one for a Ford car and the other for an Apperson car, made by the Dearborn Truck Co., 2017 S. Michigan Ave., Chicago. These new units are of strong and durable construction. Ample provision has been made for overloading, the margin of safety being 50 per cent. above rated capacity. Unusual interest in these new units is being shown by Dearborn dealers in all parts of the country and a large number of orders has been booked for immediate delivery, on both types. The two-ton units can be attached successfully to power plants of 40 to 50 horse power; cars such as the Pierce-Arrow, Packard, Peerless, Lozier, Locomobile, Oldsmobile and the larger models of the Hudson and Chalmers and other cars in this class. All of these larger, high priced cars have been built along mechanical lines, that will enable them to give good service for the next five or ten years to come; and a more ideal combination for an inexpensive two-ton truck is hard to imagine than the Dearborn and one of these cars. Other cars that will give good service with the new units are the Overland, Maxwell, Buick, Dodge, Studebaker, Hupmobile, Chandler, Apperson—in fact, any chassis is adaptable.



Dearborn 2-ton unit attachment for Ford chassis.

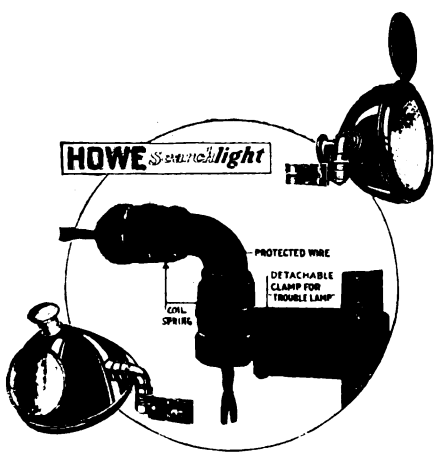


Dearborn 2-ton unit attachment for Apperson 1913 model.

The new two-ton Dearborn units are built with heavier frame, wheels and general all round heavier and stronger construction to meet every condition of hard service. Their specifications speak truck quality. Five inch channel frame dead axle 2½x2 inches drop forged and heat treated; heavy 3-inch springs, 48 inches long and 9 leaves, with bronze bushings in eyes; additional relief spring over rear axle; heavy truck wheels 34x5 inches, guaranteed hickory spokes and felloes, has 12 2½-inch spokes. Solid rubber tires, 34x5 inches; 1¼-inch pitch Baldwin roller chains and Baldwin steel sprockets. Loading space for 10-foot body.

Howe Searchlight Bracket.

Inasmuch as the idea behind the searchlight is the providing of a freely turning light, it is obvious that the bracket is of primary importance. A chief advantage of the Howe Spotlight is its ingenious patented bracket. This bracket is of the universal joint type and both joints turn at the same time so that the lamp can be moved instantly to any angle. It is directed with very little effort. The driver turns it readily with the one hand as he steers with the other. Although moved so easily, the lamp stays where it is directed until again moved. This is because of the patented spring control. Two coil springs hold the two joints in a firm, even pressure—make it easy to turn, but hold it firmly wherever turned, unaffected by jars and vibration. The Howe Bracket is attached to the windshield frame through the medium of a detachable clamp. This clamp is made in seven styles, one of which is guaranteed to fit perfectly any windshield, whether the post be round, square or oval. Simply loosening the set screw as shown in the picture, releases the lamp and its bracket for use as a trouble lamp.



Stolen Automobiles.

Councilman William Stolte of Cleveland, O., introduced an ordinance, which was passed, to regulate the sale of used cars and parts. It provides that every dealer handling used cars or parts shall fill out a description blank furnished by the department of public safety, which shall list the name and address of persons from whom the car or part was obtained, the time when it was bought and the make, license and factory number of automobiles. These blanks are to be filed with the Chief of Police each day by noon, with the complete list of all the property obtained the day preceding. Maximum penalties of $100 fine and six months' imprisonment are provided. It is believed this ordinance will do much toward clearing up the situation in regard to fences for stolen automobiles, supplies and parts.

Non-Glare Law.

A state headlight law went into effect in Illinois, Sunday, July 1. The chief provision is that no glaring headlights may be used under any circumstances within 200 yards of an approaching vehicle. They must be dimmed or extinguished. Another provision specifies a fine of $10 to $25 for any person under 16 years of age who drives a car, and a similar fine for any one who permits a child to do so.

For a Summer Outing.

What is called the Cozy Camp-mobile is a small, neat looking trailer that is easily hauled behind your car. It contains almost everything to make camp life comfortable and homelike. There is dining room, bed room, kitchen and all the furniture and utensils ready for use and in compact form. Those contemplating taking an outing should address the Bigelow-Waggoner Co., 413 Occidental Building, Indianapolis, Ind., for full description and price of this remarkable outfit.

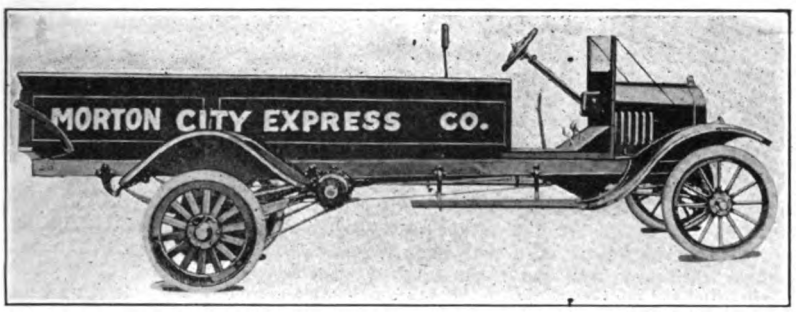
Phenix Truck Maker.

This is a new device for transforming the Ford chassis, so that it will be adaptable to a truck of 3,000 pounds capacity. The manufacturers call attention to the fact that while the Ford power plant is built to carry the ordinary equipment and body of the Ford passenger car, it is nevertheless capable of pulling many times the weight it will carry, and it is on this basis that the Phenix truck is built. The attachment carries 90 per cent. of the load, while the capacity of the Ford motor can easily pull the load without strain. Readers who are interested should consult the advertisement published by the Phenix Truck Maker, 2337-39 South Michigan Avenue, Chicago, Ill., as this advertisement contains a complete sketch and full description of this device.

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The Truckmobile.

Among other things that will prove an extra impetus to the necessity for good road building from now on will be the ever-increasing use of the motor truck. Speed is one of the big reasons for the adoption of the motor truck in place of the horse-drawn vehicle, and to get the most out of speed requires the country good roads. Motor hauling and delivery is increasing rapidly throughout the country; and what is decidedly important to the good road movement, the motor truck is gaining particularly well of late in the rural districts, even in those more isolated sections that are isolated chiefly because of the barrier of poor roads. Everybody knows the reliability of the Ford power plant. Everybody knows its simplicity. If there should be repairs to be made they can be made in a hurry. Take such a power plant with a truck attachment such as the Truckmobile and you have a truck that



Truckmobile attachment for Ford cars.

carries with ease a ton and-a half load. The 133 inch wheel base of the Truckmobile (which by the way is five to eight inches longer than any other converted truck) and the extra wide frame permit the use of a wide variety of bodies. One day you can use the Truckmobile for some particular and distinct kind of load and the next day you can use it for an altogether different kind. In other words you have a flexible truck service in a high degree. In military use, this would be extremely valuable, as it is in many lines of business. The oversize dimensions also make for easier riding and better control of the machine. Simplicity makes for strength. That is why the key-note of Truckmobile design is simplicity throughout. The simplicity of Truckmobile construction starts right with the very attaching of the unit to the Ford. Any two men who can handle a hammer, wrench and drill can do the job in five or six hours. But the big feature of Truckmobile engineering is the spring construction, and the big thing about this is the suspension of the side springs from the lower side of the frame. Truckmobile springs are not suspended at the side of the frame as in other attachments, but interposed between frame and axle. A word or two of explanation will make it easy to see the reason for this. In trying to lift a weight above your head do you hold your arm out from your side and lift the weight obliquely upwards, or do you thrust your arm directly upwards? Of course you do the latter—and there you have the reason for the Truckmobile spring suspension. By keeping the spring directly under the frame of load, the strain on springs and rests of chassis including bearings is far less than it would otherwise be. Made by the Commercial Truckmobile Co., Chicago, Ill.

Fuel Economizer.

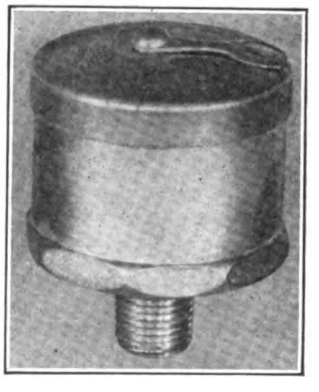
A new gasoline economizer that is not an experiment but a demonstrated success, is made by the York Carburetor & Auto Accessories Co., Inc., 681 Woodward Avenue, Detroit, Mich. The manufacturers are so very sure that this device will result in a great saving of fuel that they promise to guarantee it and return the money for the purchase price if not satisfactory. The firm thus takes all the chances themselves. The device can be installed without making changes of any sort. The cost is so low that no one need consider it anything but a real economy.

A New Ford Accessory.

The Burn-Oil Device Company, Peoria, Ill., claims great saving in fuel for Ford cars by the using of a kerosene attachment. They have scores of letters confirming this, among them quite a number stating they had been able to run their car 35 miles on a gallon of kerosene. In these days of the high cost of fuel it is the duty of everyone to maintain their car at as little expense as possible, and there should be a big sale for this new fuel saver.

An Automatic Oil Cup.

A decided innovation in an automatic oil cup has recently been patented which will be of interest to car manufacturers and the trade in general. In appearance it resembles an ordinary oil cup, but the walls are lined with felt and in the center of the cup is a hollow standard upon the top of which a steel ball vibrates with the movement of the car, carrying the



Automatic Oil Cup.

oil, which is drawn up through the felt by capillary attraction, across the top of the hollow standard, the vibration being sufficient to take the oil in such quantities as may be determined by increasing or decreasing the size of the ball. The cups are made in various shapes to take the place of grease cups as applied to automobiles. One of its strongest features is the fact that it ceases to feed oil the moment the car comes to a stop, so that one filling of oil will last from 3,000 to 5,000 miles. It is claimed that spring bolt replacements will be eliminated and with perfect, efficient oiling, any car will have much longer life than heretofore. Distribution will be made by D. S. Hickey, Jr., 40 Iffley Road, Boston.

Prest-O-Lite Welding Apparatus.

The Prest-O-Lite Company, Inc., Indianapolis, Ind., have issued a new catalogue of their apparatus for oxy-acetylene welding and cutting. It is well illustrated and extremely apprehensive. Those interested in welding and cutting will find it useful for the information it gives.

The Liberty Light Flag Holder.

This is a flag holder for holding the flags of the three principal allies in the great war—the United States, France and Great Britain. The attractive feature of this flag holder is that it is illuminated from below, so that at night the effect is very beautiful. This will be a patented feature, as a patent has already been applied for. The illustration will give readers an excellent idea as to the appearance of this device and the method used for illuminating the flags. A 6 or 12 volt lamp is furnished with the flag holder for illuminating purposes, and the whole outfit will appeal to a very large number of car owners. It is also a quick seller for dealers and agents, and any who are interested—whether dealers or owners—should write for prices and full particulars direct to the manufacturers, the Utilities Sales Association, 607 West 43rd Street, New York City.



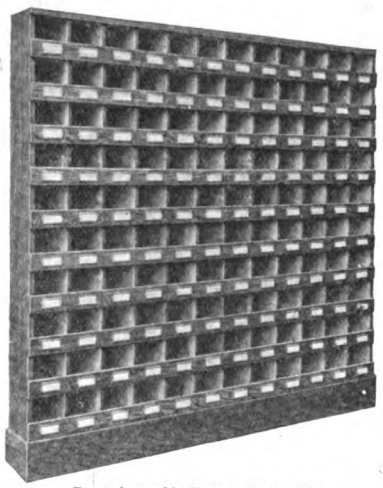
A Simple Vulcanizer.

You can do your own vulcanizing with the Superior Vulcanizer, made by the Superior Vulcanizer Co., 16A Fulton Avenue, Rochester, N. Y., and be independent of anyone. It is guaranteed to work satisfactorily, and costs but a song.

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For Keeping Stock.

The Accessory and Parts Stock Bin illustrated herewith, meets a long felt want for a convenient and economical equipment for handling stocks of valves, valve springs, bolts, piston rings, bearings, bearing cones, grease cups, etc. It is not only attractive in appearance and well made, but it costs little. It contains 120 compartments, 6 x 8 x 10, which will



Contains 120 Compartments.

care for practically all of the ordinary sizes of accessories and small parts around a garage. The front partition and ends of the bin are genuine oak, with a light grained finish. The back is of sheet steel. Each compartment bears a metal card holder for indexing its contents. It makes an attractive, serviceable and economical equipment. Price, $25.50. Manufactured by the Hobart Brothers Co., Troy, Ohio.

A New Car to Appear.

The Wolverine Motors, Inc., has been organized at Kalamazoo, Mich., for the purpose of manufacturing a high grade, four cylinder speed roadster and four passenger touring car. The capital stock is $125,000, which will soon be increased. The new concern intends to get out several demonstrators for 1918 and in the meantime will secure a permanent factory so as to be ready for active production for the 1918 market. The cars will sell for $3,000 and up and the number produced will never be in excess of 1,000 annually.

The Hoosier Sub-Carburetor.

This device if used on any car will increase its flexibility, make it start easier, and will prevent carbon. The manufacturers offer the purchase price back in 30 days, if it is not satisfactory. They have sold 4,000 already, and among these purchasers more than 3,000 have given testimonials without solicitation as to its merit. If you are an automobile dealer you should at once communicate with the manufacturer, the Hoosier Sub-Carburetor Co., Indianapolis, Ind., and get the agency in your territory. The demand will be very large for every user of it will tell his friends and they, naturally, will want something of this sort, which gives from 30 to 40 per cent more mileage, more power, and more speed to their cars. It can be installed in a very few minutes, and you will be surprised at the effect it will have on the running of your car. One man says that after he put one on, he closed his needle valve nearly one-half turn and the engine had more power than it ever had before.

A Handsome Ford Radiator.

The Radiator Sales Co., No. 8 Mt. Elliott Ave., Detroit, Mich., manufactures a radiator for Ford cars that is as much ahead of the original one when the car leaves the factory, as a dress suit is superior to a pair of overalls. The price is but $27.50, the hood is stream lined, and everything is complete to install on the Ford car. In ordering state the year in which your car was built, and whether nickel or black enamel is desired. The same firm has a limited number of "490" Chevrolet radiators, which they will close out for $20 each, as long as they last.

A Complete Comfykit.

What is called the Nathan Comfykit which was especially designed for soldiers and sailors is now to be sold to the general public, and is especially desirable for automobile tourists. It contains about everything one may need for the toilet and is being put up so as to take little space, and it is easily accessible. It makes a fine and appropriate gift to the young man who goes to sea or in the army, and the price is very low considering the material with which it is made and the various articles it holds. There are buttons, a mirror, darning cotton and needles, tooth brush and tooth paste, and an emergency case for accidents, a soap box and a pocket for stationery, a box for extra razor blades, etc. For full information address the Nathan Novelty Mfg. Co., 84-90 Reade St., New York.

New Welding Torch.

The Bishop-Babcock-Becker Company, Cleveland, O., has marketed a new welding torch as illustrated herewith. This torch has a single tube and it is, therefore, possible to do the lightest and heaviest welding by simply changing the tubes. The manufacturers state that when the proper gas pressure is obtained

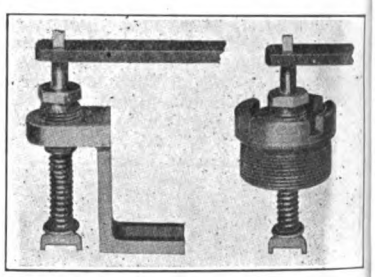


Improved Welding Torch.

it is practically impossible for this new torch to back-fire, regardless of the size of tip used. This feature will be appreciated by every user, as it not only saves a great deal of time but eliminates considerable trouble. Attention is called to the fact that while this welding torch is durably constructed it is light and easy to handle, being designed to fit the hand. It is said that the torch is simple to operate and skilled labor is not required. The illustration shows that the valves are conveniently placed below the handle, and a proper mixture is secured without difficulty. The manufacturers, whose general offices and factories are located at Cleveland, Ohio, will be glad to give further particulars, and will send a complete catalog describing their oxy-acetylene welding and cutting apparatus upon request.

A New Valve Grinder.

The main thing in grinding a valve is to do it in little time, and do it absolutely right, whch can be done with the Kandikid Valve Grinder. It is simple, can be very easily handled, and it will grind the valve of a 4 or 8 cylinder car almost as quickly as it would grind the valves in a 1 cylinder car. The illustration will give some idea of the valve grinder and the way it works, but it can give little information as to its superiority. In the new valve grinder now first on the market all its previous merits as relating to its use on motors with removable spark plug bases (port caps),



The latest valve grinder.

have been retained, and the inconvenience of carrying a pressure block for each size and thread of port hole has been eliminated by the substitution for a spark plug, of a block which has a duplicate of the threaded part of the spark plug. This same block, transferred to the Z-shaped support, acts in the same manner there in putting the actual required and definite pressure on the two surfaces composing the valve, the receiving hole in the support having been designed especially for this specific purpose. The valve grinder is to be marketed by W. C. Brown, Niles, Ohio. It is expected that the delivery of machines will take place soon after this issue of our magazine appears.

Women in Factories.

Planning to meet the labor shortage which will be produced by a prolonged war, the motor car industry is beginning to regard women seriously for factory work. At present approximately 3,000 women are being employed in the factory of the Chalmers Motor Co., the Aluminum Castings Co., Morgan & Wright, the Maxwell Motor Co. and the General Brass & Aluminum Co. The Chalmers Motor Co. is making a very extensive experiment and has placed women on drill presses, bench machines, milling machines, assembling machines and inspecting and is also using them in the foundry. Various manufacturers, now figuring on the employment of women, contemplate placing them in such occupations as sorters, counters, inspectors, sweepers, cleaners, punch press operators, screw machine work, threading and tapping screws, bench assembling and core making.

The Latest Tire Improvement.

In the old bicycle days Palmer tires were universally considered the best. They were used by all who wanted durability and easy running. Mr. Palmer has probably made more tire improvements than any one else in the business. He now manufactures a safety-cord inner tube, which practically does away with

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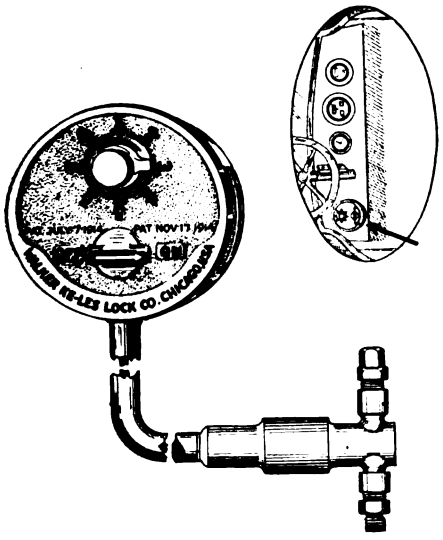
blow-outs, and gives the tire unusual resiliency. All first-class dealers are anxious to get these Palmer tubes to sell and the success they have had with them was a surprise even to themselves, but they want more dealers of this same type and they will back up the efforts of such salesmen with strong and convincing advertising, and thus make the sales large and continuous. This tube is made by the Palmer Tire and Rubber Co., St. Joseph, Mich.

New Gas Delivery System.

The Allen Pressure System Co., Inc., 20 West 61st Street, New York, have placed upon the market a Gasoline and Oil Storage and Distributing System, which eliminates both waste and guess work. It is fireproof, simple, and approved by the Board of Fire Underwriters. They also make a meter which shows at a glance the exact, individual quantity drawn off, and the total amount used. Attractive literature will be mailed upon request and agencies are advised to get in on the sales of this system before it is too late.

A Real Auto Lock.

The auto thief is becoming more bold every day. He plys his trade in the country as well as in the city. It is a good plan to lock the door of the barn before the horse is stolen, and likewise it is wise to lock the automobile before some thief gets it. If you use the Walker Ke-Les lock your car will be absolutely safe, and the price is only $10. You can probably secure one of these locks at any garage or automobile store



A safe lock.

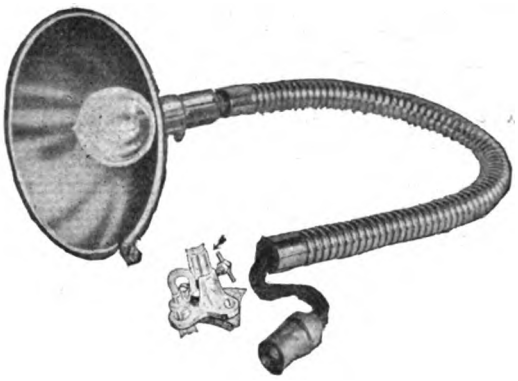
and when installed on your car one small turn of the wrist makes it safe. It locks a lock quicker than you can find your key. It is guaranteed absolutely, and with the three number combination you are the only one who can start your car. There are more than 87,000 changes to this combination. For full information, address the Walker Ke-Les Lock Co., Chicago, Ill.

New Stanwal Brake Lining.

The Standard Woven Fabric Co., Walpole, Mass., has announced a new brake lining material named Stanwal. This new material is impervious to oil, grease, gasoline, water or any foreign substance. The primary base of Stanwal is brass wire covered and protected by a special fabric, specially treated and proof against frictional heat. The company will continue the manufacture of Multibestos lining and clutch facings. Stanwal is also used for clutch facings, friction and insulating tapes, matting, etc. Before introducing Stanwal, it was subjected to a most exhaustive test, the results of which showed the material to have a uniform coefficient of friction of .40 as against .37 in the average brake lining material.

Improved Spotlight.

An extremely ingenious spotlight has just been placed on the market, being manufactured in Los Angeles, Cal. This spotlight incorporates a number of novel features of particular value to motorists and motor cycle users. Although made in three types, the leader of the line is the "Flexarm" model. Instead of the conventional bracket being used in this model, a flexible metallic tubing, similar to that used for speedometer cable-casing, supports the lamp. The advantages of an extremely flexible support such as used here becomes apparent at once. The light may be thrown instantly in any desired direction, forward, backward, up or down, with the very slightest effort of the driver. The manufacturers state that the lamp will stay in any desired position when driving, except over extremely rough roads, because of the spring action of the flexible tubing arm which can be twisted to any desired tension to overcome vibration and shaking. The Kaybee Spotlights are all of the concentrating type; that is another feature of the construction. By means of exclusive construction methods, it is said that they give more concentrated light with less glare or diffusion of rays than that heretofore obtainable. The effective light range is also of greater length, from three-quarters to one mile. A thumb switch is conveniently located just in back of the reflector. Connection of the flexible support is made at the dash by means of a small socket connection and bracket combined, which is quickly installed. These lamps are manufactured and distributed by the Accessories Supply Company, Henne Building, Los Angeles, Cal.



Kaybee Spotlight and Flexible Support.

The Right Service.

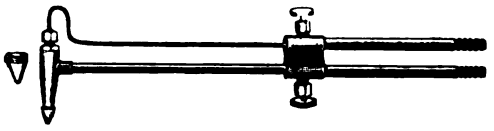
Garagemen have a great opportunity to co-operate in the popularizing of tractors this summer, according to W. C. Giberson, manager of the J. I. Case Threshing Machine Co., at Kansas City, Mo. This company has had few calls for service, though it keeps service men out. It sends complete instructions by which the owner can learn his tractor by heart, and know exactly what is the matter with it if anything goes wrong. It is natural, however, that this summer, many inexperienced operators will be called to run tractors—any tractor—and that there may be more or less demand on the local garagemen for service. "The garagemen can serve the industry in a very valuable way, if they go to the farms on such calls, with the desire to boost, rather than with any spirit of criticism," says Mr. Giberson.

New Detroit Electric.

A new Detroit electric is being produced by the Anderson Electric Co. It has a Springfield type body; side steering lever; or steering wheel if desired at an additional cost of $30; body in cobalt blue; wheels, optional color; Goodrich Silvertown tires, 33 by 4½; Detroit battery, 42 cells, 13 plate; 25 m.p.h. maximum speed; mileage capacity 65 to 100 miles, depending on road conditions. Price, $1,975.

For Battery Repair.

With the Turner Lead Burning Outfit No. 7, you are able to repair storage batteries quickly and efficiently. The apparatus is adapted to nearly every condition of the shop, at a reasonable cost. The use of oxygen and acetylene for lead burning has been adopted by many of the larger firms doing this class of work due to the fact that our torch is so constructed that the flame can be controlled



Turner Lead Burning Outfit.

to any size and temperature desired. The construction of the torch is such that the pressure from air or oxygen will siphon and thoroughly mix the gases. It can be used with oxygen combined with either illuminating gas, acetylene or hydrogen; or with air pressure combined with either illuminating gas, acetylene gas or hydrogen. It is specially adapted for brazing and welding. The price is very low. Manufactured by The Turner Brass Works, Sycamore, Ill.

Tires for Ford Cars Only.

Included in the various buildings being erected at the River Rouge by Henry Ford will be a very large unit devoted to tire manufacturing. Tires made in this factory will be manufactured exclusively for Ford cars.

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Keep Your

Johnson's Carbon Remover

Cures 80% of Engine Trouble

That knocking in your engine—the difficulty you have climbing hills—poor acceleration—lack of power—pre-ignition—noisy motor, are all caused by carbon.

Put New Life in Your Engine

with Johnson's Carbon Remover and it will run like it did the first 500 miles—quietly and full of "pep." No matter how choked up your motor may be, Johnson's Carbon Remover penetrates and softens the carbon. It then burns and powders and is blown out through the exhaust.

You Can Do It Yourself

Five minutes' time and no labor required. Simply lift the hood and pour an ounce of Johnson's Carbon Remover into each cylinder through the petcocks or spark plug openings. Go to bed—get up in the morning and drive a perfectly clean engine.

Use It Every 1000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will automatically eliminate most valve trouble and your engine will always be at its highest efficiency.

Pints $1.00
Half-pints ..... .65

Johnson's Stop-Squeak Oil

Has the Remarkable Property of Seeping Rapidly Between the Spring Leaves

and to the furthermost wearing points and it there becomes a heavy-bodied lubricant.

The irksome task of jacking up a car, prying apart the spring leaves and lubricating them is forever done away with. You, yourself, can now keep your springs thoroughly lubricated at all times. All you need is Johnson's Stop-Squeak Oil.

Make Your Car Ride Easily

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. Instead of bumping over the road, you fairly float along if your springs are lubricated so you have spring action. Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

For Squeaks of All Kinds

Johnson's Stop-Squeak Oil will remove squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil.

Quarts .....$ .85
Pints ..... .50

Write for our folder on Keeping Your Car Young—it's free.

Johnson's Cleaner

Removes Scum, Road-Oil, Grease, etc.

Johnson's Cleaner really cleans. It removes spots, stains, scum, grease, road-oil, tar, alkali, etc. Even those spots that are ground in—mud freckles—and surface scratches that you thought were permanent—will disappear like magic under Johnson's Cleaner.

Does Not Injure the Varnish

Johnson's Cleaner contains no grit or acid so it cannot scratch or injure the finest finish—it simply cleans and prepares it for a polish with Johnson's Prepared Wax ***Liquid***.

A Mirror-Like Polish

on your car adds to the pleasure and prestige of motoring, and increases the market value of your machine. It is just as important to keep your car looking well as running well. With but very little effort, you, yourself can keep body, hood and fenders just like new—use Johnson's Cleaner and Prepared Wax ***Liquid.***

Price, ½ lb. cans..35c each

If your dealer cannot supply you with Johnson's Automobile Products we will prepay the express to any point in the United States east of the Rockies.







S. C. JOHNSON & SON Dept. AD

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CarYoung

Johnson's Prepared Wax

Now Made in Liquid Form

so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is the same as our Paste Wax except that it is a Liquid.

Johnson's Prepared Wax ***Liquid*** will prove a joy to the thousands of automobile owners who prefer a wax polish on their cars but are not inclined to spend the time or effort which Paste Wax requires.

Apply with Cloth, Brush or Spray

Johnson's Prepared Wax ***Liquid*** is very easy to apply and polish—but little rubbing is necessary. You can go over a good-sized car in half an hour. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches—prevents checking and cracking—sheds water and is absolutely dust-proof.

Quarts $1.20
Pints ..... .60

Tell your Dealer that Johnson's Prepared Wax is now made in ***Liquid*** form and insist upon him securing it for you. Write for our folder on Keeping Your Car Young—it is free.

Johnson's Black-Lak

Renews Tops, Side Curtains, Cushions, Etc.

Are your top and side curtains gray, dusty and leaky? If you knew of a preparation with which you, yourself, could easily and quickly make them look like new, would you buy it?

For Mohair and Leather Tops

Johnson's Black-Lak gives perfect satisfaction on any kind of a top. One coat gives a rich, black surface—just like new. It is easy to apply—dries in fifteen minutes—does not rub off on the hands or clothing—is permanent, water-proof and inexpensive. Do not hesitate to use Johnson's Black-Lak on the finest leather. It acts as a preservative and renders the leather soft and flexible.

For Worn Metal Parts

Johnson's Black-Lak is unequaled for blackening fenders—tire rims—running boards—hoods—radiators—guards—lamps—and in fact all worn metal parts. Prevents rust and keeps your car in a high state of repair.

Quarts $1.10
Pints ..... .65

Write for our folder on Keeping Your Car Young—it's free.

Johnson's Auto-Lak

An Automobile Body Varnish That Amateurs Can Use Successfully. Dries in 24 Hours.

Johnson's Auto-Lak is a splendid varnish for bodies, hoods, fenders and all parts of the car. It can be used by the amateur with perfect results. Dries ready for use in 24 hours. Johnson's Auto-Lak is now made in Clear and Black.

Does Your Car Need Re-Varnishing?

With Johnson's products you can easily do the work yourself. Johnson's Auto-Lak goes on easily and quickly—you can finish your car one day and drive it the next. If you are interested drop us a line and we will give you directions for re-finishing your car yourself in 24 hours. This includes the entire car, from wheels to top.

Johnson's Auto-Lak is a new product and not yet generally handled by dealers. If you are unable to buy it locally—send your order direct to us.

Pints....$1.50 Quarts....$2.50

One pint is sufficient for varnishing a roadster.

If your dealer cannot supply you with Johnson's Automobile Products we will prepay the express to any point in the United States east of the Rockies.





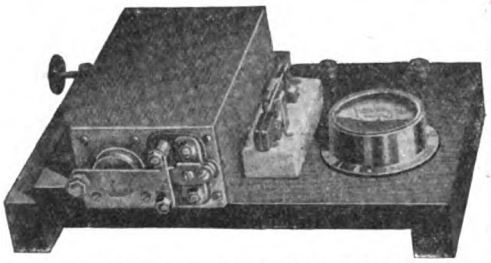


7 **RACINE, WIS. U.S.A.**

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Testing Ford Coils.

There has just been placed on the market by the Ballman-Whitten Mfg. Co., 2867 Gravois Ave., St. Louis, Mo., a device for testing Ford coils, which sells to the trade for $5.10. This Tester consists of a wooden base upon which is mounted a low reading ammeter, receptacle contact springs in which to place the coil to be tested and adjusted, a couple of binding posts for connecting on a 6-volt storage battery or four dry cells, an adjustable spark gap and a switch for making or breaking the circuit. The coil to be tested is slipped into place and a battery is connected on to the binding post provided on Tester base. The switch is then closed and the ammeter should give a fairly steady

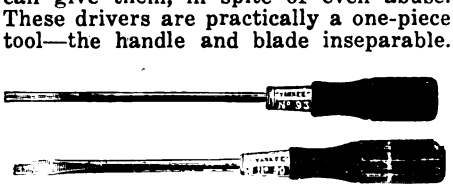


B-W Coil Tester, with coil in place.

reading of about 1½ amperes with a continuous flow of sparks across the spark gap. If the current is lower than 1.2 amperes, then the vibrator spring on the coil is weak and should be strengthened as follows: Remove the cross piece that carries the adjustable contact. Now note the distance that the vibrator spring stands away from the coil head. Increase this distance slightly by bending the vibrator spring away from the coil head. Now replace the adjusting cross head and the current will have increased as well as the stream of sparks. If the current is higher than 1.8 amperes, then the vibrator spring is too strong and stands too far away from the head of coil. In this case the vibrator spring should be bent inward.

Screw-drivers You Can Rely On.

The manufacturers of "Yankee" Tools, recognizing the usefulness of the rigid blade screw-driver, have produced a plain screw-driver with rigid blade that is superior in its way to the ordinary driver. Plain screw-drivers have handles that won't work loose. They can't work loose in spite of the hardest usage a man can give them, in spite of even abuse. These drivers are practically a one-piece tool—the handle and blade inseparable.



Superior Screw-drivers.

The ingenious little "Yankee" device locks the steel shaft firmly in the hardwood handle so that it never lets go its grip. And these handles are specially shaped so that the mechanic can get a firm hold upon them. The "Yankee" Plain Screw-driver comes in two styles: No. 90, the standard style, has fourteen different sizes or length of blades, running from the little two-inch fellow that you can slip in your pocket, up to a 30-inch blade—the largest screw-driver ever made. The No. 95, cabinet style, is made in eleven sizes—from 2½-inch to 15-inch length blades. In other words, no matter what your particular liking in size or shape of rigid blade screw-driver is you'll find among these twenty-five different sizes one that is going to exactly fit your needs, your requirements and your particular taste in drivers. Made by North Bros. Manufacturing Co., Philadelphia, Pa.

Heating the Fuel.

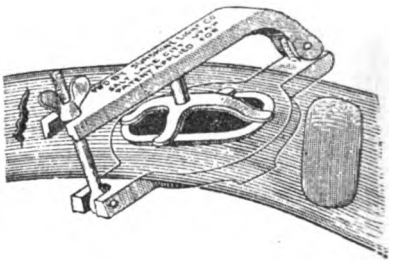
At the present time, not only on account of the high cost of gasoline, but the shortage of the supply, every private user is interested in trying to devise means to increase the efficiency of this particular commodity. Numerous inventions have been tried out to increase mileage or efficiency, also with a view of decreasing costs. Various devices have been used, a great many of them along the same general lines, applying heat to increase vaporization. The use of heat has been attempted, in different forms, either water jacketed manifolds, hot air attachments to carburetors, electric attachments, etc. Therefore they all acknowledge by their efforts that heat is the solution, provided it is properly applied. The first point of interest is, where to obtain the heat and can it be relied upon to give a supply at all times. There is a supply in the exhaust manifold, it is of high enough degree to produce the desired results. The next thing is to utilize it and apply it where it will act upon all of the gasoline before it enters the intake ports of the motor. The Hot Spot Heater is attached in such a way that every particle of gasoline must be influenced as it passes through the intake manifold, as it must strike upon the hot spot, and as the heat is circulated through the hot spot, this circulation being caused by the back pressure from the muffler, and as the heat is given up at a predetermined point, this being accomplished through the method of space restriction at the end of the hot spot, which is inside the intake manifold, through friction, this heat is intensified. There are 1,400 degrees of heat in the exhaust manifold and the natural radiation, in carrying this heat to the Hot Spot Heater, will reduce the intensity but will still leave sufficient to answer the purpose, tests having proven that from 500 to 650 degrees Fahrenheit will actually be delivered at the end of the hot spot, or a surplus of above 100 degrees Fahrenheit more than is necessary to entirely vaporize the gasoline. The Hot Spot Heater is being marketed by the Economizer Sales Co., 2838 Michigan Ave., Chicago.

Piston Ring Directory.

Probably the most complete reference book ever published by a manufacturer for free distribution among Dealers and Mechanics, has just been issued by the Burd High Compression Ring Company, piston ring manufacturers, Rockford, Illinois. This directory is an invaluable source of information for the mechanic and contains data not only on Burd high compression piston rings, but on piston rings in general, their proper fitting, their installation, their lapping and everything connected with this branch of mechanics. The book contains 264 pages. is attractively bound and should be in the hands of every garage man and dealer for information that cannot be obtained anywhere else in such a complete and comprehensive form. It will be mailed free upon request to any member of the trade, using his stationery or enclosing his business card.

Lifts the Irk from Puncture Work.

This Super-Vulcanizer will vulcanize a patch quickly and permanently on any automobile or motorcycle inner tube in five minutes without the use of cement, gasoline, alcohol, acid or blaze. Cannot overcure. Will not blow out in the wind. The fuel is a harmless combustible preparation contained in a pan. The vulcanizable material is specially prepared raw



Super Vulcanizer.

rubber furnished on the reverse side of the pan. When you apply the patch just ignite the heating substance with a match, which is sufficient to cure the raw rubber. In five minutes you have a perfect, permanent repair. Discard the pan and ashes, then tube is ready for instant use. No experience necessary. If you can light a match you can operate it. Manufactured by Sunshine Light Co., Inc., 70 West 4th South St., Salt Lake City, Utah.

Two New Auto Specialties.

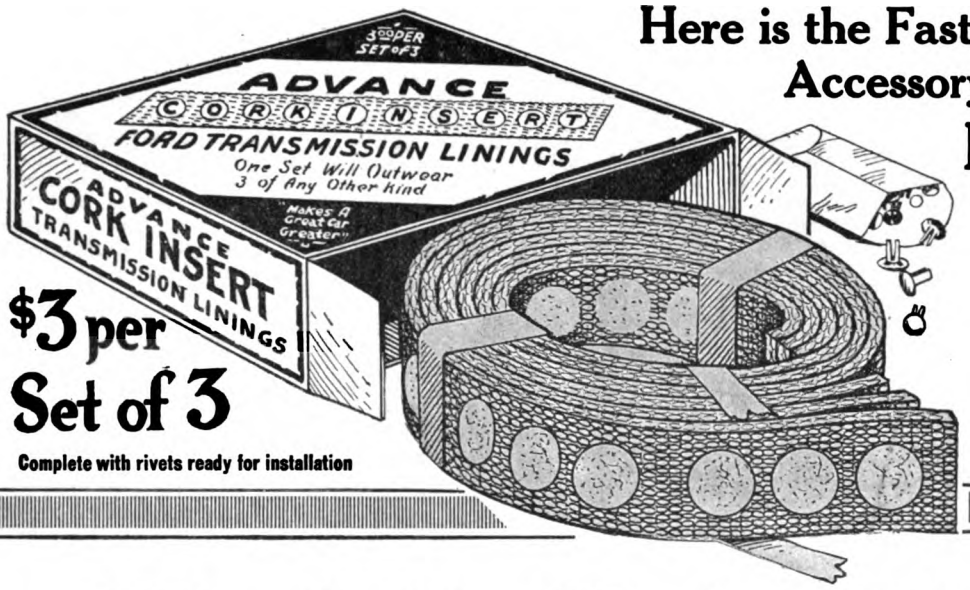
The Apco Mfg. Company, formerly the Auto Parts Company of Providence, R. I., has brought out two new specialties for the Ford car. One of these should appeal to those owners of Fords equipped with the horn button located on the steering column, as the new horn button attachment is attached to the center of the steering wheel where it can be operated without the driver removing his hands from the wheel. The Apco horn button attachment can be installed in a few minutes, comes with the necessary wiring and retails at 25 cents. The tapered filler tube of the Ford car is not adapted to the usual flag holder, and to meet the demand for a three-flag holder the company has brought out a design that displays the flags to a good advantage as the staffs are crossed. The holder is easily attached, becomes a permanent fixture, is finished in black enamel and retails at 25 cents.

Overhanging Loads.

The Hoosier Motor Club has induced the common council of Indianapolis, Ind. to pass an ordinance providing a heavy fine for the driving of a vehicle after sunset containing a load that extends over the bed of the vehicle five feet or more without having a red light attached at the end of the protruding load. The club had compiled statistics to show that many accidents have resulted from motorists colliding with objects extending over the beds of vehicles.

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Here is the Fastest-Selling Accessory of 1917, Dealers!



$3 per Set of 3

Complete with rivets ready for installation

They Make the Ford Brake BRAKE

YOU know how the Ford jumps when it starts, and jerks when it stops — how it shivers and jars every time the brake goes on. Here is something that puts velvety smoothness in the Ford Transmission, so that it goes into low or reverse like a high-priced car. It starts gliding to a quiet stop at the first touch of the toe on the brake. No more clatter, no more jar — regular big car stuff.

ADVANCE
CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917.

TRANSMISSION LININGS FOR FORDS

They STOP the Grabbing and Slipping

Into expensive, imported transmission fabric are inserted circular pieces of cork, slightly thicker than the fabric itself. These cork surfaces engage the brake drums immediately when the pedals are pressed, due to the high coefficient of friction of cork and steel. **Ordinary transmission fabric becomes glossy and hard** and does not grip unless an excessive amount of pressure is brought to bear. Then it suddenly grabs and slips—and that's what causes the jars and the mechanism-killing vibration.

The corks in Cork Insert Linings eliminate the slipping, the jarring, the vibration, of starting and stopping. They also add wonderfully to the life of the linings. The corks wear very slowly—never become hard or glazed—hold their place in the fabric throughout the long wear and do their work to the very last.

Advance Automobile Accessories Corp.
Dept. G5-1 56 E. Randolph St., Chicago

That's why Cork Inserts outlast two to three sets of ordinary linings.

Get Cork Inserts Now

Cork Inserts are being advertised to your trade in the Saturday Evening Post and leading trade papers. They are selling by the thousands. Your customers know about them and are ready to buy as soon as you are prepared to sell them. It's harvest time right now.

Cork Inserts are sold in handsome two-color packages, complete with rivets for installation. Use the coupon and send your order today for Cork Inserts. Your Jobber will get full credit.

ORDER A DOZEN SETS

ADVANCE AUTOMOBILE ACCESSORIES CORPORATION,
Dept. G5-1, 56 E. Randolph Street, Chicago

Express one dozen sets of Advance Cork Insert Transmission Linings for Fords, subject to regular dealers' discount.

Name.....

City..... State.....

Jobber's Name .....

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Standard Norma Ball Bearings.

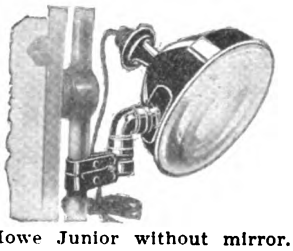
The Norma Company of America, 1790 Broadway, New York, in consideration of the Washington Convention of the Society of Automotive Engineers, issued a special folder under the title "Norma"—In the National Service." In very brief paragraphs it refers to the almost universal standardization of magnetos and lighting generators on "Norma" Ball Bearings in the fields covered by the combined societies—automobiles, trucks and motorcycles; motor boats; aeroplanes; gas engines and tractors. Without specific reference in the text to war time conditions, a martial atmosphere is given the folder by the character of the pen-and-ink illustrations.

Tightens Auto Wheels.

Out in Modesto, California, they are making a preparation that solves the problem of many motorists. All car owners can remember the time when one of the wheels was so loose that only a kind providence saved the occupants of the car from injury. The Liquid Wheel Tightener Company is now making and marketing a preparation called Spoktite, which, it is claimed, will prevent wood treated with it from shrinking. Hot, dry weather has a sure effect on the spokes and felloes of wheels, and in fact, on anything made of wood. Floors, tool handles, implements, all warp and shrink out of shape. Everywhere that a firm union is necessary and is dependent upon the close-fitting of one or more wooden parts for its durability, there is great danger of its failing in its purpose. Spoktite will repair all such breaks. An axe handle can be replaced and a permanent joint made with the application of Spoktite. Some wheels can be taken from the scrapheap and a good repair made with this liquid tightener. It swells any wood to which it is applied and will remain on the job for a long time. The Liquid Wheel Tightener Company, of Modesto, California, will gladly answer any questions about Spoktite or send a sample if desired.

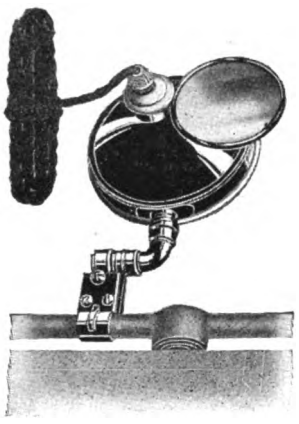
Rear View Spotlight.

Appreciating the demand for a spotlight with the famous Howe spring controlled bracket in a low priced model, the Howe Manufacturing Company has added a new model called the "Howe Junior No. 15." It has a four-inch rear view mirror and sells for $4.75. The same lamp without the mirror sells at $4.



Howe Junior without mirror.

The Howe Spotlight is unique in that it provides without extra charge, two-piece detachable clamps for attaching the lamp with its wonderful bracket to any windshield post; round, square or oval. Jars and vibration do not affect the position of the lamp. This means that it is very readily attached to any car. Loosening one set screw, the clamp detaches and the spotlight can be used as a trouble lamp. The Howe Junior is a very fine appearing lamp. The finish is as good as the car. The principal difference between it and the larger and more expensive models of the Howe is that it is single shell, and does not have the cord concealed inside the bracket. Dealers,



With mirror.

garage owners, and car owners will be interested in a new leaflet describing all of the Howe Spotlight models, which can be had free of charge by writing the manufacturer, mentioning this journal. Address Howe Manufacturing Company, 1732 S. Michigan Ave., Chicago.

Tuthill Spring Co. to Use Gas Furnaces.

The Tuthill Spring Company of Chicago are now operating, full time, a total of fifty-two fuel oil furnaces in their forging and heat-treating departments. Owing to the excessive price of fuel oil, they have been conducting a series of experiments on a new type of gas furnace, which so far indicates more perfect combustion at lower cost than has been possible heretofore. The demand for automobile pleasure car and truck springs has far exceeded the capacity of the Tuthill Plant, and no more contracts will be accepted for 1917. A bulletin recently posted at the Tuthill factory, over the name of F. H. Tuthill, President, is interesting because of its reflection of the spirit of the times. It reads as follows:

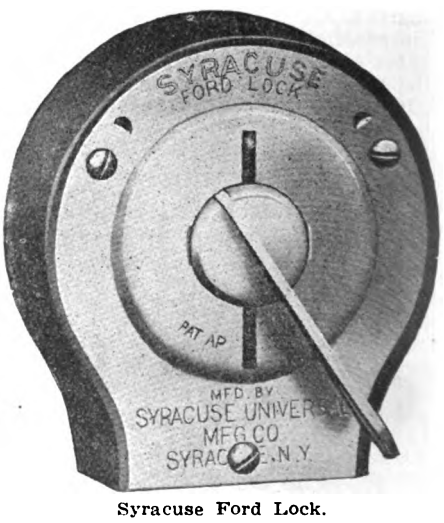
"War necessities must have first call, that is, springs required by our government come first, but ways and means must be found not to side track ordinary contracts or orders or general replacement business. Our ability to meet increased demand by the maintenance of maximum production will be a test in which we must all take part. If this company can so eliminate wastes, as to increase its capacity to meet the demands of old customers, and also meet and possibly anticipate demands from our government, while at the same time coping with problems of raw material shortage and labor difficulties, then we shall be able to go through to peace without noticeable disturbance to the industries which we assist."

Chalmers Six Does Locomotive's Work.

The Chalmers Master Six is in regular service as a locomotive over the Warner & Webber Falls Railroad Company of Oklahoma. This railroad runs the 12 miles between Warner and Webbers Falls. The Chalmers pulls two freight cars over the two and one-half per cent grade with loads from 5,000 to 25,000 pounds three scheduled trips every day and sometimes several extra trips. Carrying these loads it takes from 30 to 45 minutes to cover the 12 miles. It is the regular Chalmers Master Six in all respects except the flanged metal wheels to fit the rails. The car can be converted into an automobile for road use in 30 minutes. It was driven 20,000 miles before being put in service as a locomotive. This railroad was the only one running between these two towns and after it failed the Chalmers Master Six was substituted. The car carries 7 passengers in addition to hauling two freight cars. The passenger fare is 50 cents one way. S. R. Threlkeld, President, General Manager and Chief Engineer of the railroad, says that he has never had one minute's trouble with the Chalmers "locomotive" in the months it has been in service. He has not even had to take out a spark-plug and frequently remarks that the Chalmers is a fine car. "They must certainly put good material in 'em. We get from 8 to 12 miles on a gallon of gasoline over the rails with this sturdy Chalmers locomotive."

Lock Your Car.

Every owner of a car, of course, knows how important it is that his car should be locked when left even for a brief period. There are gangs of organized automobile thieves all over the country stealing cars wherever they can when left unguarded and not properly locked. It is not very long ago since a $6,000 car was stolen in this city while the chauffeur was running up the steps of his employer's house to notify him that the car was at the door. Just as the chauffeur's back was turned, the thief jumped into the car and got away with



Syracuse Ford Lock.

it. The Syracuse Universal Manufacturing Company, Syracuse, N. Y., have brought out a good lock especially for Ford cars which sells at a price which brings it within the reach of everybody. See accompanying illustration. They say it is absolutely burglar proof. It can only be turned by the keys accompanying each car. If you are interested, send for descriptive circular giving further particulars and prices. Do not permit your car to remain unlocked when left standing even for a minute, or you may lose it sometime or other.

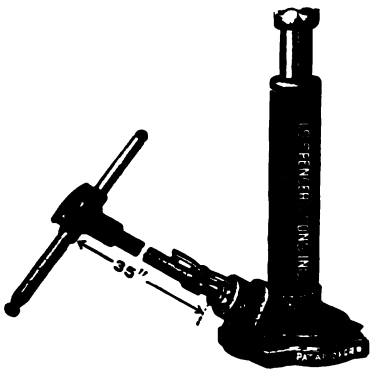
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Auto Light Deflector.

The Art Metal Mfg. Co., Cleveland, O., has put on the market a device that fully eliminates the glare of atuomobile headlights, and it costs but $1. It is sold with a money back guarantee, and dealers and garage and repair men should stock up with some of them, for the sale promises to be large.

A Superior Automobile Jack.

The illustration shows an automobile jack that is easy to manipulate, will not get out of order, and should be in



A Reliable Auto Jack.

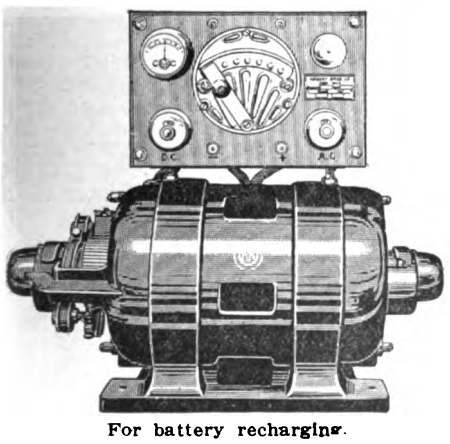
the car house of every automobile owner. It is made by I. S. Spencer's Sons, Guilford, Conn. A postal card will bring a full description of this useful device.

Spindle Connecting Bolt.

Osborne & Stephenson Mfg. Co., Plainville, Conn., make a Ford car spindle connecting bolt which promises to fill a long felt want. They promise immediate delivery in any quantity.

Automobile Battery Charging Outfits.

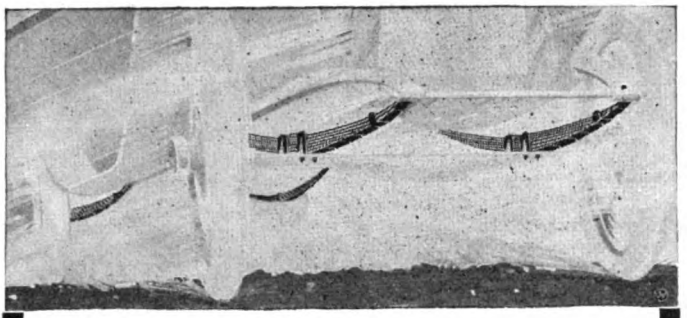
Hobart Bros., Troy, Ohio, have just brought out a new ½ K. W., or 500 watt battery charging appliance, which should interest the garage and allied trade. This outfit has ample capacity to enable battery charging work to be profitable to the user, and is remarkably free from at-



For battery recharging.

tention, or operating expense. Practically any one can handle this work, with no experience whatsoever. The average cost of charging a battery with this machine being approximately 15 cents and the auto owner pays from 75 cents to $1.50 for each battery charged, which means a substantial margin of profit, when seven batteries can be charged at one time. Hobart Bros. have a novel plan of selling this equipment, on a small payment each month, which guarantees the outfit giving the most satisfactory service, and means that the outfit costs practically nothing, the profits from the work usually purchasing the machine. Write for full description, price, etc.

Subscribe for the Automobile Dealer and Repairer $1.00 Per Year



Springs That *Stand* the Strain

Bang! Right into that hole at forty miles an hour! Did he break a spring? No, his car was equipped with

Tuthill Titanic
Lubricated Springs

Guaranteed forever against center breakage—guaranteed at all points and in every respect for one year.

No weakening center bolts—no center nibs. Instead they are strongest at the center—they are reinforced by a patented arch. Rigidly tested both for *elasticity* and *tensile strength* — easily adapted to any axle construction *without extra expense.*

Our Special Ford Tuthill Titanic Spring carries the same broad guarantee as other Tuthill Titanics.

Write for 1917 Price-list—the most complete list ever published for spring replacements—also our proposition to dealers and name of nearest distributor.

Tuthill Spring Company
760 Polk Street Chicago, Illinois

Amazon Has New Mileage Guarantee.

A departure from the conventional tire mileage guarantee has been made by The Amazon Rubber Company at Akron, O. Instead of guaranteeing their tires for a certain number of miles, the new guarantee reads "and the mileage rendered is guaranteed to be satisfactory to the consumer." By this guarantee, if the customer feels that he has not purchased his tire mileage at the lowest possible price, he is at liberty to bring the tire back.

Profit in Painting Motor Cars.

The garage or repair shop that has not yet installed a paint shop department will find profit in so doing. Valentine & Company, 456 Fourth Ave., New York, have recently published a book entitled "The Motor Car Paint Shop Hand Book." It contains chapters on "How to Make the Paint Shop Pay," "Equipment," "Painting Methods and Materials," "Colors and Color Varnishes," "Bookkeeping and Cost Keeping," etc. This book is handsomely bound in cloth and contains just the information needed to install a paint shop department. We understand that a copy will be sent free of charge to any garage owner or repair man who may be interested in the idea of a paint department. It will be found of interest too to those who already have paint departments. We understand that the edition on this book which, by the way is illustrated, is not unlimited, so that our readers who want a copy should write for it at once.

A Superior Ford Truck Attachment.

The Unity Truck Attachment, made by the Unity Motor Truck Co., 306 Engineers' Building, Cleveland, Ohio, converts, at a low cost, the economical, dependable Ford into a sturdy, practical 1,250 lb. truck with 7 to 9 foot loading space back of seat. It is easily clamped, bolted, and securely applied to the Ford without drilling—only a wrench is needed to make a complete assembly. The firm has issued a folder which shows you at a glance why the Unity is a good, practical job. Get this folder and read about the perfect, housed main drive extension with its added universal joint, heat treated shaft and Hyatt H. D. Bearing to carry it, the 50-inch long side springs, mounted on the Ford perch and housing, the big, strong frame and long wheel base which give plenty of loading space, allow correct load distribution and avoid overhand with its consequent skidding and the two truss rods which cradle, align, and strengthen the rear axle unit.

New Wheel Company.

Promotion of a new company for the manufacture of demountable wheels is being completed in Grand Rapids, Mich. The company is to be known as the Kolben Mfg. Co., and will be capitalized at $200,000. Stock will be offered at $10 a share. The company will manufacture hubs only for wire, wood or steel wheels.

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Maine Auto Road Book.

The Maine Automobile Road Book for 1917, issued annually by the Touring Bureau of the Maine Automobile Association, 12 Monument Square, Portland, Maine, is now ready for distribution and the Association feels extremely proud of its sixth annual edition. This year's book numbers nearly 500 pages and is nearly 100 pages larger than the 1916 issue which held the record up to that time. The scope of the book has been greatly enlarged and it now covers not only Maine completely, but this year it has been enlarged to include also the principal arteries of travel in all of the New England States and all of the main automobile routes in Canada from Montreal away east through Quebec to the provinces of New Brunswick and Nova Scotia. The book will carry the tourist from Washington, D. C., Philadelphia, and New York, to Halifax, N. S. Its Western limit is Albany, N. Y., its Southern limit is Washington, D. C., its northwestern limit is Montreal, P. Q., its Northern limit is Quebec and the North Shore of the St. Lawrence River, and it goes as far East as Halifax and the Land of Evangeline.

The famous Pine Tree Tour is still a feature of the book and it also includes the widely known Ideal Tour. The majority of the routes are given in both directions. The book has 25 city and town street maps, new illustrations, new and complete indexes; and features of special value are the new automobile, fish and game, and other important laws enacted by the Maine legislature which was in session this year. Other features are new maps covering every route in the book. The 1917 volume is handsomely bound in a waterproof cover and is completely filled with information of interest and of great value to the motorist touring not only in Maine, but throughout the Northwestern United States and Eastern Canada.

The 1917 Champion.

Many of the noted racing drivers having enrolled in the Aviation Corps and other branches of the service, the American Automobile Association decided to eliminate the 1917 racing championship. When Uncle Sam's imperative call takes the monarchs of the motordrome the question of racing champion must be left unsettled. There's no question as to the champion brand of lubricants. Dixon's Graphite Automobile Lubricants have won undisputed honors—hands down. In scores of races, with scarcely an exception, they have been used by the winning drivers to kill friction, for the slightest delay due to friction is fatal. That's why the winners use Dixon's and why most of the other contestants follow suit. Dixon's will serve the pleasure or commercial driver just as well as they meet the requirements of the racers. Their use means more mileage—smoother, quieter running—less upkeep cost.

New Ribbed Tread Tire.

The Mason Tire & Rubber Company has placed a new Ribbed Tread Tire on the market. This is in addition to the popular Lattice Non-skid tread which this company has manufactured since its inception. The new Ribbed Tread has a jet black top and white side wall and makes a snappy, classy appearance. In speaking of this new tire, Mr. D. M. Mason, General Manager of the Company, said: "Our new ribbed tread tire has been perfected after months of experimenting and testing. This tread has all the strength and resiliency of the well-known Mason Lattice Tread, non-skid tire and was built by us to satisfy the demand for an easy steering



The Mason Tire.

front wheel tire to accompany our non-skid. We have designed it to make a classy appearance and it adds distinction to any car. This new Ribbed Tread, as well as our Lattice Tread, is the achievement of the best tire makers we have been able to gather together. All the knowledge of experts, who have years of successful effort behind them, have gone into these tires to make them the best we can possibly produce. In the manufacture of this Ribbed Tread we have strictly adhered to our original policy from which we have not deviated and shall not, to build a tire of the highest quality at a moderate price. The manner in which our business is growing is a source of great gratification to us. In order to fill our orders we are operating night and day and are compelled now to increase our factory facilities."

An Amazing Record.

Out in Plainville, Kansas, a month or so ago an old automobile was plugging around town in a sort of matter-of-course way. There was nothing in the steady pulse of its motor or in the old-fashioned lines of its hood to suggest that it was unique in any particular. Yet this old 1909 Buick, owned by F. E. Slason, had traveled 261,800 miles, a verified record unequaled, to our knowledge, by any other car in the world. During 1915 in the course of the Hyatt record mileage contest, this car was brought from its undeserved obscurity into national renown. Because every mile of its thousands has been covered on its original set of Hyatt Quiet Bearings, the old Buick is now known as the "Hyatt Roller." The Hyatt Quiet Bearings in the car are at the differential, on the pinion shaft, and in the rear wheel hubs, where they get the greatest grind and wear; they would naturally be expected to be the first parts to give way. But they haven't. They are still there, requiring only occasional lubrication and never needing adjustment or other care. But the old car has recently swelled its astounding mileage record by twelve thousand miles, additional and absolute proof of the wonderful durability of Hyatt quiet bearings.

Cylinder Grinding.

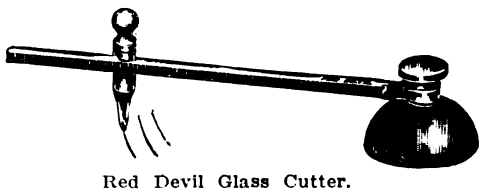
Butler Mfg. Co., of Indianapolis, who specialize in cylinder regrinding, pistons, rings and pins, have not raised their prices despite the fact raw materials have undergone a decided advance. This is an enviable record and they are doing all in their power to retain it. The factory is operated on a production basis; the very best and latest machinery is used and high efficiency is maintained. Devoting, as they do, their energy to this one line, the management is enabled to make a careful study of the work. Wages have been increased to keep pace with the high cost of living, and the spirit of loyalty is strong among the employees. Honest, intelligent service is always the aim of the company, and among machinery houses they have a reputation of requiring more accurate machinery for all of their work than the majority of manufacturing plants.

Safety for Tires and Wheels.

An equipment that will prevent wheels from breaking over and punctured tires, is being sold by the Stone-Thompson Mfg. Co., 1502 Michigan Ave., Chicago, Ill. It also makes demountable wheels of the wheels now on Ford cars. Little labor is needed to apply them, and the equipment can be installed in a few minutes. There will, no doubt, be an extremely large sale for the Stone Demountable Wheel as soon as it becomes fully known, and we advise dealers to make application for the agency of this outfit at once. It makes a quick, demountable wheel of the wheel now on the Ford car, while the regular tire equipment is used. The cost is low and the firm is now ready to receive orders.

Circular Glass Cutter.

The latest addition to the extensive line of "Red Devil" tools is reproduced herewith. This is a "Red Devil" Circular Glass Cutter and embodies some notable improvements over the old tool of this kind. This is designated as style No. 263 and is a convenient tool for cutting automobile headlights, either from plain or sheet glass, from 2 to 22 inches in diameter. It consists of a



Red Devil Glass Cutter.

metal base with a rubber mat to prevent it from slipping. It is also provided with a nickel-plated steel rod, graduated into 16ths of an inch, for adjusting the size of headlight glass required. The cutting head, which contains the cutting wheel, has an adjustable set-screw. It is most useful for automobile owners, dealers and garage men who prefer to cut their own headlights rather than keep a large stock of them. The manufacturers are Smith & Hemenway Co., Inc., 83 Coit St., Irvington, N. J.

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New "Cork Insert" Ford Fan Belt.

The Advance Automobile Accessories Corporation of Chicago, announces a new Ford fan belt. This belt is based on the same idea as underlies "Cork Insert" Transmission Linings for Fords. Circular pieces of cork are inserted into high grade tanned and stretched strips of specially waterproofed oak leather. The corks are backed up by heavy fabric and cannot become loose or slip out. The effect of this fan belt is to eliminate the slipping which cuts down the efficiency of the ordinary belt. The fan belt is subjected to very hard service. It is exposed to water, oil and grease. Grit and dirt are ground into its surface. The normal effect of service likewise, is to wear it smooth and polished from the



Ford Fan Belt Improvement.

constant friction. All of this tends to destroy its gripping properties until the element of slip becomes great. Cork Insert Fan Belts reclaim this lost motion. They make the fan turn with the motor, and eliminate the slip, because the corks are not affected by water or oil or grease or dirt. Cork retains its gripping qualities indefinitely and wears slowly, so that its use results in a fan belt not only of increased efficiency, but of greatly prolonged life. Cork Insert Fan Belts for the 1917 model of the Ford retail for $1 and for other models, 85 cents.

Bodies for Ford Cars.

The Parry Mfg. Company, Indianapolis, Ind., have issued an attractive catalogue showing an unusually comprehensive line of bodies for Ford car chassis. These bodies are guaranteed to stand up under the hardest kind of usage. They ought to sell unusually well and dealers will take very little risk indeed, if they investigate this matter and stock up with a line of them. Catalogues will be sent giving full description.

New York Office for Osgood.

The Osgood Lens Supply Company, of 2007 Michigan Ave., Chicago, Ill., have opened a New York office at 1834 Broadway, New York City. This office will be in charge of G. E. La Vietes, who is already well known in the trade. No doubt the business of the Osgood Lens & Supply Co. will thrive in the New York territory under the able supervision of Mr. La Vietes.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

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Ask For Catalog D. R.

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32x3½	12.50	35x4½	24.75
33x4	17.18	36x4½	25.25
34x4	19.00	37x5	29.75

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New 30x3½ Non-Skid
(Unguaranteed)
$7.50
Jandorf Automobile Co.
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30x3	$6.50	30x3	$5.00
30x3½	8.00	30x3½	6.00
34x4	13.00	34x4	8.00
Guaranteed		$1.00 Less for Re-covering	

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282 Halsey Street Newark, N. J.

Double Tread Tires
Notice Our Prices Before Going Elsewhere
PRICE LIST

Size	Plain	Size	Plain
30x3	$4.50	35x4	$8.50
30x3½	5.00	36x4	9.00
32x3½	6.00	36x4½	9.50
32x4	6.50	36x5	9.50
33x4	7.00	37x4½	9.50
34x4	7.50	37x5	10.00
34x4½	8.00		

For Non-Skid, 50 cents more on all sizes.
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Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

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28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
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DOUBLE TREAD TIRES AND TUBES

GUARANTEED

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SO ARE OUR TIRES.

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90	30x4	7.00	2.50	37x4½	9.00	3.10
30x3	4.50	1.75	32x4½	9.00	2.75	32x4	8.00	2.75	34x5	9.50	3.25
30x3½	6.00	2.10	34x4½	9.00	3.00	33x4	8.00	2.75	35x5	10.00	3.25
32x3½	6.50	2.15	35x4½	9.00	3.00	34x4	8.00	2.75	36x5	11.00	4.00
34x3½	7.50	2.25	36x4½	9.00	3.10	35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
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261-A West 54th Street NEW YORK CITY 112-A East 100 Street

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GUARANTEED 4,000 MILES

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Size	Plain	Non-Skid	Tube	Size	Plain	Non-Skid	Tube
28x3	$5.95	$6.95	$1.80	35x4	$13.45	$14.95	$3.30
30x3	6.50	7.50	1.90	36x4	13.95	15.50	3.35
30x3½	7.95	8.95	2.15	34x4½	16.95	18.95	4.00
32x3½	8.95	9.90	2.25	35x4½	17.45	19.45	4.10
34x3½	9.50	10.45	2.35	36x4½	17.95	19.95	4.15
31x4	11.45	12.60	2.95	37x4½	18.45	20.45	4.25
32x4	11.95	12.95	3.05	35x5	19.45	21.95	4.90
33x4	12.45	13.50	3.10	36x5	20.45	22.95	4.95
34x4	12.95	13.95	3.20	37x5	21.25	23.25	5.05

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32 x 3½	"	11.00	"	12.50
33 x 4	"	15.00	"	17.00
34 x 4	"	15.00	"	17.50
36 x 4	"	22.00	"	24.00

ALL OTHER SIZES ON REQUEST.

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NEW AND SECOND HAND
Tires and Tubes
Write for Prices
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Buy of our agent if one in your town.

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American	.75
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Barley	.75
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Buick	.75
Cadillac	1.00
Carter Car	.75
Case	.75
Chalmers, 1909-10-11	.75
Chalmers Model 17)	.75
Chalmers, 1915-16-17	1.00
Chandler	.75
Chevrolet (490 Model)	.50
Chevrolet (Little Six)	.75
Chevrolet (Baby Grand)	.75
Chevrolet (Royal Mail)	.75
Cole	.75
Crawford	.75
Cunningham	.75
Dauch Tractor	.75
Denby Truck	.75
Detroiter	.75
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Dodge	.75
Dort	.75
Empire	.75
Ford	.50
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Henderson	.75
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Hupmobile, 1915-16-17	.75
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Bulletin No. 6

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"Fused Electrically by Patented Process"

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PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

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1½ Ton Capacity $350

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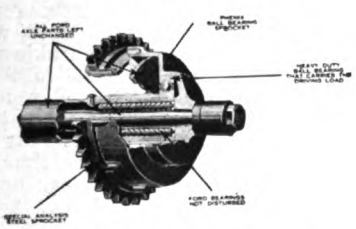
Carries 90% of the Load—Prevents Broken Rear Axles

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But the Ford power plant will *pull* many times the weight it will carry—and on this basis the PHENIX Truck Maker is built.

There is no danger of overloading the power plant of the PHENIX Truck Maker, or of putting undue strain on the motor. At no time is the motor or car—even when hauling the maximum load—subjected to greater strain than when traveling at moderate speed as a pleasure car. The PHENIX Truck Maker—with its massive construction and broad, heavy, artillery type wheels, *carries 90% of the load,* safely and easily. *The Ford part of the unit merely pulls it.*

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Special Ball Bearing Sprocket Prevents Rear Axle Trouble

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If a dealer check here.....

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Classified Advertisements—Continued from page 80.

Cylinders Reground

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

Miscellaneous

COUPON Books for gasoline and supplies. Samples free. J. P. Forbes, Coshocton, Ohio.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

A New Ford Car Tractor.

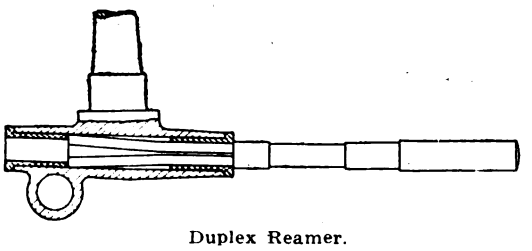
The E. G. Staude Manufacturing Co., St. Paul, Minn., make a tractor for Ford cars, which allows plowing in the morning with the car, and taking it out for pleasure in the evening. It is said to be superior to a three-horse team for plowing, and it will pull a 7-foot double action disc easily. The firm is having a big sale for these tractor attachments and all because it gives universal satisfaction.

Safety Brakes.

The Never Break Products Co., Bangor, Pa., make an adjustable brake for Ford cars that will fit any model. The brakes for rear wheels cost only two dollars, and they are guaranteed without conditions. No changes to make to install them, and by their use absolute safety is secured.

A Useful Tool.

The G. H. Dyer Co., 155 Brookline St., Cambridge, Mass., make a Duplex Reamer for Ford cars, which does the work quickly and accurately. It is illustrated herewith. They make other indispensable tools for Ford car work, and they are all moderate in price, and highly useful in the garage.



Duplex Reamer.

A Reliable Ford Car Lock.

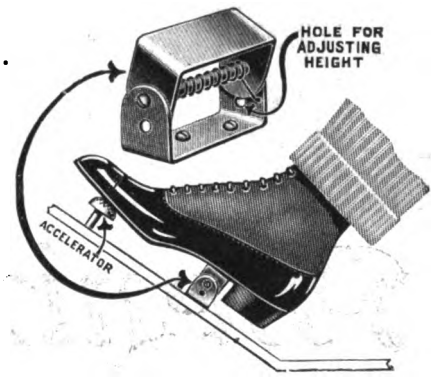
The Syracuse Universal Mfg. Co., Inc., Syracuse, N. Y., make a lock for Ford cars that they sell for $1.50. It cannot be picked and has 1,000 combinations. It is installed in three minutes, and is being distributed by 165 jobbers in this country and Canada. Dealers are advised to write for discounts.

Main Battery Charging Set.

The Main Electric Company, Pittsburgh, Pa., is marketing a battery charging outfit, which is substantial, reliable and is positively guaranteed. No city current is necessary—it generates its own electricity. Operates from a line shaft or engine by belt drive. Charges from one to five lighting or starting batteries at a time. Any voltage, 6 volts up to 30. Large profits are made by charging batteries from this outfit, practically all clear profit. Usually driven from power previously installed and in operation, making no additional operating expense. Makes you independent of a lighting circuit and doubles your profits. Simple to install, no necessary upkeep. Immediate deliveries. Bulletin No. 42 on request.

Relieves the Driver.

The New York Coil Company, 338 Pearl Street, New York, have just placed upon the market a device intended to relieve the foot and leg of all strain and prevent the irregular application of power to the engine, which is so noticeable in driving over rough roads or "bumpy" streets. The device consists of two members formed of drawn steel with a rod running through both pieces so that the top member rocks backward or forward at the same time carrying the entire weight of the leg and foot, which allows a gradual application of power and enables the operator to keep the accelerator fixed at any position desired The spiral spring keeps the upper member in an upright position and means are also provided to raise or lower the device to suit any height of accelerator. The supporter is heavily nickel plated, and sells for seventy-five cents.



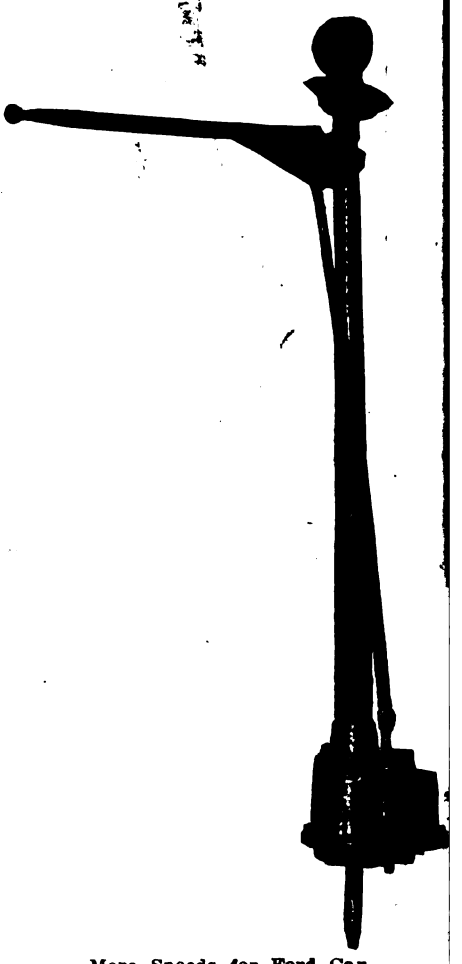
Easy acceleration.

An Emergency Axle.

Ekern Bros. Mfg. Co., Flandreau, South Dakota, make an emergency axle for Ford cars, which is quickly installed. weighs but 8 pounds, costs little, and when needed is likely to be needed very badly indeed. It ought to be an attractive device for Ford car owners.

Woodford Auxiliary Transmission.

With the increasing use of Ford truck attachments, the necessity for a more flexible range of gearings than that which can be had from the standard Ford construction which gives but two gear ratios, has become very apparent. A construction built for this special purpose has been invented in Los Angeles some time ago, and has been manufactured and marketed successfully for more than a year. This construction is an auxiliary transmission giving two speeds, and when used in conjunction with the Ford transmission four gear ratios are available. The transmission is of the sliding gear type, enclosed in a gear case seven inches long. The drive shaft and torque tube is cut, shortened to the proper length to allow for the transmission and the tube seams rewelded. The transmission is then bolted on to the drive shaft and is ready for installation. The makers claim that in addition to the obvious merits, it has another which is extremely desirable to Ford owners either for pleasure cars or truck purposes. The transmission provides a positive neutral point, no gears engaged. This is distinctly a great safety factor, and likewise permits the car to be pushed around without any transmission drag or braking effect. The transmission is bolted to the rear end of the drive shaft, and a flange ready drilled is provided on the transmission case for bolting to the rear axle. Any mechanic can make the change in about one hour on a Ford car or about two hours on a truck type. $52.50 is the price for the complete assembly, and a credit of $7.50 is allowed for the return of the old drive-shaft and torque tube. This makes the net retail price $45.00 F. O. B. Los Angeles. This device is manufactured by the Woodward Truck Attachment Company, 2035 W. Pico Street, Los Angeles.



More Speeds for Ford Car.

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AUTO THIEVES NOW FOILED!!





WALKER KE-LES AUTO LOCK

No Key to Lose
No Keyhole to Find

For All Cars— Gasoline Electric and Steam



Dealers! Here's THE Auto Lock!

Cuts Off Gas, Battery, Magneto, Self-Starter

You can see at a glance, Mr. Dealer, that the Walker Ke-Les is the *right* idea in an auto lock. No key of any kind is used. The Walker Ke-Les works on the combination principle. Same principle as the combination lock for modern burglar-proof safes and bank vaults—only much simpler. Over 3,500 Walker Ke-Les Locks already in use. It is the lock that motordom has always wanted. It is the lock that the dealer has always wanted to sell. It is the one lock that makes every car—gas, electric and steam—absolutely safe from theft.

$10 ($15 Properly Installed)

100% Profit

80% of the business you do yields you a profit of only 15 to 30%. On the Walker Ke-Les Auto Lock you make a profit of 100%. You sell the lock for $10 and get an extra $5 for installing it. We advertise this $5 installation price broadcast so that you are protected on it.

Immediate Delivery

No matter what your experience has been with other so-called "Auto Locks" you'll find the Walker Ke-Les to be the one right proposition in every respect, from the merit of the lock itself to the matter of keeping dealers always supplied.

WRITE! Mail the coupon and get Descriptive Folder on this marvelous auto lock; our dealer's proposition; particulars of our money-back guarantee and our big, national advertising campaign.

WALKER KE-LES LOCK CO. JAMES H. CUMMING, Sales Manager CHICAGO, ILL.

SPECIAL FEATURES

No key to lose or leave in lock. No keyhole to find.
Over 87,000 changes to the combination.
Locks and unlocks faster than one could find his key.
No complicated mechanism or tumblers—just smoothly operating discs. Can't get out of order.
Can be installed on any car—gas, electric or steam. Sets flush with dash or instrument board, right in front of driver.
Absolutely prevents "back-fire" from setting car afire.
Complies with Insurance, Fire and Police requirements regarding cars standing in street.

"Tell me about it" Coupon

Walker Ke-Les Auto Lock Company,
Dept. G, Cunard Building, Chicago, Illinois.

Gentlemen: Please send me Descriptive Folder on your Walker Ke-Les Auto Lock and your dealer's proposition.

Name and Address

_____

_____

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The TRUCKMOBILE and YOU—

The truck attachment idea is admittedly the sensation of the automobile industry. Its growth in the few short years of its existence has been without equal. Dealers, who only a few months ago scoffed at the idea of presenting a truck attachment, today are selling hundreds of them.

This is your opportunity to do the same. But in selecting a truck attachment dealership you want, above all, to represent the one that is biggest in actual construction, biggest in correctness of design and engineering, biggest in performance, biggest in consumer value, biggest in dealer profit—in every way

"Biggest of them all!"

From among the many big points of superiority of the TRUCKMOBILE we list these four—unique to the TRUCKMOBILE—which make it stand out above all others:

$350

And a Ford Chassis
(Old or New)

Makes a Guaranteed 1½ Ton Truck for Every Purpose

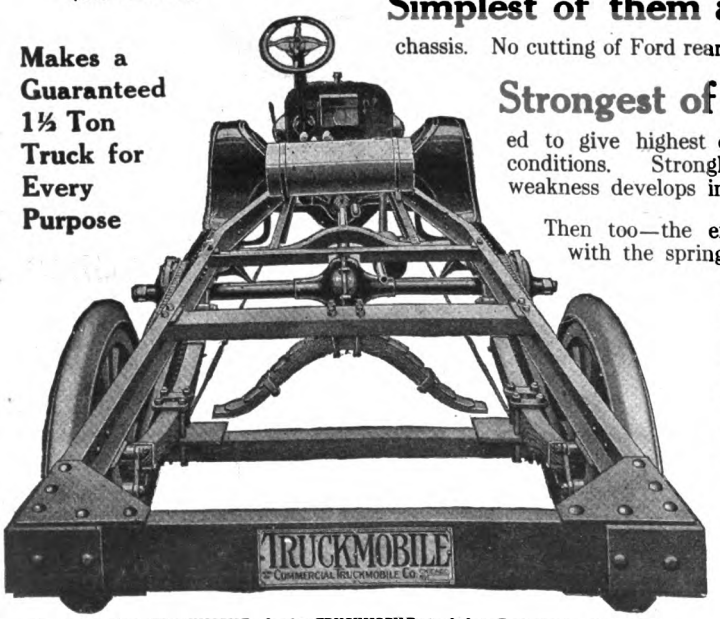
Widest of them all— 6 to 9 inches wider frame than any other gives added stability and sturdiness and eliminates the sidesway with its drag on the motor and wear on bearings.

Longest of them all— 133 inch wheelbase permits greater loading capacity and makes it easiest riding and easiest steering of them all.

Simplest of them all— Fewer parts and less of dealer's time spent in attaching to Ford chassis. No cutting of Ford rear axle or housing necessary.

Strongest of them all— Massively, though simply, constructed to give highest degree of service under any and all conditions. Strongly reinforced at every point where weakness develops in others.

Then too—the exclusive method of spring suspension with the springs interposed between frame and axle, the quickly attached bell sprocket. Add to this the fact that the TRUCKMOBILE is the greatest value for the money—most economical of them all in tire and gasoline mileage, cost of operation and upkeep. All these things make it **Best for the Dealer to sell because it is Best for the User to buy.** Write today for attractive dealer's proposition.

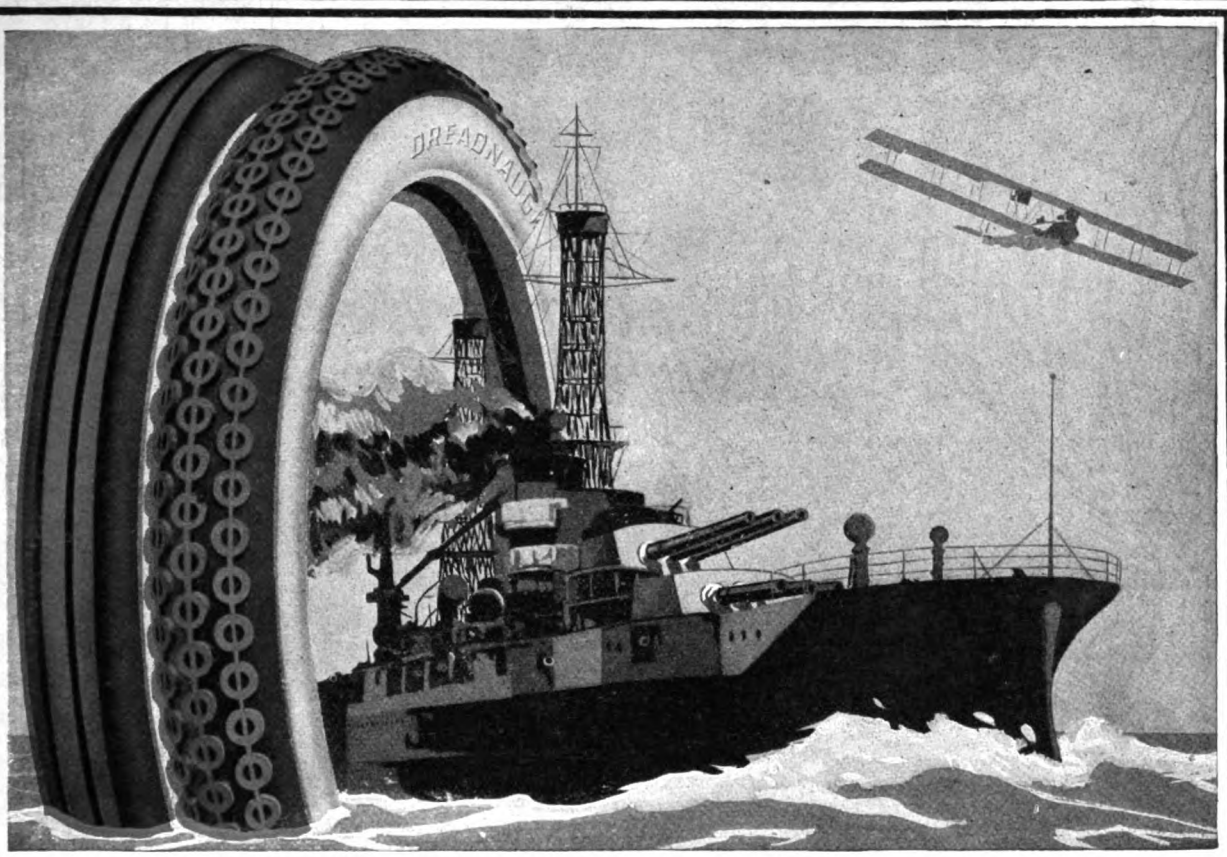


Rear view of the TRUCKMOBILE, showing TRUCKMOBILE attached to Ford chassis. Note massive construction, heavy reinforcement of frame and position of spring interposed between frame and axle.

Commercial Truckmobile Co.
400 Truckmobile Bldg.
Chicago, Ill.

Biggest of them all!

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DREADNAUGHT TIRES

To Dealers: DREADNAUGHT TIRES are the most rugged, durable, smoothest riding and best withstand the ruthless grind of the road. The handsome Red Treads combined with the soft-toned ivory side-walls add smartness and distinction to the car.

THE DREADNAUGHT instantly has won the favor of the public wherever introduced.

5000 MILES GUARANTEED

DREADNAUGHT Red Silent "Vacuum" Tread is a positive anti-skid. The bar through the centre of cups prevents clogging and minimizes noise and road friction.

DREADNAUGHT Red "Ribbed" Tread replaces to great advantage the old-fashioned plain tread.

THE NAME IS AN ASSET TO THE DEALER

Liberal supply of interesting literature and the most attractive advertising devices ever issued by a tire company sent to all of our representatives.

We have an exceptional proposition and assure excellent service with intensive co-operation from our organization. Write or wire, Department "Y"

Beautifully illustrated booklet, "*The Evolution of the Battleship*," by Henry McDonald Spencer, sent free on request.

CHARLES F. U. KELLY, Inc.
Sales Department
1834 Broadway, New York

Manufactured by
The Dreadnaught Tire & Rubber Co
Baltimore, Maryland

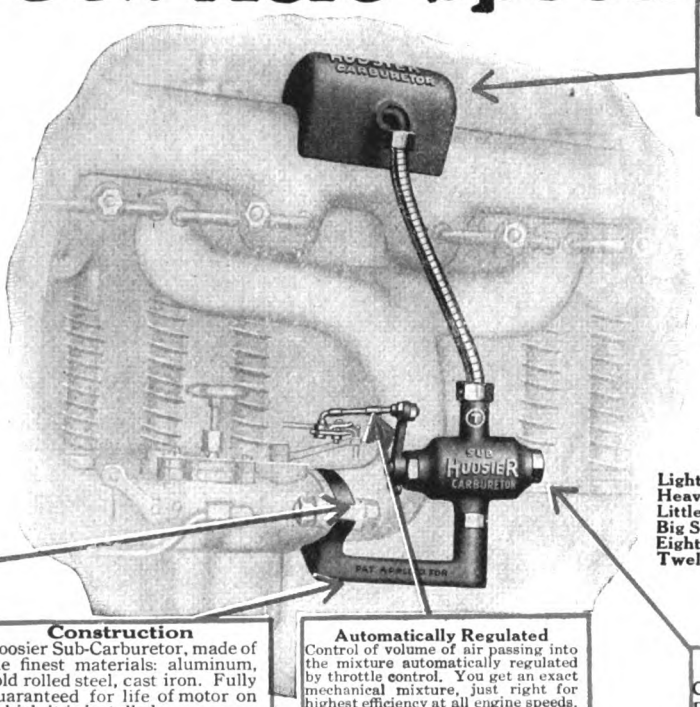
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Get these Guaranteed 3176 Users out

40% Greater Mileage
35% Greater Power
30% More Speed

Heater
Fits over exhaust — Air inlet in back—Carries heated air through flexible tube to valve. On large cars flexible coil around exhaust replaces heater box.

Money Back in 30 Days if not Satisfied



$7.85 for Fords

Light 4 Cylinder Pleasure Cars	$ 8.75
Heavy 4 Cylinder Pleasure Cars	9.50
Little Six Cylinder Pleasure Cars	10.00
Big Six Cylinder Pleasure Cars	11.25
Eight Cylinder Pleasure Cars	12.25
Twelve Cylinder Pleasure Cars	14.50

Add duty for Canada

Screen Block
This screen block fits between carburetor and intake manifold and contains air spray nozzle for supplying air to mixture and a fine wire cloth mechanically break mixture into finer form.

Construction
Hoosier Sub-Carburetor, made of the finest materials: aluminum, cold rolled steel, cast iron. Fully guaranteed for life of motor on which it is installed.

Automatically Regulated
Control of volume of air passing into the mixture automatically regulated by throttle control. You get an exact mechanical mixture, just right for highest efficiency at all engine speeds.

Valve
Controls volume of heated air passing into the mixture, giving exact proportions necessary for all conditions of motor operation.

OVER 4,000 Hoosier Sub-Carburetors have already been sold—over 3,000 enthusiastic testimonials have come in to us entirely unsolicited. Everyone says: "Hoosier Sub-Carburetor is the greatest economy device ever put on to a motor."

Heated air is drawn from the logical place — around the exhaust pipe. It is injected into the mixture at the proper point just after the mixture leaves the carburetor. The amount of air is mechanically regulated. You get a rich mixture when you need it—starting or running on low engine speeds. You get a more economical, more explosive mixture when you want it—at high engine speeds. That is why users of Hoosier Sub-Carburetor say: "If we had to pay five times as much for it, we would gladly do so because of the results it gives."

Any Good Garage Man will Verify This

How does Hoosier Sub-Carburetor increase mileage? It breaks the mixture up into finer form—gives it more air.

NOTE—About 87% of the gasoline taken into a motor with an ordinary carburetor comes out from the exhaust unexploded. It is not sufficiently vaporized. Hoosier Sub-Carburetor cuts down this waste by a big percentage by breaking up the mixture and vaporizing it much more completely.

How will Hoosier Sub-Carburetor prevent carbon? Carbon is formed from unexploded gasoline in contact with lubricating oil.

Hoosier Sub-Carburetor greatly reduces the amount of unexploded gasoline. Prove this by opening the pet cock on a motor not equipped with Hoosier Sub-Carburetor. You get a dull red blaze without Hoosier Sub-Carburetor. With it you get a clear, steel-blue blaze.

How does Hoosier Sub-Carburetor give more power and speed? It breaks up and vaporizes the mixture — makes it more combustible — gives a quicker and more powerful explosion.

How does Hoosier Sub-Carburetor give greater flexibility? Motor flexibility comes from the proper regulation of a mixture and a more rapid explosion. When the gas explodes rapidly, the motor does not load up.

We Guarantee These Results

We positively guarantee, with a 30-day money-back clause, the amazing results obtained by Hoosier Sub-Carburetor users.

40% greater mileage. 35% greater power. 30% more speed. Wonderful flexibility—easier starting—less carbon.

Use Hoosier Sub-Carburetor on your own car. If you don't get these results send it back; we will gladly refund your entire purchase price within 30 days of your purchase.

Amazingly Simple to Install

You can install Hoosier Sub-Carburetor in a very few minutes — do all the work yourself if you want to. Full instructions accompany each device. After you have once put it on your motor, you will hardly recognize your car as the same one you were using before you made the installation. It will put the "pep" of a new car into any old motor. It will make any new motor tremendously more efficient.

3176 testimonial letters from 4000 users — UNSOLICITED

Wanted—Exclusive Dealers

The Hoosier Sub-Carburetor will sell like wildfire to every car owner. As soon as you get your contract we will prove results on cars in your territory—ready for you to start sales. We will back you with big national and local advertising. Prove to us that you are the best equipped and responsible. Write, wire, phone or jump the first train for Indianapolis; get this fastest selling accessory; a money-saver for any car owner—a money-maker for you.

Better Than 30 Miles

I put the Hoosier Sub-Carburetor on my car and filled the tank full, and when the gauge showed three gallons, my speedometer read 214 8/10 miles, which is a little better than 30½ miles to the gallon. I was averaging 100 miles to five gallons of gasoline before I installed it.
D. L. STINSON, Twin Buttes, Ariz.

Speed—Power—Less Carbon

I am well pleased with my trial. I get more speed, power, less carbon, and the engine runs a great deal smoother.
J. A. TEAGARDEN, Auburn, Cal.

Could Not Be Without It

I installed the Hoosier Sub-Carburetor on my car a few days since and made a trip of 20 miles through heavy mud roads. I closed my needle valve nearly one-half turn and the engine had more power and pep than it ever had before. In fact, I could not get along without it.
C. L. HOOKER, Crowley, La.

Average 24½ Miles

Your favor of the 28th received. During 10 days' use of the car it covered 514 miles on 21 gallons of gasoline or an average of barely 24½ miles to the gallon.
WM. A. HOWE, Pasadena, Cal.

Big Gain Over All Others

My tests were as follows: Miles per gallon of gasoline on Ford car, with no other changes except carburetors. With Kingston Carburetor, 18 miles per gallon; Holly Carburetor, 22 miles per gallon; Stromberg Special Carburetor, 27 miles per gallon; Hoosier Sub-Carburetor, 31½ miles per gallon.
R. E. BEERS, Pond, Cal.

Runs Like a New Car

My car is 2 years old in November and with your Carburetor it runs like a new car.
C. E. EDWARDS, Buhl, Idaho

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Results-on any Car-Today of 4000 say—

Wonderful Flexibility
Easier Starting
Less Carbon

Easy to Install
No Adjustments
Positive in Action

SUB HOOSIER CARBURETOR

Ready Now
Ship Anywhere
Get it

YOU are a live dealer—wide awake to real selling propositions. It won't take you a minute to see why this wonderful device is certain to be your biggest seller.

Thousands of devices have purported to give economy, flexibility, speed, power. Where are they now? They are not on the market. What is the reason? Simply the fact that they did not make good when they were used by car owners. If they had made good they would still be selling like wildfire. Gasoline price is going up. Car owners must get more mileage.

Hoosier Sub-Carburetor is a proved economizer—a proved power and speed developer—a proved advantage to any motor. It has made good.

You have already seen big evidence of this fact. Over 4,000 Hoosier Sub-Carburetors have already been sold—over 3,000 enthusiastic testimonials have come in to us entirely unsolicited.

These 4,000 users came without any sales effort at all. No advertising. No big dealer campaign. They were orders that came just because car owners wanted Hoosier Sub-Carburetors. But they are of tremendous value to you. They show you that Hoosier Sub-Carburetor is a real selling proposition.

This is Your Big Chance

Hoosier Sub-Carburetor is going to be the fastest selling accessory ever offered dealers. All the preliminary work has been done. The tests have been made—owner satisfaction has been proved. Our advertising campaign will be tremendous, in all the big national publications. We are going to sell Hoosier Sub-Carburetors for you.

Big Mileage Increase

I went 176 miles without the Sub-Carburetor. Left with a full tank of gasoline, when I got home I had one inch left in the tank. Then the next Sunday I went 194 miles. Left with a full tank of gosoline and when I got home I had 3½ inches left in the tank.
H. BEHUKEN,
San Francisco, Cal.

40% Increase

On my trip to Washington, D. C., and return, my average mileage was about 16 miles per gallon, with my Inter-State Six. Before installing the Hoosier I did well to make 11 miles per gallon. The increased power is certainly noticeable. It's a dandy.
DR. J. M. SINGER,
Dunkirk, Ind.

9 Miles Increase

Mileage has been increased from twenty to twenty-nine miles on each gallon of gasoline used.
HARRY O. WILSON,
National Military Home, Ind.

Gained Over 15 Miles

Got 34 3/10 miles per gallon of gasoline, where without it I made only 18 5/10 miles over the same road and in the same time under the same conditions.
A. McALEXANDER, San Diego, Cal.

Very Good

We gave your Sub-Carburetor a good test and made 19.4 miles without and 26.2 miles with it. I think this is very good.
HERZOG'S FURN. CO., Saginaw, Mich.

Doubled Mileage

I have purchased a Hoosier from you and have it on my car, getting from 25 to 35 miles on a gallon of gasoline, where I didn't get but 12 to 18 before I put on the Hoosier.
B. E. HARRIS,
Americus, Ga.

More Snap and Vim

I had been getting from eighteen to twenty miles on a gallon of gasoline, but with your Sub-Carburetor I got an average of thirty-two miles and more snap and vim to motor.
DR. H. K. RADCLIFF,
Dunkirk, Ind.

The demand in your territory will be instantaneous.

Bigger than any demand you have previously experienced for any accessory.

What automobile owners have tried to get in other economizers, they do get in the Hoosier Sub-Carburetor. The time was never so ripe as it is now for a real, practical gasoline saver—power and speed increaser—than can be used on any make of car.

The possibilities are stupendous. Your time for action is limited.

Dealers are already being closed up in tremendous numbers in all parts of the country. If you are a distributor you can make Hoosier Sub-Carburetor the biggest producer you have to sell. The demand will be so tremendous—so spontaneous that all you will have to do is to take orders.

Practically every user of a Hoosier Sub-Carburetor has sold several more to his friends. Take advantage of this tremendous wave of business.

Don't Forget The Money Back Guarantee

If we had not already shown you the tremendous number of unsolicited testimonials that have come to us, our "Money Back in Thirty Days" guarantee would be sufficient evidence that we have an accessory of proved value. For we put the proof entirely up to the user.

A few minutes' work and the Hoosier Sub-Carburetor is installed. Then the user has thirty days to prove its wonderful advantages.

Whatever else you do, wire now for this big seller.

You Want This Real Economizer On Your Car

We don't have to prove to you that you need this wonderful economizer. Over 3,000 automobile users have already proved it by their own experience.

We don't have to argue about the wonderful merits of Hoosier Sub-Carburetor. Our wonderful money-back guarantee is your protection. If within thirty days after you use it you feel that you can do without it, return it to us and get your money back. The only thing we want to say to you is, "Get your order in early. Send the Coupon. You have thirty days in which to satisfy yourself of the results.

HOOSIER SUB-CARBURETOR CO., A.D.&R. July, '17
Indianapolis, Ind.

Enclosed find check or money order in full payment for one **Hoosier Sub-Carburetor** with the understanding that you guarantee it for life and will refund cost price in full if I return your device to you collect within 30 days.

Name of car ..... model ..... year .....

Name .....

Address .....

I recommend as a good dealer .....

..... of .....

Hoosier Sub-Carburetor Co., Indianapolis, Ind.

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An electric hand crank you can sell *to* Ford owners

Ford Owners are looking for a starter that fits the Ford

In cars other than the Ford, the electric starter is *built-in*. Not only is the starter designed to fit the car, but the car is designed to fit the starter. But in a Ford, this is different. When you install an inside-the-hood starter, you interfere with the essentials of Ford design.

But the Eveready Ford Starter is literally an electric hand crank. It sits outside the hood on the cross channel member of the chassis, right where the crank grows, and it does its job just exactly as the crank does it—not by a one-direction pull, but with a complete rotary twist. Its weight is off the engine base. It does not disturb the balance of the motor nor the distribution of weight on its three suspension points. It cannot cause undue wear on the main bearings. It does not fill up the cooling air space under the hood. It is free from the side-thrust, the noise, and the nuisance of chains and gears. And when you have engine repairs to make, it is no more in your way than your lamps or springs. This is the starter you can sell.

There is still some uncovered territory on our distribution map. The Eveready Starter presents a wonderful opportunity to live dealers. Mail coupon below for particulars.

AMERICAN EVEREADY WORKS
OF NATIONAL CARBON CO., Inc.
Long Island City - New York

CANADIAN NATIONAL CARBON CO., Ltd.,
Toronto.



EVEREADY

Starting and Lighting System for FORD Cars

Send details of your proposition to dealers.
Name.....
Street.....
City.....State.....

Digitized by Google

EKERN'S EMERGENCY AXLE No. 3 FOR FORD CARS.



With this device you can place the Ford Car on its own wheels in two minutes. Knock the broken axle stub out of the wheel hub, place wheel on Emergency Axle Stub and hook the Device on the flange of the Axle Housing and the Ford can be pulled in at any speed desired with safety. Weight 8 lbs.

Sent Express Prepaid to any address in the United States for $4.90. Cash with order.

EKERN BROS. MFG. CO., Flandreau, SOUTH DAKOTA

Useful for Car Owners.

The Aerofram Company, Inc., 105 Massachusetts Avenue, Boston, Mass., make a union connector for dry cells which is highly recommended. Their



Aerofram Gasoline Saver only costs a dollar, and can be attached to any car in ten minutes. It increases power, keeps down carbon, and makes the motor run better in every way.

New Specialty Devices.

The Star Specialty Manufacturing Co., 227 West Erie Street, Chicago, Ill., have issued a series of circulars describing and illustrating their products. Among the most important of these products is a small starter for Ford cars that costs little and a gasoline-tight piston ring. There are a good many others in the list, and accessory dealers should write and get all of these folders, which describe articles that ought to sell well.

America First.

During these trying times it is not only incumbent upon us all to be patriotic, but to let others know that we are for America first, and at all times. The



flag illustrated herewith for automobile hoods is an unusually attractive one. It is being made by The Art Metal Works Co., Inc., 7-15 Mulberry Street, Newark, N. J., and its cost is nominal.

"LAKEWOOD" QUICK ATTACHABLE FAN BELT FASTENERS



(Actual size 1 inch Fastener. We supply necessary split rivets)



Take the "jinx" off Fan Belt Repair troubles.

On or off in a jiffy—makes Fan Belt Repair profitable to you and enables you to quickly handle "special" fan belts to order. Outlast belts.

Car Drivers will buy them separate also.

Write us direct or ask your Jobber to get them for you.

LAKEWOOD FABRIC BELTING & MFG. CO.
1516 Highland Ave. Lakewood, Ohio, U. S. A.

DO YOUR OWN VULCANIZING.
SAVE MONEY. BE INDEPENDENT.
Superior Vulcanizers do perfectly all kinds of repairs.
EVERY CAR OWNER AND GARAGE NEEDS ONE.
Write for descriptive Catalog.
SUPERIOR VULCANIZER CO.,
16A Fulton Ave., Rochester, N. Y.



WE GUARANTEE
The Demaco Gas Saver
to Increase Mileage anywhere from 20 to 40%. Money Refunded if not as represented. Regulated from seat. No guessing. Easy to apply. Good profits for Dealers and Agents.
Demonstrator free to Dealers and Agents.
Decatur Mfg. Company
717 E. North St., Decatur, Ill.

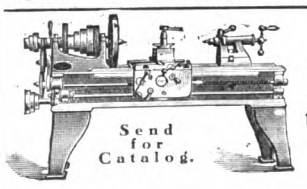
TIRE-DOH
Thousands of dealers recommend it for repairing punctures, blowouts and inner tube tears—it will fix torn-out valve stems and do other difficult jobs—without the need of heat or tools.
See Your Dealer, or Write Us.
ATLAS AUTO SUPPLY CO., 616 W. Austin Ave., Chicago, Ill.

Cox "Splash-Pan" Type
BUMPERS
For Chalmers, Hupmobile, White, Mitchell, Oldsmobile, Studebaker, and the constantly increasing number of other cars with splash pan extended to the end of frame.
Write for prices on the whole line.
COX BRASS MANUFACTURING CO.
Home Office and Factory: Albany, N. Y.

"NATIONAL" PRODUCTS
ALL GOOD
Air Compressor, Garage Vulcanizer, "Surecure" Vulcanizer, Spring Oiler, Gas Saver and Gasoline Gauge for Fords.
THE NATIONAL MOTOR SUPPLY CO.
PAINESVILLE, OHIO

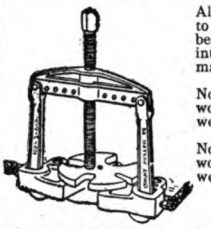
NEW YORK COIL COMPANY
MANUFACTURERS OF
Ignition and Automobile Specialties
338-340 PEARL ST., NEW YORK, N. Y.
MID-WEST DISTRIBUTORS:
Gray-Heath Company, 1440 Michigan Ave., Chicago, Ill.

280,000 Sold Since January
"PERRY"
The only lock that thieves won't touch.
Write for Dealer proposition.
PERRY AUTO LOCK CO.
Dept. A 1238 MICH. AVE., CHICAGO, ILL.



The Sebastian Lathe Co.
108 Culvert St.
CINCINNATI, OHIO.

A CRANE PULLER MAKES A GOOD ARBOR PRESS



All that is necessary is to bolt the base to a bench, insert the legs into it, the 2 set screws make a fine Arbor Press.

No. 2—2 arm Base takes work 9 in. in diam., weighs 18 lbs. $5.50.

No. 3—2 arm Base takes work 11½ in. in diam., weighs 30 lbs. $7.50.

Write us today about it

THE CRANE PULLER CO., 54 Lake St., Arlington, Mass.



New DOVER Two-In-One Offset Funnel
For all cars with Rear Tanks.
New Braced Spout.
Spout removable, forming a regular Funnel.
(6) *Send for 1916 Catalogue.*
Dover Stamping & Mfg. Co., Cambridge, Mass.

DAY AND NIGHT SIGNS
Flexlume signs have raised white letters standing out from a dark background which makes them not only strong when illuminated, but perfect day signs as well.
Write for sketch.
THE FLEXLUME SIGN CO.
1445-1451 Niagara Street Buffalo, N. Y.
Flexlume Sign Co., Ltd., St. Catharines, Ont.
Electric Products Corporation, Los Angeles, Cal.

YANKEE Pump $5
A woman can work it with one hand. Clamps on running board in a jiffy—folds to fit any tool box—never dries out and loses compression.
Apex Electric Mfg. Co., 1411 W. 59th St., Chicago, Ill.

MICRO PISTON RINGS



Two part, pressure tight.
Write for offer to dealers.
MICRO PISTON RING CO., Inc., 116 Nassau St., N. Y.

G. A. C. ACCELERATOR FOOT REST
Pays for itself many times in gasoline saved. Eliminates leg strain on long trips. $1.25
GENERAL APPLIANCE CO.,
129 Federal Street, BOSTON

THE MITCHELL SIXES
Now 100 per cent Over-strength; 24 per cent Added Luxury; 31 Extra Features.
$1525 For 7-passenger Six, 48 H. P., 127-inch wheelbase.
$1250 For Mitchell Junior—40 H. P., 120-inch wheelbase.
Prices F. O. B. Racine.
Mitchell Dealers now have these models on show. Go see them.
Mitchell Motors Company, Inc., Racine, Wis., U. S. A.

Easyon Chains
"Grip Like a Mud Hook—Ride Like a Bare Tire"

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Announcing The

A Personal Talk with Dealers

Are you ambitious to hit the business grade at higher speed? The coming year promises a whopping big demand for high grade cars. How much of that demand will you supply in your territory? It depends upon the car, not which you represent, but which represents you.

Every car has features which appeal to some people. The perfect car would be one appealing to everybody. That car hasn't been built yet. The next best car, the one that will accelerate your business for you, is the one which appeals to *most* people. The balanced car.

You say—"Sure! That's the car I want. Where is it?" We can say that

The New Ross Six is the Balanced Car

Saying so doesn't make it so, but behind the Ross are the factors that do make it so. What are they? *Knowledge of what the Public wants and the experience to produce it.*

The Ross Six is successor to the tried and proven Ross Eight, which performed stunts unequalled by any car of similar price. (Details upon request.) Another superior feature of special import at this time is added to the Ross characteristics—Fuel Economy.

The Ross Automobile Company is now under new management—aggressive men of broad experience in the automobile industry who will put the New Ross in the front rank and take some good live dealers with them.

In selecting dealers, numbers are not the object. It is more important that representatives are keen, progressive men, who can be relied upon to carry out the broad ideals of service planned for the Ross.

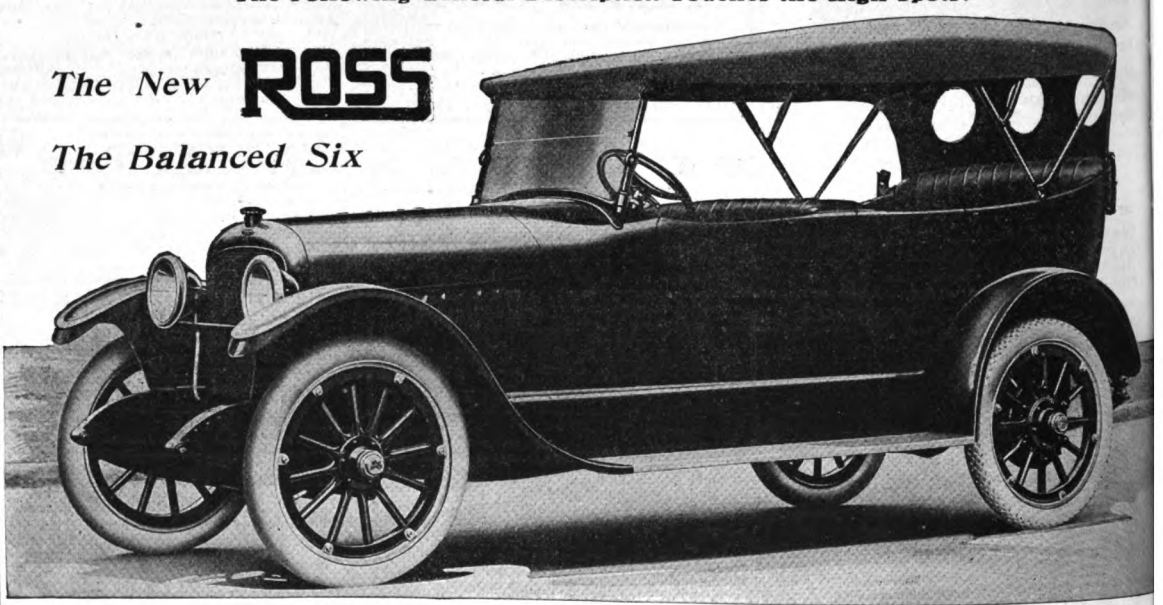
Dealers will be selected carefully, and correspondence is desired with responsible men who are looking for a car of unusual sales possibilities.

A Balanced Car—A Balanced Sales Plan—A Balanced Distribution

The Following General Description Touches the High Spots:

The New **ROSS**

The Balanced Six



General Specifications:

Bodies: 7 Passenger, 4 Passenger Suburban Type, 3 Passenger Roadster, Coupe, Sedan and Town Car.
Design: Full streamline, one man top. Unusually refined in design and finish
Upholstering: Rich, blue mottled Spanish leather.
Windshield: Rain-vision; ventilating.
Motor: Continental 6-cylinder. (See opposite page.)
Transmission: Selective sliding gears; 3 speeds forward and reverse; chrome nickel-steel gears and shafts.
Clutch: Multiple disc.
Axles: Full-floating rear; front I beam section.
Starting and Lighting: Two-unit system.
Lubrication: Force feed, pump driven to cylinders.
Radiator: Cellular type. Ample capacity.
Control: Center.
Steering: Irreversible, left hand drive.
Steering Wheel: Eighteen inches, corrugated, tilting type.
Drive: Shaft drive; universal joints.
Springs: Semi-elliptic front (42x2 inches); semi-elliptic rear (57⅞x2½ inches).
Wheel Base: 130 inches.
Wheels: Extra selected second-growth hickory. (Wire wheels furnished at additional charge).
Tires: 35x4½ inch Non-skid, rear; plain front.
Rims: Quick Demountable.
Horn: Motor Driven.
Instruments on Cowl: Speedometer, ammeter, ignition switches, oil pressure gauge, cigar lighter, electric lights, with 10-foot extension cord always ready with automatic take-up.
Equipment: Tire repair kit, jack, pump, tire carrier, 1 extra rim, tools, etc.
Weight: (7 passenger) 3250 pounds.

Price, $1750 For 7 Passenger, Suburban type and Roadster

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New Improved ROSS
The Balanced Six

What Car Balance Means

The motor is the brain of a car. Like the brain of a man it manifests its energy thru the body. Every part of the body must work in perfect harmony with the brain or much of the energy is wasted. Perfect balance in man or car is essential to most effective action.

The Brain of the Ross Car

First of all, for perfect balance, the brain must be efficient. In selecting a brain for the New Ross, experience said—"Continental."

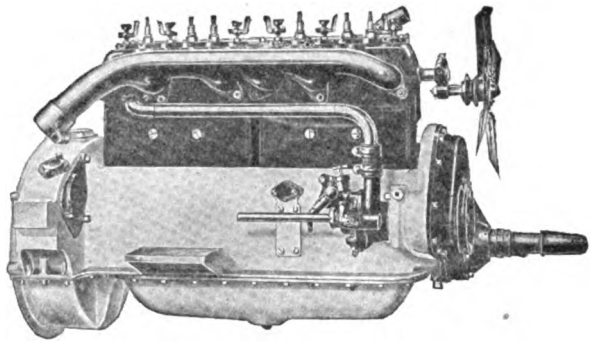
Investigations, comparisons and rigid tests proved the Continental to be the dependable and powerful brain the Ross ideals demanded.

Experienced automobile men will agree that the Continental is "there with the goods." A six cylinder type was selected because "sixes" are most popular, the Public having learned from experience that six cylinders are necessary for proper flexibility and power, and that the few advantages to be gained by more than six do not compensate for the added cost of fuel and maintenance.

How Balance Is Obtained

Having the proper brain or source of energy the rest of the car must be so designed and connected with it that every ounce of power can be utilized, controlled and made the ready servant of the man at the wheel. The Ross designers are past masters of this kind of designing.

To attune every part of the car to perfect harmony with the motor, to develop a marvel of control, to gain unusual speed of acceleration without sacrifice of other qualities, to turn out a balanced car, that was their job. How well they succeeded is evidenced by the amount of new business and the keen interest and enthusiasm manifested by both dealers and consumers.



Continental Red Seal 3 1/2x5 1/4 Motor

The Continental needs no other recommendation to experienced automobile men than its reputation established by performance.

The Continental is the product of the largest exclusive motor manufacturers in the world. Specialization and efficiency of enormous production are responsible for Continental supremacy. A supreme motor for a supreme car.

A Balanced Sales Plan

The Ross ideals of car performance have resulted in feats such as going up Lookout Mountain locked in high, carrying seven passengers weighing 1103 pounds, at an average speed of 27 miles per hour, a feat never before accomplished by any car; taking the celebrated Fillmore Hill in San Francisco, the terror of motorists, locked in high, with apparent ease, and many other rigorous tests of power and flexibility.

These ideals have been applied to the selling plan as well. The brains behind it must be the best. The Ross must take the market on high also. Sales co-operation, advertising, dealers' business promotion, every factor of the selling organization is balanced.

The best merchandising talent possible have laid the plans for real aggressive sales conquests.

Dealers who are selected to handle the Ross will find themselves part of a well balanced organization, pulling together with one object—to make the Ross the most popular car on the market.

Business Prospects Now Best This Country Has Ever Known

Unsettled conditions this Spring have retarded sales. But since the tension due to the money market has been materially relieved, the automobile industry is on the verge of the greatest production era in its history. This is shown by the inrush of orders to every factory. The characteristics incorporated in the Ross cars appeal especially to these prospective buyers and the wide awake dealer who "gets on the job" now, will not only get the best picking from this season's market, but will establish a firm foundation for a wonderful future business.

WRITE FOR DETAILS NOW AND BE PREPARED

Balanced Distribution

Balanced distribution requires careful selection of representatives. If you feel that you are the one for your territory, get in touch with us. This coupon may be the key to the best business you have ever done. SEND IT TODAY.

ROSS AUTOMOBILE COMPANY
DETROIT, MICH.

Ross Automobile Company, Dept. 20A

Please send me full information regarding the New Ross Car and your selling plan.

Name .....

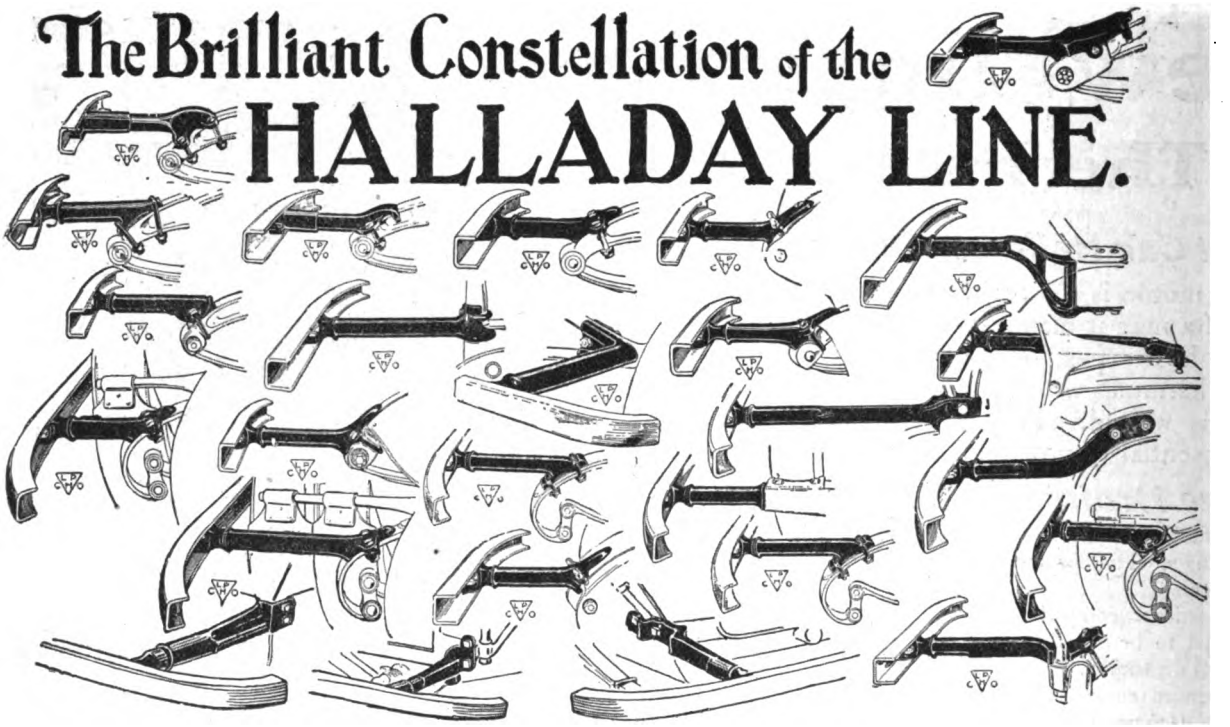
Company .....

Address .....

City ..... State .....

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The Brilliant Constellation of the HALLADAY LINE.



No Matter What Car You Sell or Use

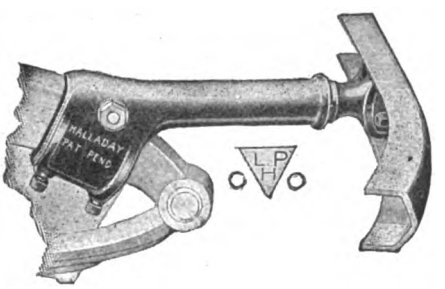
In the HALLADAY LINE

There is a Bumper to Fit it—Front and Rear

Accessory dealers who carry this line are in position to control the Bumper Business in their territory.

Halladay Quality is known thruout the trade as highest attainable and

Halladay Design is invariably up to the minute and always ahead of the others.



Here is an example of the new

HALLADAY Side Connection Bumper

for cars with expansion aprons or splash pans covering the entire inside of the frame extension.

Adjustable to any frame curve or angle and quickly and solidly attached without cutting or marring the frame or apron.

This is the most nearly universal bumper ever made.

A HALLADAY Display Stand prominently displayed in your store is a silent salesman for your entire accessory line.

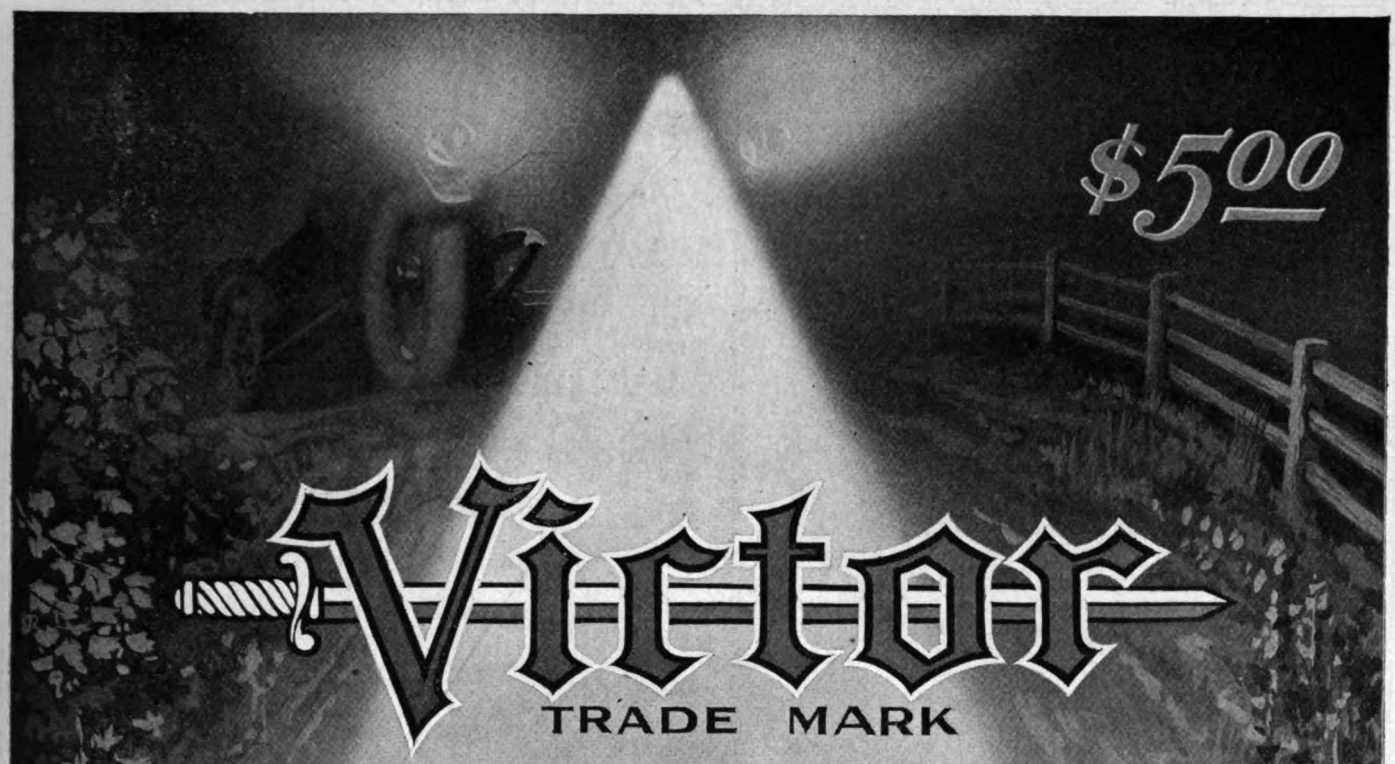
Write Us, or Your Jobber, Today for Catalog and Terms.

L. P. HALLADAY & COMPANY, Streator, Illinois

DISTRIBUTORS:

Asch & Co., 16-24 W. 61st St., New York City.
E. L. Thompson Co., 817 Boylston St., Boston, Mass.
Gray-Heath Co., 1440 Michigan Ave., Chicago, Illinois.
Sanford Brothers, Chattanooga, Tenn., Southern Distributors.
Hughson & Merton, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

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Victor
TRADE MARK

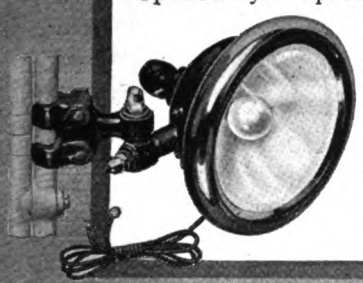
The GREAT SPOT LAMP *regardless of price!*

WHEN you buy a spot lamp to make night driving safe and to enable you to see the traffic behind you in the day time, your first demand should be for quality. Price is only incidental to beauty, durability, simplicity and practical utility.

In beauty the VICTOR has no rivals. Perfect symmetry; workmanship of the highest order; the finest of automobile enameling, nickel door rims and mountings, and a three inch convex condensing mirror inserted in the shell from the inside.

Strength! You see it in the rugged, short shank bracket with double acting knuckles that permit you to adjust the lamp to any angle without imposing undue strain on the frame of the wind-shield.

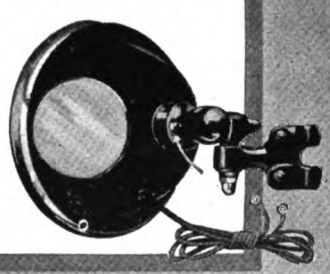
The doors of the VICTOR are hingeless, dust-tight and absolutely noiseless at all times. They are self-locking but easily opened by the pressure of a single button.



All fastening attachments are carried invisible, on an inner lining. The glass is held secure by spring clamps. It can't fall out when the doors are opened.

The VICTOR is equipped with Mazda Nitrogen Bulb, tremendously powerful and very economical of current. You can change bulbs in about a minute and focus the lamp in half that time. A Cutler-Hammer positive switch and six feet of conductor cord complete the electrical equipment. The world offers nothing better.

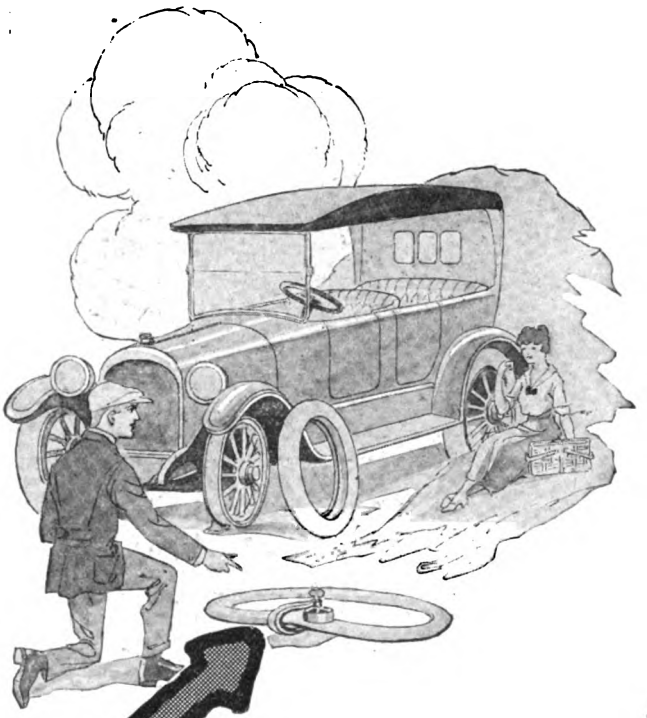
Only our enormous production makes our five dollar price possible. Yet you couldn't get a better lamp for twice as much money. This is why you should insist on seeing the Victor Trade-Mark on every spot lamp.



The Corcoran Victor Company

Reading Road Cincinnati Ohio.

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THE NEW
ADAMSON
MODEL "E"
5-MINUTE VULCANIZER



The Complete Line

For larger tube injuries, tire and tube blowouts, tread cuts, etc., the "Adamson" line is complete with various outfits.

Prices range from $1.50 for Model "M" for tube repairs only, to $12.00 for Model "S" for tire and tube repairs and private garage and repair shop use.



These folders furnished free to "Adamson" Dealers. Order a supply for your customers.

A Light and Handy Outfit For the Quick Repair of Tube Punctures

MAKES REPAIRING A PLEASURE

Uses common gasoline—the most convenient and dependable fuel. Will vulcanize your tubes **anywhere** in five minutes.

Built on the same proven principles that have made "Adamson" Vulcanizers the most practical and largest selling line in the world.

Complete with box of a dozen "Adamson" 5-Minute Repair Gum Patches for $1.00. Extra box of 12 patches only 25c.

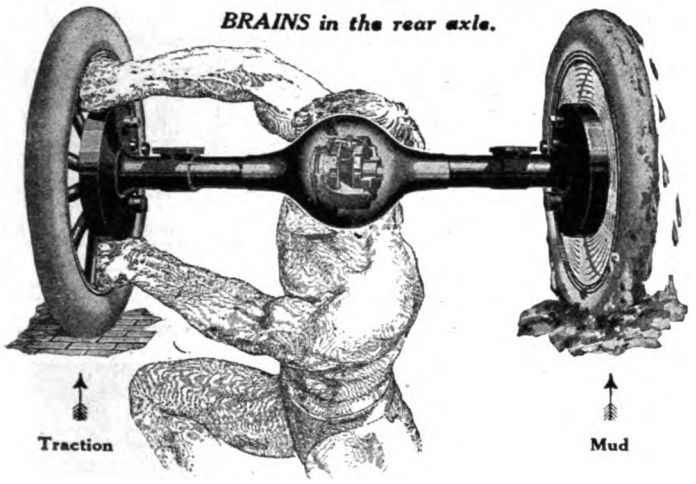
DEALERS!

This outfit is a tremendous seller.
Order now from your jobber.

ADAMSON MANUFACTURING CO.
East Palestine, Ohio

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BAILEY
NON-STALL
DIFFERENTIAL



POWER to the wheel that can use it.

A Fundamental Necessity For Every Car

The Bailey Non-Stall Differential *corrects a basic weakness.*
Old style differentials let the power go to waste by sending it to the wheel that does not have traction.
This causes practically all skidding, slipping, stalling, spinning and side-swaying. It is an enormous unnecessary waste of power and tires, and often causes accident troubles and expense.
The Bailey avoids all of this.
With the Bailey no power goes to waste, but *all* of it is used *properly.*
It makes you master of all road conditions.
Anybody can install it quickly. It can be fitted to any rear axle.

Owners and dealers should write us for complete information.
Bailey Non-Stall Differential Corporation, Chicago, Illinois, 1124 Michigan Ave.

It's EASY with a QUIK-EZY

TO CHANGE TIRES ON A SPLIT RIM



The Quick-Ezy Tire Tool with its powerful screw will yank any old rusty split rim apart in a jiffy. It grips at three points and won't bend or slip.

Every garage needs it to give quick service to tire customers and to save time and money.

Every motorist needs it for emergencies on the road.

It's new. *The Quick-Ezy.* Write today for full information.



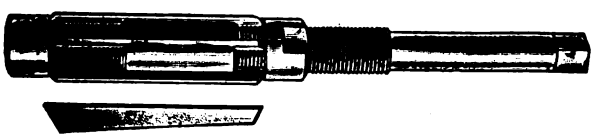
THE H. L. HURST MFG. CO.
2183 North St., CANTON, OHIO

The best made for repair work

The Critchley Expanding Reamer

Reg. U. S. Patent Office

Try One and You Will Want More.

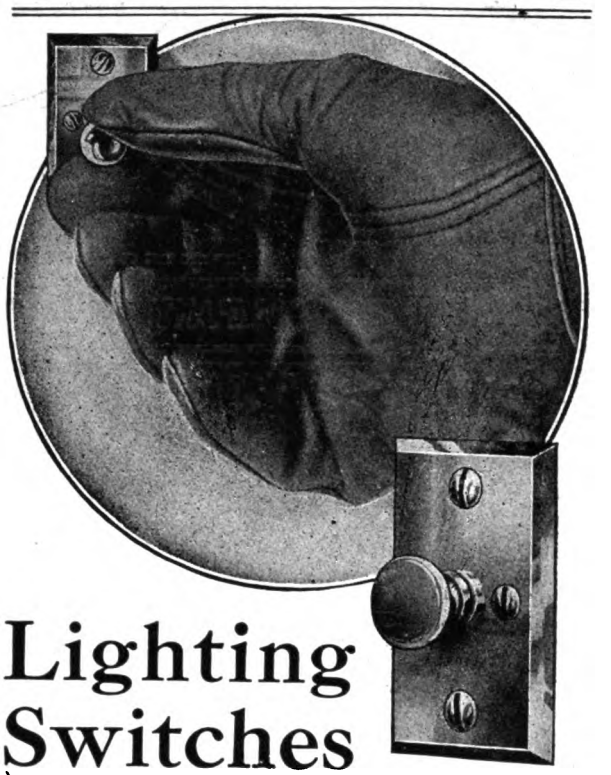


Reams odd size holes

Send for Circular

CHADWICK & TREFETHEN
32 BOW STREET PORTSMOUTH, N. H.

CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

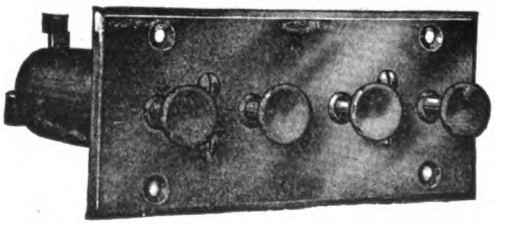
One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP
Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

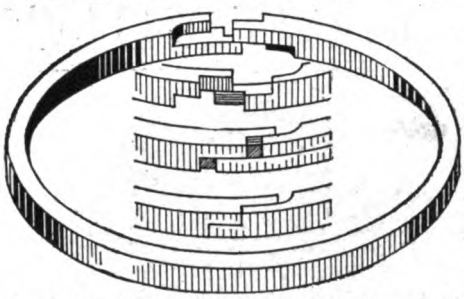
Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.

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"SEE THAT JOINT"



GILL RINGS are one-piece and absolutely tight. They increase power because they do not allow any leakage of gas or oil, and decrease expense. Each GILL RING is cast individually and has natural elasticity. Try a set and then feel the "Pep" in your motor. If they are not satisfactory we will return you your money. *Dealers Everywhere.*

THE CHALSMITH COMPANY, 351 West 59th Street, CHICAGO, ILL.

YOU CAN'T BEAT IT!



The Famous **"Little Giant" Starter**

FOR FORD CARS

A Mechanical Starter OUT OF SIGHT

Entirely within the hood. Everywhere recognized to be *superior* to all other mechanical starters made for Ford cars. Easily installed, **safe, simple, durable, dependable, and always ready.**

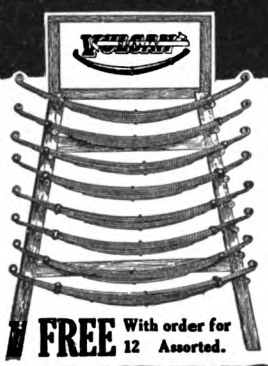
First Cost is Whole Cost

Fully Guaranteed Live Agents Wanted

For Full Information, Address

THE LITTLE GIANT STARTER CO., CANTON, OHIO

Get this FREE display rack



A Vulcan Spring for every Car, Quick Service, Liberal Discounts.

JENKINS VULCAN SPRING CO.

Factory Branches Carrying Complete Stocks

Saint Louis, Mo. - - 1402 Chestnut St.
Minneapolis, Minn. - 1024 Hennepin Ave.
Reading, Pa. - - -538 Franklin St.
Fort Worth, Tex. - 708 Commerce St.
Sumter, S. C., - - 29 Caldwell St.

FREE With order for 12 Assorted.

GOODELL-PRATT



1500 GOOD TOOLS

Write for Complete Catalog

Goodell-Pratt Company Greenfield, Mass. *Toolsmiths*

FIFTH EDITION—JUST OUT!

IMPROVED ONE HUNDRED PER CENT.

Dyke's Auto Encyclopedia.

SEVERAL BOOKS IN ONE.

ENTIRELY REWRITTEN AND ENLARGED—UP-TO-DATE

SOME FACTS CONCERNING THIS ENLARGED 5TH EDITION:

There are 50 **Instructions.**
2370 **Illustrations.**
3 **Supplements** in addition to the 50 instructions, part printed in two colors, treating on the construction, operation, repairing and adjusting of the **FORD, PACKARD** and **KING EIGHT.**
824 pages, large size, 6¾x9¾ inches.
350 pages and 976 illustrations on **Electric Ignition, Electric Starters** and **Generators.**
34 pages and 75 illustrations on the **Delco** system alone.
74 pages and 254 illustrations on **Adjustments, Tests,** etc., of leading **Electric Systems.**
99 pages and 534 illustrations on **Repairing.**
29 pages and 180 illustrations on **Tires** and **Tire Repairing.**
44 pages and 97 illustrations on **Carburetion.**
84 pages and 239 illustrations on **Engines** and **Parts.**
21 pages on **Digest of Troubles.**
4000 lines to the **Index.** This is a feature worth noticing, as it means a ready reference on everything pertaining to motoring.

Index is printed on **colored** paper, easy to refer to.

Dictionary is also included, which gives the meaning of motoring terms.

You must see this new 5th Edition in order to appreciate just how complete a book it really is—Order N-O-W.

The Price is still **$3.00** (or **$3.32** postpaid).

How to Become an Expert Automobile Mechanician

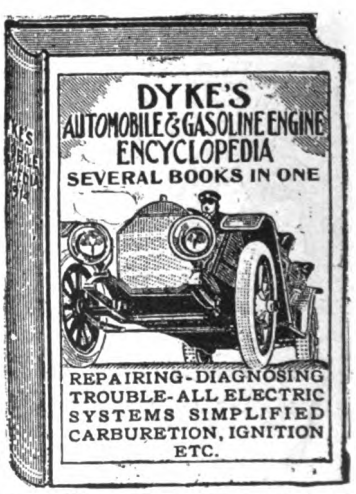
The quickest and cheapest, but BEST way, is by studying Dyke's Automobile and Gasoline Engine Encyclopedia.

It is a practical, simplified instruction on everything you want to know and OUGHT to know about motoring.

First you learn the principle of construction of each and every part of a car and engine—then the variance of construction—then the adjustments and repairs.

You learn how to diagnose troubles in a scientific manner. Step by step you advance until you are a *real expert* on timing the valves and ignition, repairing and adjusting. You learn the carburetion subject so thoroughly, you can adjust any make.

You will like this book, in fact we will guarantee you would not sell it for three times its cost if you could not get another.



It's worth ten times its cost if only placed on the shelf and used as a reference.

Beware of Imitators—this is the *original, simplified* book on REPAIRING, ELECTRICAL SYSTEMS, TROUBLES, Etc. It is the only book in the world combining all these subjects under one cover. Why get three—or four books?

Mr. Dyke published the first practical Automobile Book in America.

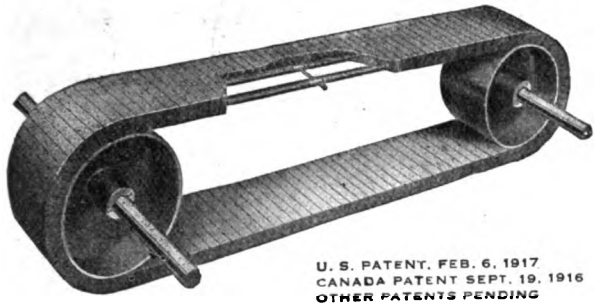
Address all Orders to

AUTOMOBILE DEALER AND REPAIRER

73 MURRAY STREET, NEW YORK

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SELF ADJUSTING BELT



Belts made for all Automobiles, Tractors and Machinery. The Only Self Adjusting Belt on the Market.

Made of piano wire springs running lengthwise of the belt with leather blocks cut and laced on the springs, making the wear of the leather come on the edge of the grain of leather. Gap in cut shows springs of belt.

PRICE OF SELF ADJUSTING BELT

Width	Per Foot
⅝ inch	$ .50
¾ "	.60
1 "	.80
1¼ "	1.00
1½ "	1.20
1¾ "	1.40
2 "	1.60
2¼ "	1.80
2½ "	2.00
2¾ "	2.20
3 "	2.40

CAR PRICES

	Each
Fords, 1909 to 1917	$1.65
Fords, 1917	1.85
Maxwell, 1916 to 1917	3.70
Overlands	2.65
Buick Six 45	2.00
Dodge	1.65
Studebakers	1.65
Chevrolet	1.35
Reo Six	2.60
Reo Four	2.00
Buick Big Six	2.45

Other belts made to order.

These belts are guaranteed for one year.

Dealers and Jobbers, Write for Discounts

SELF ADJUSTING BELT CO.

420 FIRST AVE., N. E. WATERTOWN, S. D.

EXTRA PROFITS

If you fill in and mail this coupon TODAY →

Get control of your territory

This book describes an Auto accessory now advertised in

ALCEMO MFG. CO.,
97 Bridge St., Newark, N. J.

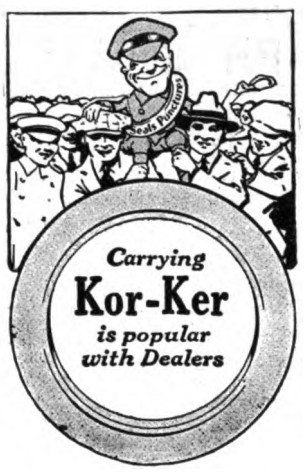
Please mail me your book and your dealer proposition.

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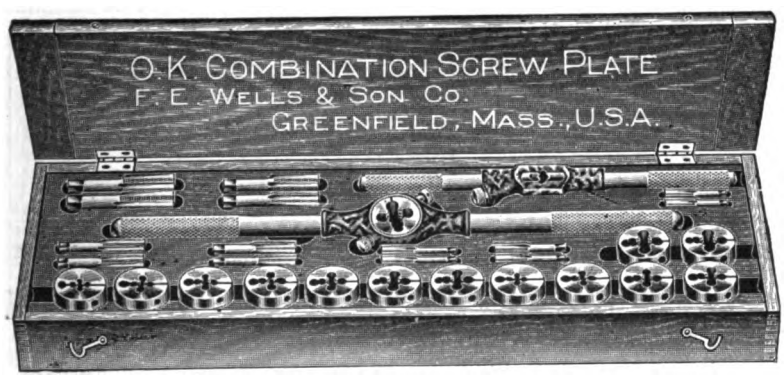
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LIFE
COLLIER'S
COSMOPOLITAN
LITERARY DIGEST
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McCLURE'S
NATIONAL GEOGRAPHIC
METROPOLITAN
EVERYBODY'S
LESLIE'S
WORLD'S WORK
and 14 other National Magazines.

O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

$1/4^{20}$, $5/16^{18}$, $3/8^{16}$, $7/16^{14}$, $1/2^{13}$, $5/8^{11}$, $3/4^{10}$,
U. S. Standard

$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $7/16^{20}$, $1/2^{20}$, $5/8^{18}$, $3/4^{16}$,
S. A. E. Standard

LIST PRICE — $20.00

This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies. This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

F. E. Wells & Son Company

Greenfield, Massachusetts

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4 OUT OF EVERY 5 OF OUR READERS



OWN AUTOS

THEY ARE PHYSICIANS

Economical Publicity

The Journal of the A. M. A. gives manufacturers of automobiles and accessories the opportunity of reaching every week over 50,000 automobile users and over 10,000 prospective owners.

It requires no stretch of the imagination to appreciate the economy of advertising in THE JOURNAL considering that it offers profitable publicity with a minimum amount of waste circulation.

The Automobile a Necessity with the Physician

The automobile with the busy physician is a real necessity. He needs efficient means of transportation which implies a serviceable car and accessories of proven value and standard quality.

Physician a Frequent Buyer

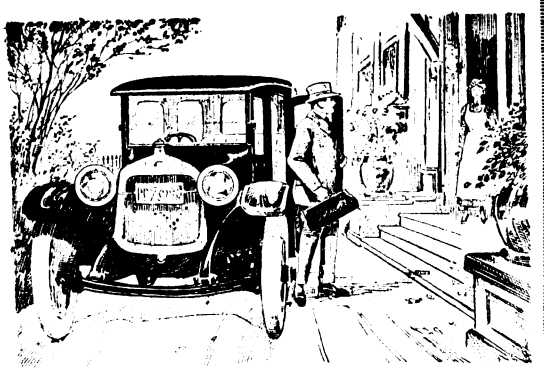
The doctor's average mileage per year is 25,000 miles. He drives in all seasons, every day. In many cases his mileage is higher according to the exigencies of his practice. From this fact he is a frequent buyer.

Professional Paper an Effective Medium

There is no better way to get close to the physician than to appeal to him through the advertising columns of his favorite professional paper.

Rates and particulars on request.

The Journal of the American Medical Association
535 N. Dearborn St. Chicago, Ill.
WILL C. BRAUN, Adman



ALONE IN A VAST FIELD

This is the ONLY handy reliable Lock that sells at

A PRICE THAT THE FORD OWNER WILL PAY

Absolutely pick proof. 1000 different keys. Satisfaction guaranteed. Installed in 3 minutes.

Distributed by 165 Jobbers in the U. S. and Canada.

Dealers

Write for your Big discounts.



Installed on a regular Ford Switch

SYRACUSE FORD LOCK

Price $1.50—Canada $2.00

SYRACUSE UNIVERSAL MFG. CO., Inc., SYRACUSE, N. Y.



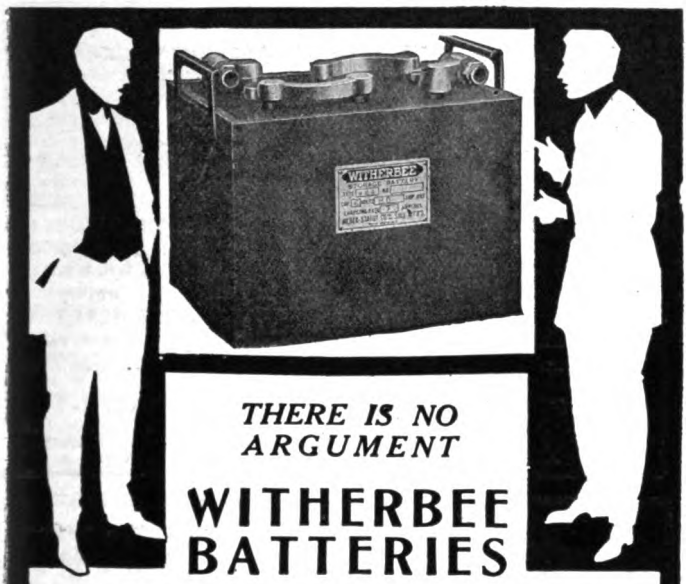
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HARDENED

FORD SPINDLE CONNECTING BOLT

IMMEDIATE DELIVERY.
ANY QUANTITY.

OSBORNE & STEPHENSON MFG. CO.,
Plainville, Conn.



THERE IS NO ARGUMENT

WITHERBEE BATTERIES

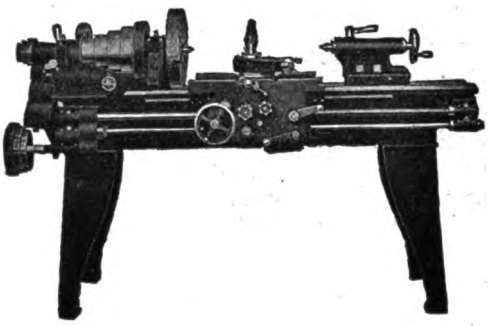
FROM the very start—years ago—we were determined to keep away from slip-shod methods—with the natural result that Witherbee Batteries are today famous all over the world—for longer service than others of the same rated capacity.

People do appreciate high quality—and they've beaten a path to our door. When we accept your money you can rest assured that you are getting the very highest quality battery known to man.

Every requirement in Lighting and Starting Batteries may be filled from our line.

Details of Dealer's proposition will be mailed—write to us this day. Are you a quality man? Desirable Territory still open.

WITHERBEE STORAGE BATTERY CO.
1904 Broadway, New York City
Factory: 643-649 West 43rd St., New York



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices.

THE MONARCH MACHINE TOOL CO.
SIDNEY, OHIO

Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

1500 SIZES. YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING

WRITE NEAREST OFFICE

GEORGE NASH CO.
217 Pearl Street
New York City

EDGAR T. WARD'S SONS
44 Farnsworth Street
Boston, Mass.

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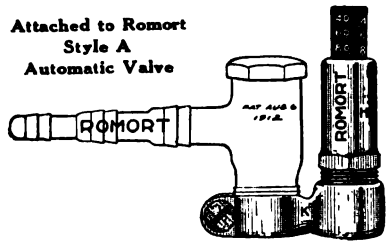
Attention, Mr. Garageman!

ROMORT TIRE TESTER ATTACHMENT

PRICE, $1.50

This is a device for attaching your gauge to Romort Automatic Air Valve, and gives the service station a permanent holder for its gauge, ready for instant use by the public, eliminating the necessity of loaning gauge to operator, who three times out of five will drive off with your gauge in his pocket.

Attached to Romort Style A Automatic Valve



Simply screw your gauge into this holder and you have a tire tester and tire inflator combined in one, and the old trouble of losing gauge is forever over.

Every garage with free air should be equipped with the Romort Automatic Air Valve and Tire Tester Attachment.

The above price includes the Attachment only.

CAUTION—When ordering, state whether for Style A or B Valve.

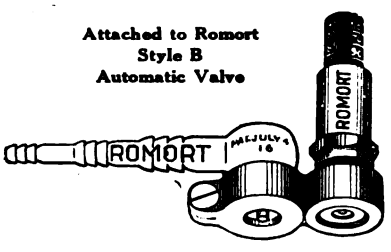
For Sale by All Jobbers

ROMORT MFG. COMPANY

SEATTLE, WASH. 1810 Westlake

CHICAGO 1323 Michigan Ave.

Attached to Romort Style B Automatic Valve



SEE THAT GROOVE CONTROLLING THE OIL?



LISTEN! The groove full of oil forms a dam. Gas cannot get down, oil cannot get up. That's why motor has more power, no carbon.

ISN'T THAT A REASON?



"NO-LEAK-O" RINGS GUARANTEED SATISFACTORY, OR MONEY BACK

Don't rebore cylinders.

"NO-LEAK-O" restores power when others fail.

Write for booklet A 2. Ford size or under, 50c. Discount to the trade.

AUTOMOBILE ACCESSORIES CO.

(Sole Mfrs.) 816 W. North Ave., Baltimore, Md.

Represented by: AUTO APPLIANCE CO., 110 W. 34th St., New York; H. G. PARO, 1414 S. Michigan Blvd., Chicago; I. W. VAN DE GRIFT, 627 Charles Bldg, Denver; I. E. CHUMBLEY & CO., Nashville, Tenn.

PERFECTION MULTIPLE PISTON RINGS

The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. **Try them and prove it.**

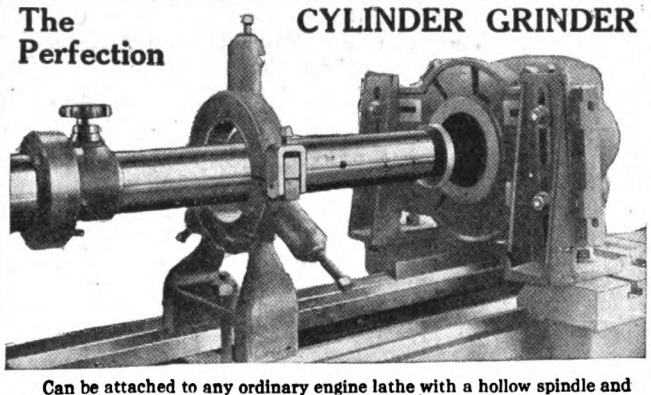
Dealers Wanted. *Write for prices and discounts.*

Manufactured by AMERICAN PISTON RING CO., 1925 S. Charles Street BALTIMORE, MD.

N. A. PETRY CO., Inc.
1309 Race St., Philadelphia, Pa.
Eastern Representative, North and South, East of Denver.

A. H. COATES
444 Market St., San Francisco, Cal.
Western Rep., North and South, West of Denver.

The Perfection CYLINDER GRINDER



Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. **Descriptive literature on request.**

WOOD & SAFFORD MACHINE WORKS, GREAT FALLS, MONTANA



BRAENDER

TIRES and TUBES

Are Cheapest on Mileage

They are strictly high grade—built to outlast all others, and they do it. Ask any user.

Send for particulars about BRAENDER Bull Dog Non-Skid—the Fastest, Safest, Smoothest-Riding Tire Made.

Braender Rubber & Tire Co.,

Factory: Rutherford, N. J., U. S. A.

Branches: 250 W. 54th St., New York, N. Y.
675 N. Broad St., Philadelphia, Pa.
1350-54 So. Michigan Ave., Chicago, Ill.

BRAENDER Bull Dog Non-Skid

Trade Mark

THE KING DRAG

The Great Road Builder

In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets could not fail to do a good deal of good.

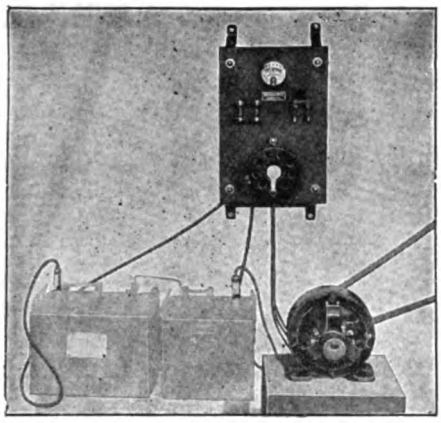
We will send **a sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

Address the

MOTOR VEHICLE PUBLISHING COMPANY - 71 Murray St., New York City

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MAIN BATTERY CHARGING SET



No City current is necessary—it generates its own Electricity. Operates from a line Shaft or Engine by belt drive. Charges from *one* to *five* Lighting or Starting Batteries at a time. Any voltage, 6 volts up to 30.

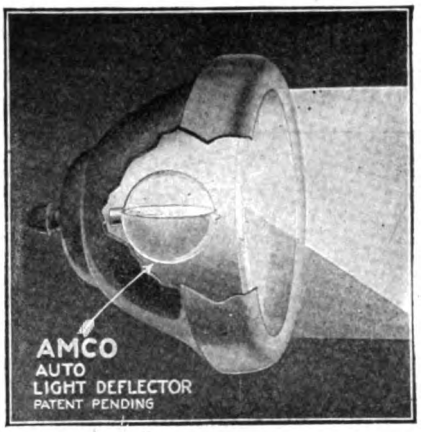
Large profits are made by charging batteries from this outfit, practically all clear profit. Usually driven from power previously installed and in operation, making no additional operating expense. Makes you independent of a lighting circuit and doubles your profits.

Dynamo, high grade, shunt wound, 250 watts capacity, oil ring type bearings, baked black enamel finish.

Slate Switchboard with D'Arsonval type Ammeter, Rheostat, Double Pole, Single Throw Knife Switch, Cartridge Fuses, Irons for mounting, and two large flexible leads with large clips. Properly packed with blue print and complete instructions for operation and care. Price, F. O. B. Pittsburgh, $55.00.

Simple to install, no necessary upkeep. Positively guaranteed. Immediate deliveries. Bulletin No. 42 on request.

MAIN ELECTRIC MFG. CO., Pittsburgh, Pa.



"AMCO"

Is the trade name of the most PRACTICAL, EFFICIENT and LOW PRICED device on the market for the elimination of the "GLARE" of Automobile Headlights.

The "AMCO" is a small WHITE ENAMELED metal cup that snaps firmly on the underside of the lamp bulb, the WHITE surface of the cup deflecting the rays of light to the upper part of the silvered reflector, causing them to be projected Outward and Downward on the road ahead of the car.

The "AMCO" has been licensed by Five States and has received unqualified endorsement from coast to coast. Sold with a positive "MONEY BACK" Guarantee.

U. S. Patent No. 1,208,487

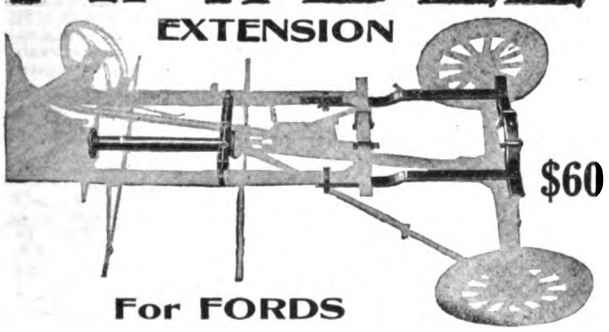
Price, $1.00 Per Pair

Manufactured Only By

THE ART METAL MFG. CO., CLEVELAND, OHIO

HAYDEE

EXTENSION



Biggest Idea in Commercial Car Field

HAYDEE EXTENSION

All Henry Ford had at the start was the best car at the lowest price. All the HayDee Ford extension means is the best commercial car at the lowest price.

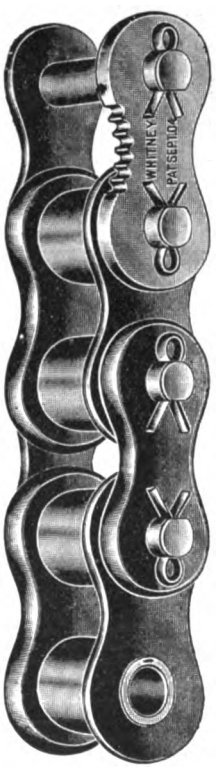
In two years the HayDee Extension has won for us the virtual control of the light delivery car business of New York City. It will give you the same control in your city. Think of being able to offer your customers a delivery car with 130 inch wheel base, 90 to 100 inches of loading space and a superb paneled body for less than $700!

Write for facts about this practical money making device together with photos of a wonderful line of bodies that can be mounted on a Ford with our extension.

HAYES-DIEFENDERFER CO.

1872 BROADWAY NEW YORK CITY

Whitney Chains



are used by the leading truck makers in order to insure dependable service.

You can give your customers the same maximum service by specifying Whitney Chains when replacements are necessary.

Whitney Chains may be purchased from the leading jobbers of auto supplies from the Atlantic to the Pacific Coast.

The Whitney Mfg. Co.

Hartford, Conn.

Chains — Keys — Hand Milling Machines.

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SUFFERING FROM A KICK BACK.



You may have no interest in this lady

BUT

any member of your family or anyone dear to you might suffer in the same way.

THE BILL AUTOMATIC SPARK RETARDER

Positively Prevents Such Disaster

by automatically retarding the spark to a point of absolute safety and then advancing it to the normal running point as soon as the crank is disengaged.

The cost is nominal, only

$8.50

Its value cannot be measured in dollars as it is both accident and liability insurance against suffering, inconvenience and financial loss.

If you own a Ford you cannot afford to be without it.

If you are a dealer or repairman it is a profitable and quick selling accessory.

WRITE US OR YOUR JOBBER—TO-DAY.

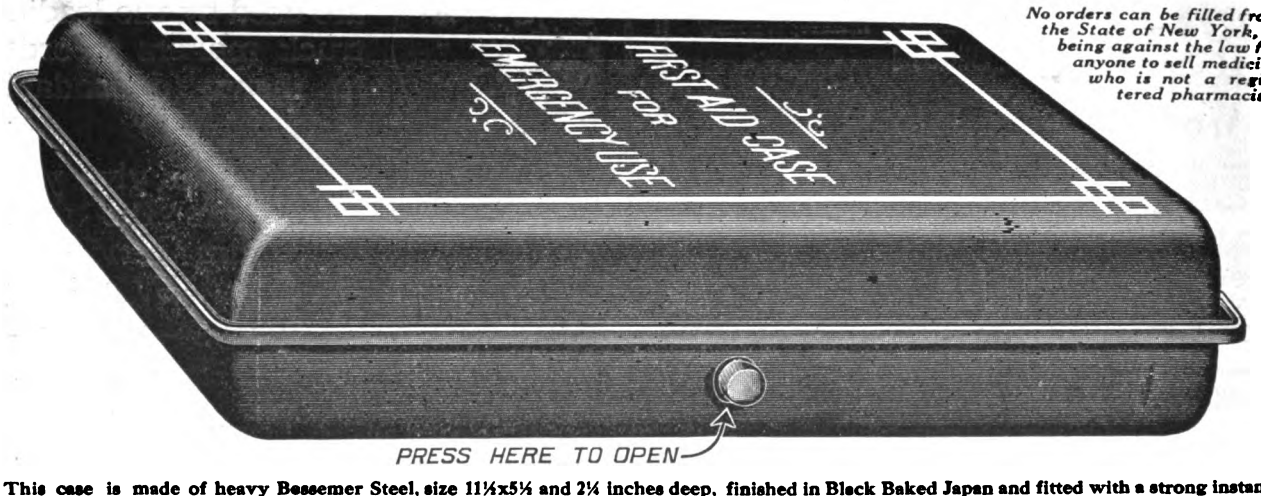
BILL Mfg. Co., La Porte, Ind. Chicago Distributors: GRAY-HEATH CO., 1440 Michigan Avenue, Chicago, Ill. New York Distributors: ASCH & CO., 16 to 24 West 61st St., New York, N. Y.

IT MAY BE YOUR TURN NEXT

TO MEET WITH AN ACCIDENT ON THE ROAD.

It may also be a case of life and death to have the materials at hand for prompt treatment. We have recently made arrangements for a First Aid Case for emergencies especially for the readers of the AUTOMOBILE DEALER AND REPAIRER.

No orders can be filled from the State of New York, it being against the law for anyone to sell medicine who is not a registered pharmacist.



This case is made of heavy Bessemer Steel, size 11½x5½ and 2¼ inches deep, finished in Black Baked Japan and fitted with a strong instantaneous snap. It is strong enough to resist injury to the contents through accident or dampness.

The contents have been carefully selected to supply the needs in an emergency, before the doctor comes. All gauze, bandages and cotton have been prepared in aseptic laboratories under the same rigid inspection as those supplied to the United States Army and Navy.

The contents of this case consists of:—1 "First Aid to the Injured" Instructions. 1 Yard plain Sterilized Gauze for dressing large wounds. 10 Yards 2-inch Sterilized Gauze Bandages for dressing cuts and bruises. 10 Yards 2½-inch Sterilized Guaze Bandages for dressing cuts and bruises. 1 Package Sterilized Absorbent Cotton for pads and dressings. 1 Box Carbolic Salve for burns, sores, insect bites, etc. 1 Yard 1 inch Zinc Oxide Adhesive Plaster for retaining dressings and covering small wounds. ½ Ounce Tincture of Iodine, an antiseptic for immediate use on all wounds and abrasions. ¼ Ounce Spirits of Ammonia for use in case of shock, heart failure and faintness. ½ Dozen Safety Pins.

The retail price of this outfit is $2.50. We have made an arrangement with the manufacturers of such a liberal character that we can supply this outfit with a subscription to the AUTOMOBILE DEALER AND REPAIRER for a year, for the regular price of the outfit, $2.50.

In case you have already subscribed for this year, we will send you one of these outfits, postage prepaid, on receipt of $1.60, which may be remitted by check, money order, or in any convenient way.

Every subscriber to the AUTOMOBILE DEALER AND REPAIRER should have one of these outfits. It may mean the saving of your own life or the life of some friend. ***ORDER AT ONCE AND THEN YOU WON'T FORGET ABOUT IT.***

Address, **MOTOR VEHICLE PUBLISHING COMPANY,**
Publishers of the AUTOMOBILE DEALER AND REPAIRER, **71-73 MURRAY STREET, NEW YORK**

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LIBERTY-LIGHT FLAG HOLDER

(PATENT APPLIED FOR)



Gives a beautifully brilliant display of the flags at night and is an attractive feature on a car at all times.

Connect with headlights, side-lights, dash-light or extend wires direct to storage battery.

The adjustable straps of holder allow for fitting to any radiator cap, large or small.

The size of the flag sockets can be increased or diminished to hold other flags than those we sell.

Connecting wire and lamp (6 or 12 volt) furnished with holder.

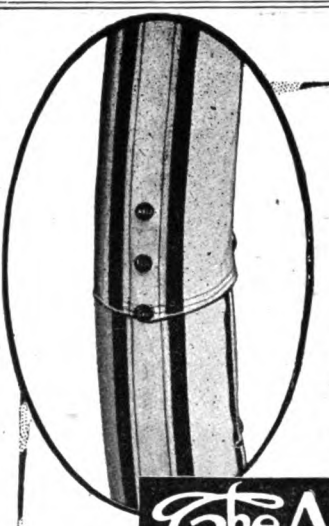
Price of holder:
Ebony Finish - $2.00
Nickel Plated - 3.00
Flags extra (three) .50

Allied Flags 5x7"
Wholesale or Retail

DEALERS AND AGENTS APPLY

UTILITIES SALES ASSOCIATION

607 WEST 43rd STREET NEW YORK



Style
—AND—
Protection

from deterioration is the result when spare shoes are covered by

The ALLEN TIRE CASE

A durable, close-fitting tire cover made in all styles, all sizes and every color, to suit your own ideas.

Price, $3.00 and up
At Your Dealer's.

Interesting booklet free on request.

THE ALLEN AUTO SPECIALTY CO.,
16 West 61st St., New York
2007 Michigan Ave.,
Chicago

HARWARD
ONE PIECE
HIGH POWER PISTON RING

The World's Foremost Piston Ring

Because of its efficiently unique and sensible one-piece construction, the Harward has become the world's foremost piston ring.

The Harward was invented by an engineer after exhaustive, scientific tests of all other types and makes.

***Dealers:** Write for Interesting Information and Prices.*

HARWARD MFG. CO., 3939 Magnolia Avenue, ST. LOUIS, MO.

FREE TOURING MAPS



CHECK MAPS DESIRED
AND MAIL TO
GULF REFINING COMPANY
DEPT. 1880 PITTSBURGH, PA.

☐ Middle West
☐ Transcontinental
☐ New England
☐ New Jersey
☐ Pittsburgh-Buffalo
☐ Southern States
☐ Pennsylvania
☐ Texas

NAME .....

CITY ..... STATE .....

Special Request

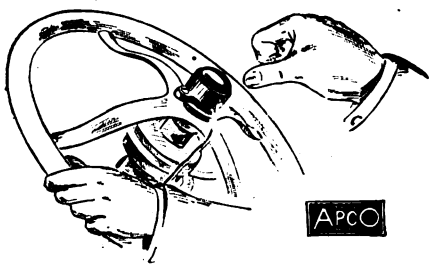
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TRADE APCO MARK

Horn Button Attachment

25c



Places the horn button at the top of the steering wheel where it can be reached instantly and surely.

The same button that came on the car is used and this makes the installation very simple. Complete with extra wire and full directions.

If your dealer cannot supply you, send us your order and his name and we will see that you are supplied

Our Catalog of Fifty Other Items Is Free for the Asking

TRADE APCO MARK

MANUFACTURING COMPANY
INCORPORATED
PROVIDENCE, U.S.A.

Leave Your Tube in the Vulcanizer
AND WAIT ON YOUR CUSTOMERS

Why Not?

AMERICAN AKRON

Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

IF YOUR VULCANIZER IS YOUR BOSS, DECLARE YOUR INDEPENDENCE TODAY

Write for Prices

The American Rubber & Tire Co.
AKRON, - - - - OHIO

PEERLESS PISTON RINGS
ARE THE BEST



PEERLESS RINGS are similar to the standard type of rings in every respect EXCEPT—that they will not leak.

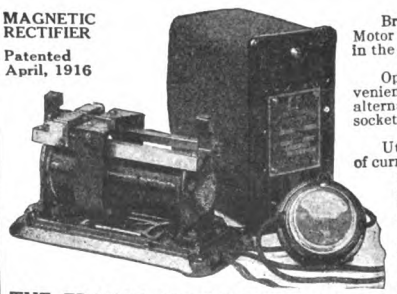
Selling them means more money to you — improves your standing with your trade and makes you a better purchasing agent for those depending on your ability and judgment.

Write today for prices and descriptive matter.

LARSON & HILKER,
Distributors,
19 S. La Salle Street,
CHICAGO, U.S.A.

F-F BATTERY BOOSTER

MAGNETIC RECTIFIER
Patented April, 1916



Brings up the gravity of Motor Car Storage batteries in the shortest possible time.

Operates from any convenient 110 volt 60 cycle alternating current lamp socket. 60 watt capacity.

Utilizes the Full Wave of current, has Carbon Electrodes and makes Recharging a profitable business where batteries are taken in to charge.

$15.00 Complete
Effective July 1st, $18
F. O. B. Cleveland

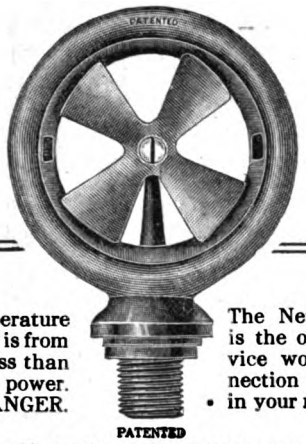
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THE FRANCE MANUFACTURING CO., Cleveland, Ohio
Jobbers and Dealers Throughout the United States and Canada

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STOP YOUR ENGINE OVERHEATING



THE NEW MOTO-FAN WILL PREVENT IT

Efficiency Temperature in your Radiator is from 190 to 195°. Less than that means lost power. More means DANGER.

The New MOTO-FAN is the only cooling device working in connection with the water in your radiator.

PATENTED

The rapidly revolving blades of the MOTO-FAN draw up through a vent on the right hand side of the "ring" the superheated air from the radiator, replacing it with a steady stream of cool air driven in through the "down" vent on the opposite side.

There are several devices for indicating superheated conditions AFTER they arise.

The MOTO-FAN goes one better by forestalling and preventing those conditions.

A ⅜" hole drilled in the radiator cap is the only work required to install the MOTO-FAN.

Anyone who can handle a drill can mount it in three minutes; then goodbye to overheating troubles.

Sectional View.



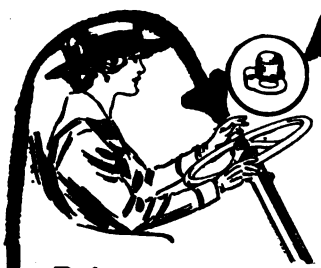
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3" wide—3¾" high.
Black, with polished nickeled blades. An ornament as well as a necessity.

LIST PRICE, $2.50 EACH.
(Liberal Discount to the Trade.)

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The HANDY PUSH BUTTON AND HOLDER FOR FORD CARS

DEALERS! GARAGEMEN!
Don't Wait, Order Now!

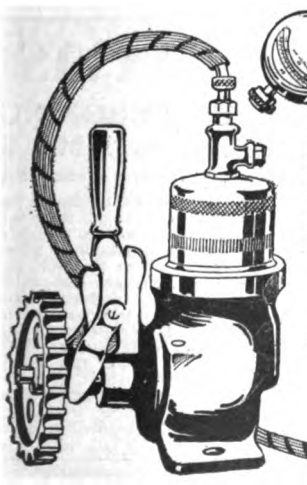
Price **50c**

Here is a little article, easy to handle—small investment—right discounts—needed by every Ford Owner in the land.

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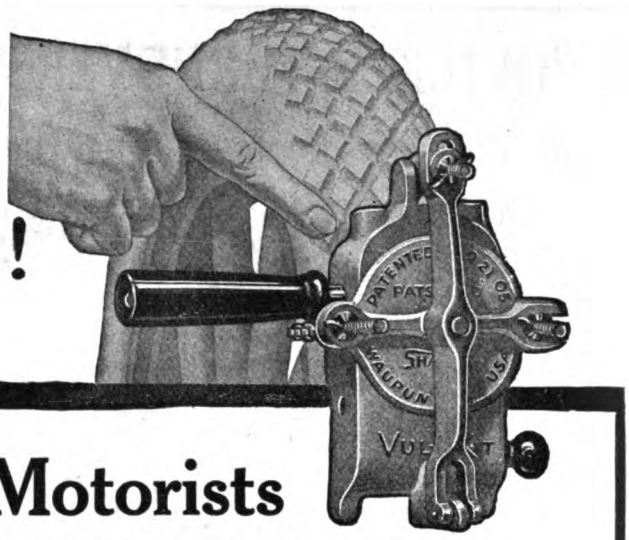
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9 out of every 10 motorists NEED it. And its $10.00 price usually turns that NEED into WANT.

Order from Your Jobber or Write Us

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SHALER

Vul-Kit For Tubes and Casings **$3.50**

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Furnished on Mossberg Displays

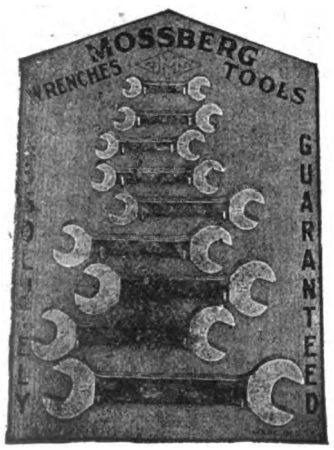
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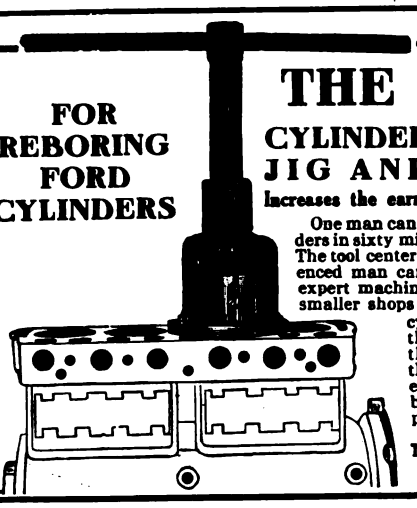
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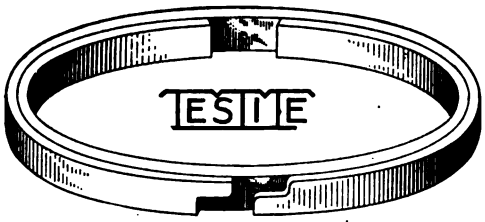


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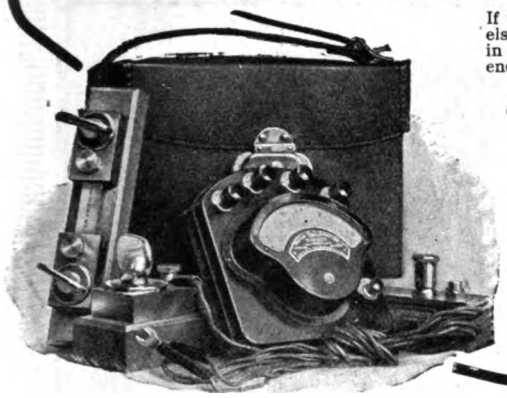
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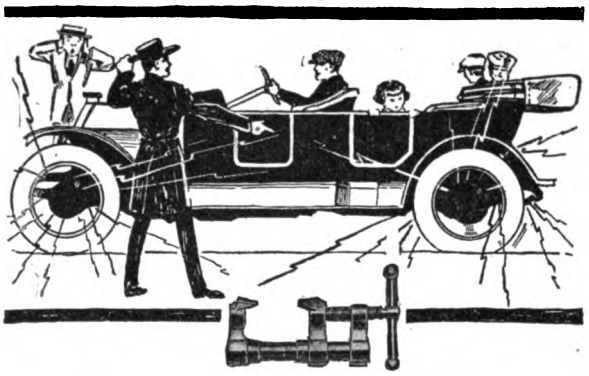
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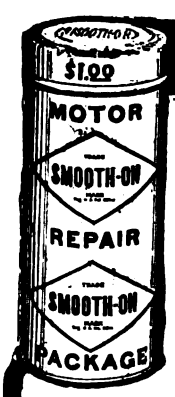
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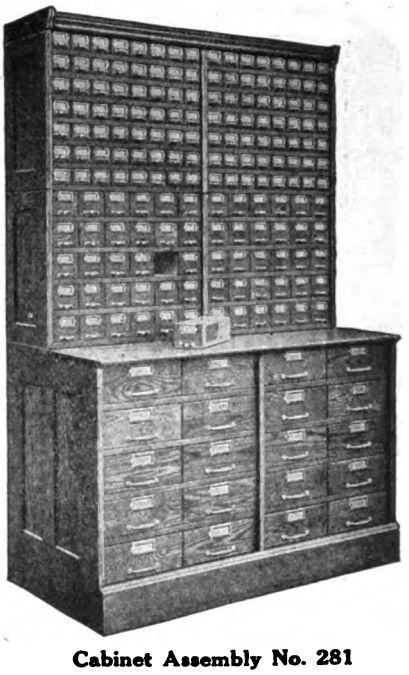
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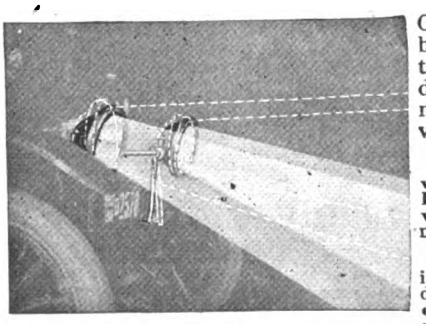
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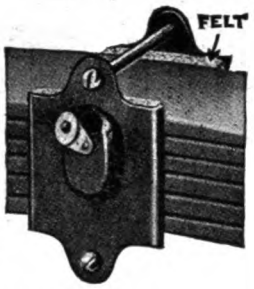
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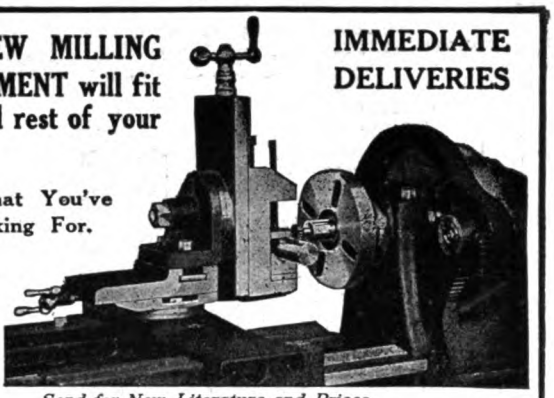
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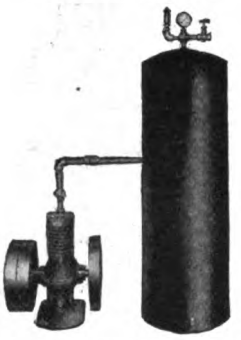


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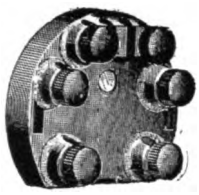
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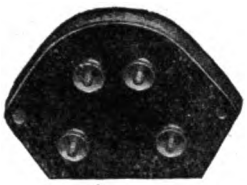
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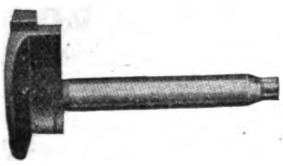


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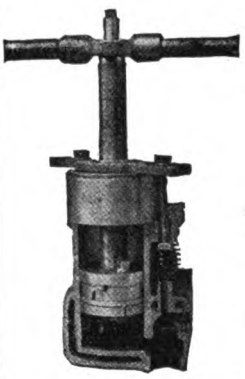
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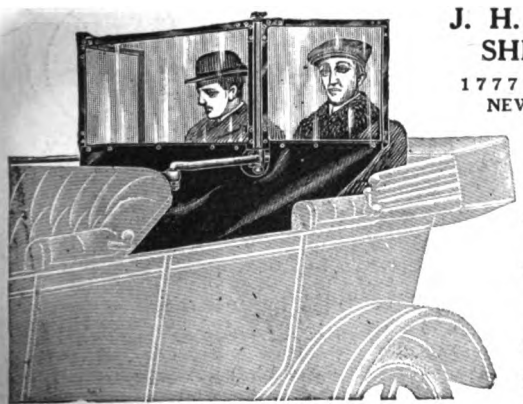
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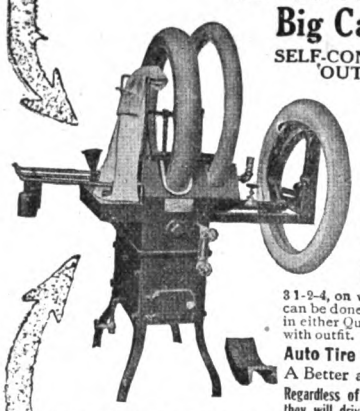
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A reduction of 4 lbs. weight on reciprocating parts saves a tremendous percent of crankshaft and wrist pin bearing wear.

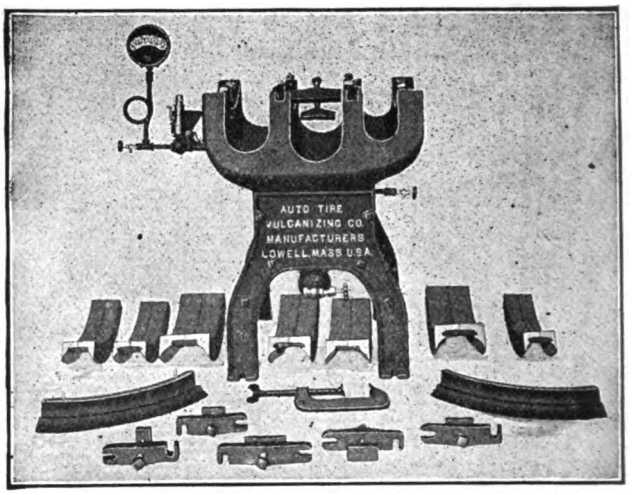
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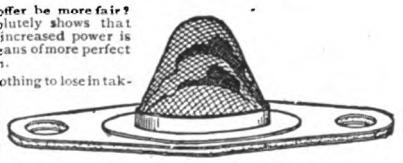
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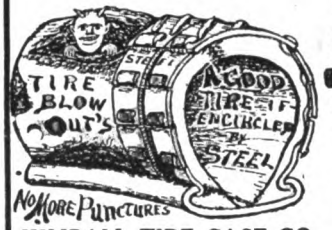
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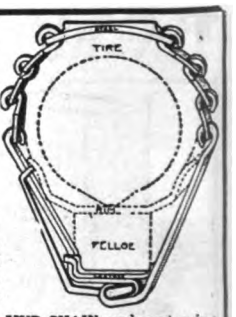
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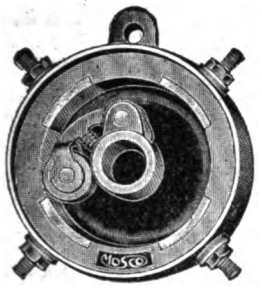
36,931 Automobile Dealers, all kinds, U. S., price $50.00 or $2.50 per thousand by states.
8,884 Ford Dealers, U. S. and Canada, price $18.50 or $2.50 per thousand by states.
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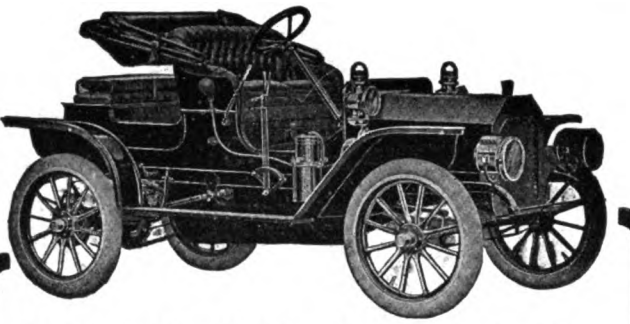


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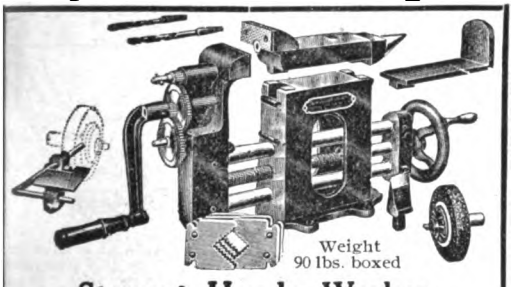
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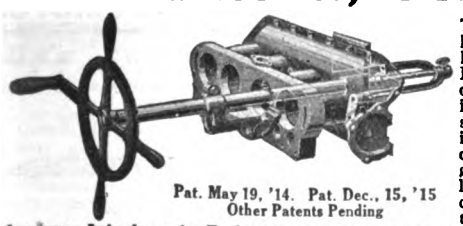
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MORE MILES PER TIRE LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

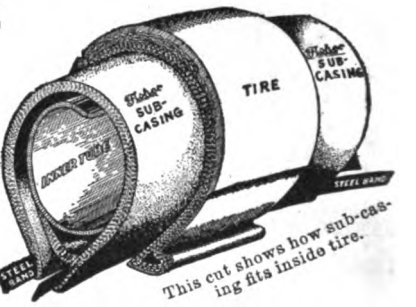
A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

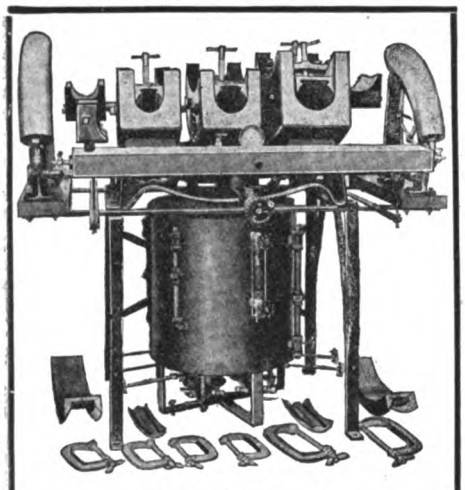
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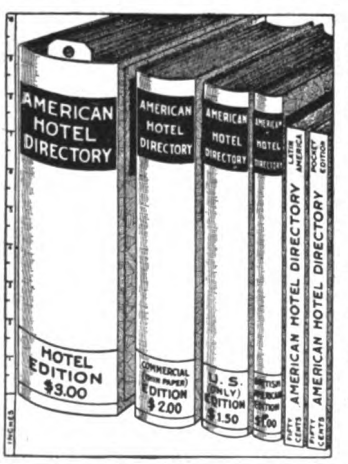
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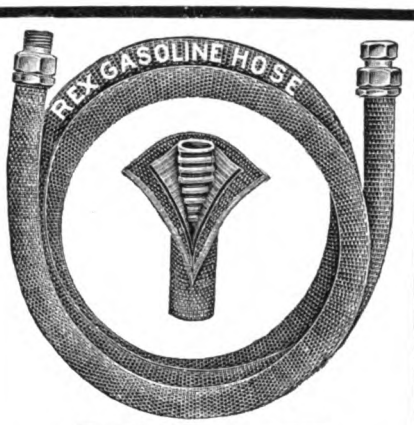
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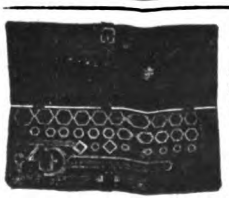
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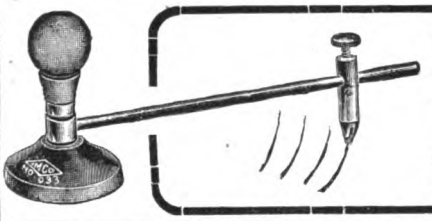
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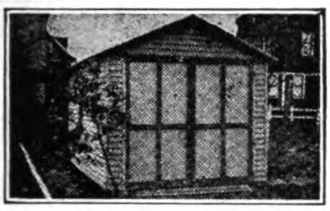
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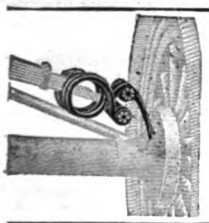
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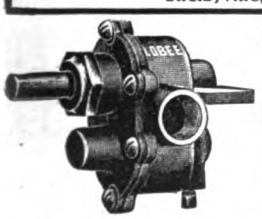
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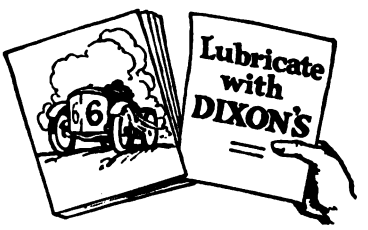
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Dixon advertising is bringing these triumphs to the attention of millions of motorists—making new friends for Dixon's, more customers for dealers.

Place your reliance in Dixon's for increased and steady business of the better kind, just as the speed kings do for better lubrication, and just as your customers do when they know the **service** Dixon's give.

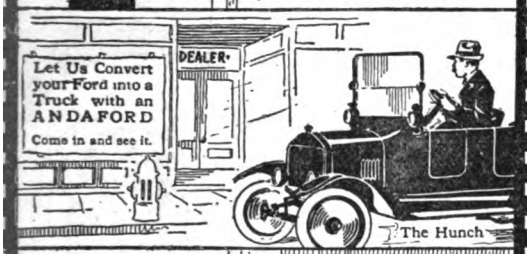
Write to us for Dixon's Dealer's Deal No. 184-G.

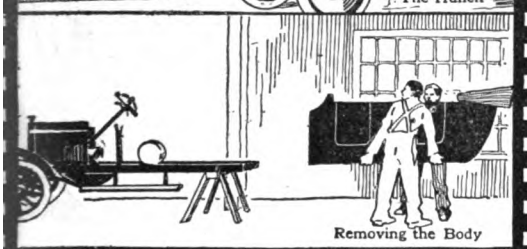
JOSEPH DIXON CRUCIBLE COMPANY
JERSEY CITY, N. J.
Established 1827

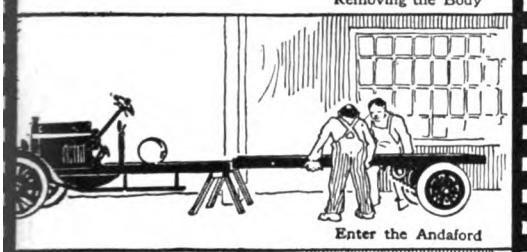
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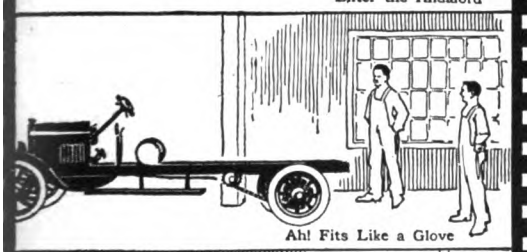
A POPULAR MOVIE.









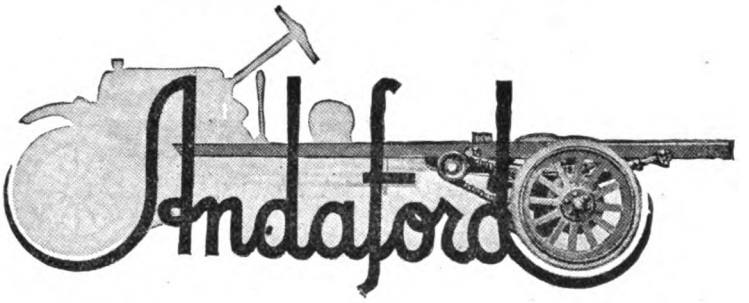




MORAL FOR DEALERS

Success in business means vision to realize a Public Demand and being prepared to supply it.

$295.00



Lowest in Price Biggest in Value

"And the little old Ford it rambled right along" says the song, a tribute to Ford efficiency and durability. Millions of Fords, now rambling as pleasure cars, will continue to ramble in the future as sturdy, dependable, 2500 pound trucks.

Business men are awakening to the fact that it is folly to buy a new truck or do without, when a Ford can be so easily and quickly converted into a first class 2500 pound truck, at such a surprisingly low cost. There's a good, profitable harvest in this field for live dealers.

The Actual Market

The demand for trucks of this capacity is enormous and certain. The money saving inducement for the merchant in being able to secure so easily a truck with the well known efficiency of the Ford, means a money making proposition of stupendous proportions for dealers. No need to develop a market. It is ready and waiting.

The Potential Market

The future needs for small trucks can hardly be estimated. When trucks can be procured at so low a cost, thousands of uses will be found for them, which are as yet unthought of. Your imagination can run riot along this line without exceeding the possibilities. The low upkeep of the Ford will result in fleets of Ford Trucks replacing the heavier kind, etc. Be ready for the harvest.

Why The ANDAFORD

The ANDAFORD attachment, composed of chassis, heavy artillery rear wheels, springs, chain drive, etc., made to attach rigidly to original Ford chassis by simply removing pleasure car body and rear wheels, is designed by men associated with the auto industry ever since it was an industry. In construction, utility and quality of materials it is supreme, and the price—$295, will make it a ready seller. Limited space prohibits lengthy description, but suffice to say, facility for enormous production enables us to turn out the biggest value on the market at the lowest price, with a profit to dealers that we know will interest you.

Your Best Interests

demand looking into the money making possibilities of the ANDAFORD. Get into this profitable field now.

The Andaford Truck Company

Jefferson and McDougall Avenues, Detroit, Michigan

THE ANDAFORD TRUCK COMPANY
Jefferson and McDougall Aves., Detroit, Mich.
Please send me full information regarding Andaford.

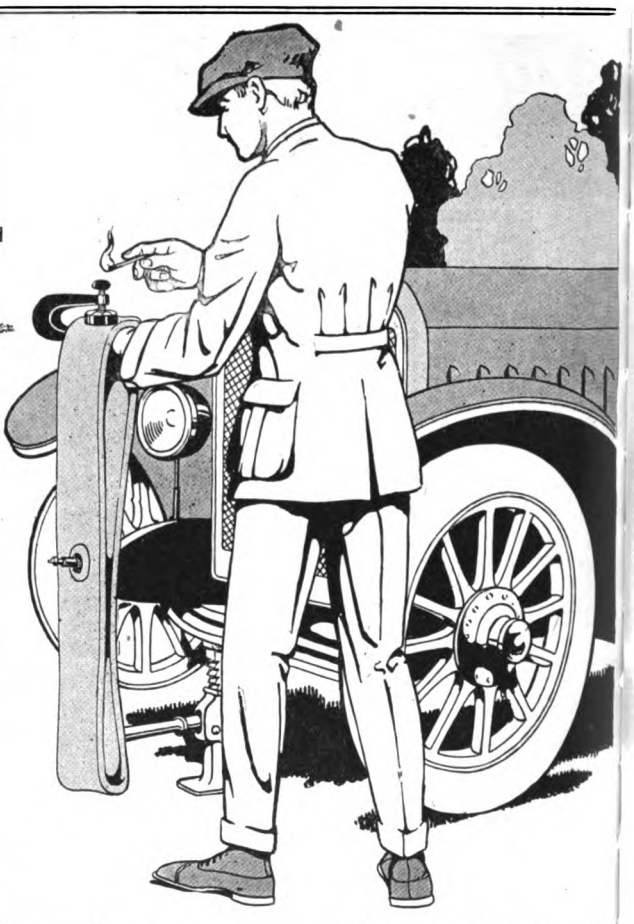
Name .....

Address .....

City ..... State .....

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THE NEW ADAMSON MODEL "E" 5-MINUTE VULCANIZER



IT IS the unforeseen emergency that shows the wisdom of carrying a complete repair kit. Your repair kit is not *complete* without an "Adamson" 5-Minute Vulcanizer.

Carry an "Adamson" outfit—it takes up little room—and you have the means of speedily and permanently repairing any tube puncture. This outfit uses gasoline, the handiest fuel, and is complete with a box of a dozen "Adamson" Repair Gum Patches for just one dollar. And an extra box of patches costs only 25 cents. It is the cheapest and wisest preparedness investment a tourist can make.

Your Dealer Has an "Adamson" Ready for You—Ask Him

Are You a Dealer?

If you handle the "Adamson" line, you know its rapid-selling qualities—let's remind you to look at your stock. If you don't handle the "Adamson," why not right now get full information on the popular accessory that does not come with the car?

These folders furnished free to "Adamson" Dealers. Order a supply for your customers.

ADAMSON MANUFACTURING CO.

EAST PALESTINE, OHIO

Complete Line of various sizes of "Adamson" Vulcanizing Outfits for tube and tire repairing; prices range from $1.00 to $12.00.



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The spark plug that is standard equipment for U. S. Army and Navy airplanes—

the spark plug that brings the majority of racing cars first under the wire—



the spark plug that is found in Duesenberg and Seabury "Speedway" motors—



is the spark plug for the dealer who wants to make the most sales to the owner who wants the most power in his car.



RAJAH
SPARK PLUGS



Because Rajah Spark Plugs are built sturdy enough to withstand the test of racing cars, speed boats and airplanes, they give the automobile owner dependable power with a big margin of endurance.

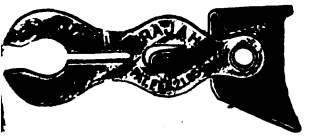
Because Rajah Spark Plugs are fairly priced and extensively advertised, they give the automobile dealer dependable sales with a big margin of profit.

That is why Rajah Spark Plugs are so popular with dealers and owners alike.

Address RAJAH, *Bloomfield, N. J.*

HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland, Seattle
JOHN MILLEN & SON, Ltd., Montreal, Toronto, Winnipeg, Vancouver

RAJAH TERMINALS

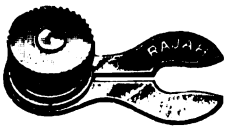


Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.

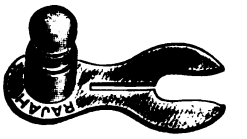


Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.

RAJAH ADAPTERS



Rajah Thumb Nut Terminal
Adapter for Dodge, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



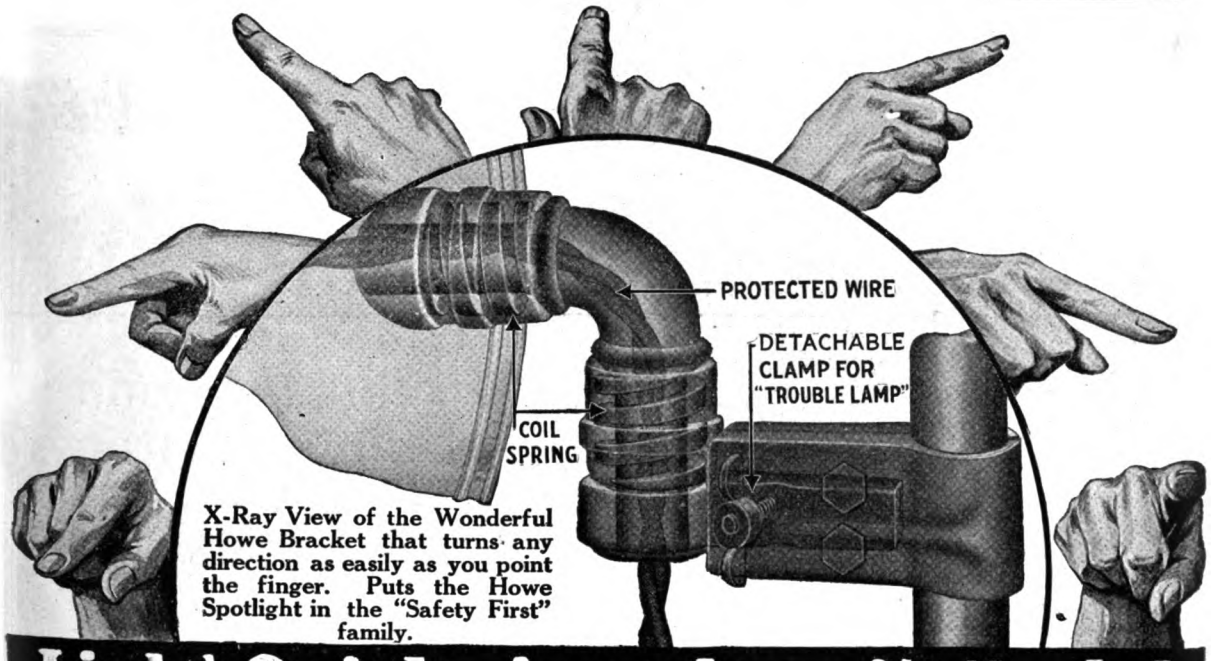
Rajah Stud Terminal
Adapter for Buick, Chevrolet, Oldsmobile.

Rajah Terminals and Adapters are furnished so that Rajah Plugs can be used on any car not equipped with the Rajah type of Clip Terminal. Any size exchanged if desired.

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X-Ray View of the Wonderful Howe Bracket that turns any direction as easily as you point the finger. Puts the Howe Spotlight in the "Safety First" family.

Light Quick—Anywhere it's Needed —Around the Automobile

Light that explores the bad turn—that makes safe the passing on a narrow road, that tilts downward to give a powerful road light without glare, that provides a wonderful trouble lamp—these and a hundred and one other uses make the Howe Spotlight a necessity. The value of a spotlight is in direct proportion to the efficiency of its bracket. The Howe Bracket is a wonderful combination of ease of action with positive firmness. It permits an easy turn *direct* to the spot you want to see. It *holds* the lamp firmly right *where* you turn it. Road shocks and vibrations won't move it. The patented coil springs, acting on the turning joints, are the secret of this *gentle* firmness. They take up all jar and loose motion—insure perfect service always.

HOWE Searchlight

"The Spotlight with the Wonderful Bracket"

The wonderful Howe Bracket also contains and protects the wires—prevents flopping, wear, and short circuits. ***The Howe is always in focus—gives a perfect Spotlight at all distances.*** Outlines objects a quarter of a mile away. The switch is "on and off type"—right in the neck of the handle. You light up with the same motion that you turn the lamp. One of seven 2-piece Howe clamps insures a perfect fit for every windshield frame. The finish is baked-on enamel—good as that of the car.

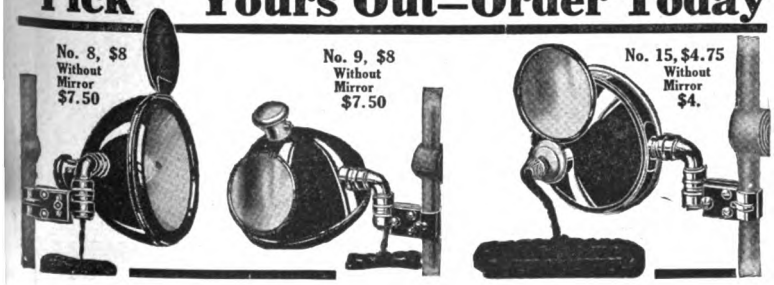
Be Sure Your Spotlight Is a Howe

If your dealer hasn't it, accept no other. Remember, a spotlight is only as good as its bracket. ***Only*** the Howe has the wonderful spring controlled bracket. Send remittance for the Howe Lamp you want, telling the make, model, and year of car you drive—for a Howe Lamp prepaid. Be sure to give your dealer's name.

Dealers: The Spotlight with the wonderful bracket makes the best buy—it's the big seller. You ought to have it ***now.*** Wire for a dozen, mentioning jobber's name.
Display stand, attractive circulars, and other live selling helps furnished without charge. Write for full particulars.

HOWE MANUFACTURING COMPANY, 1732 Michigan Ave., Chicago, Ill.

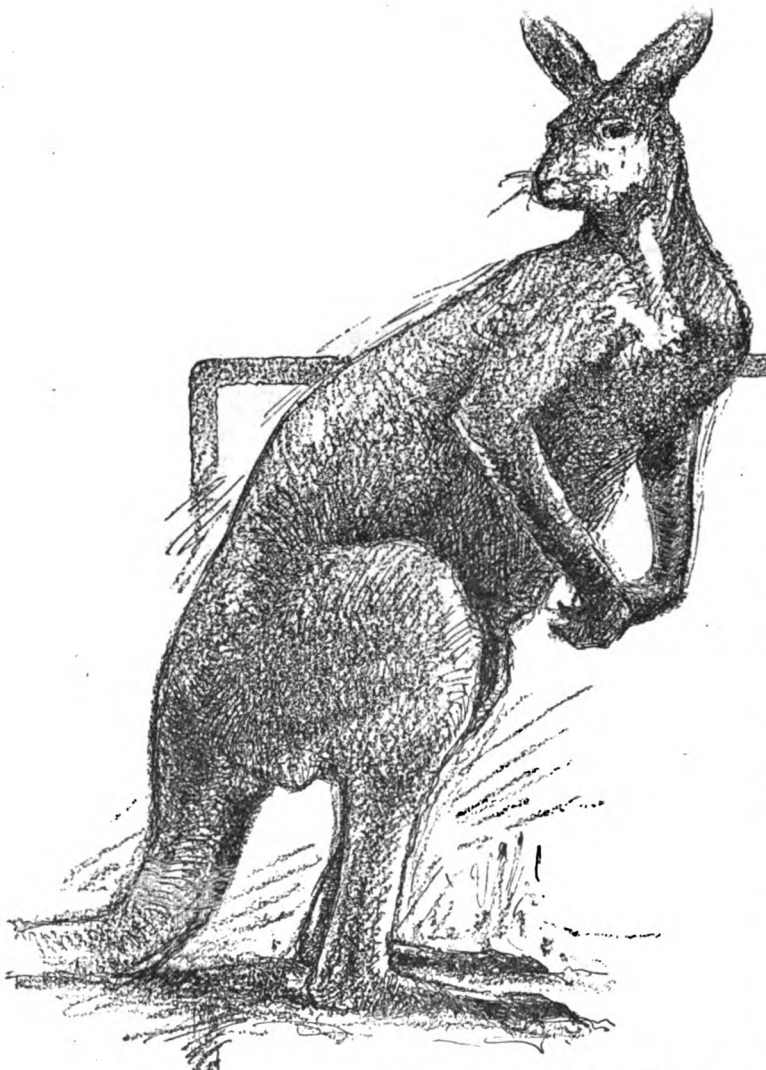
Pick Yours Out—Order Today



HOWE MANUFACTURING COMPANY
1732-36 South Michigan Avenue, Chicago, Ill.
Send one (1) dozen Howe Lamps as follows:—
☐ No. 8 ☐ No. 9 ☐ No. 7 (same as No. 8, without mirror) ☐ No. 15 ☐ No. 11 (same as No. 15, without mirror)

Name.....
Street No.....
City.....
Jobber's Name.....

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From the Land of the Kangaroo

"QUALITY", said a shrewd Yankee merchant, "will carry your goods further than craft". The pun may be poor but the sentiment expressed is very much to the point.

Quality has carried Texaco Products a long way. On the other side of the world they are as well known as they are here at home.

Recently the following letter, forwarded from far-off Australia, was received at our New Your office. It is a proof of the reputation established in the land of the Kangaroo by

TEXACO MOTOR OIL

THE JUNCTION GARAGE
Scheps Bros.
MOTOR ENGINEERS AND IMPORTERS

Melbourne, February 18th, 1916

Mr. J Norman Parker
c/o Messrs. R. W. Cameron & Co.
Queen Street, Melbourne.

Dear Sirs:

Kindly send us per carrier 5 barrels Texaco Motor Oil E. H. and 2 barrels ditto No. 2 "M" as supplied to us previously. If your principals maintain the high quality of these oils you may count on us for regular requirements as we have used these in our own cars, one of which we had down for inspection last week after 20,000 miles running, and this car showed absolutely no signs of carbonization in the cylinders, or on the pistons, hence the above order.

We are using Texaco Motor Spirit almost exclusively, and we are very pleased with the quality.

Yours faithfully,
SCHEPS BROS. *(Signed)* Fred Scheps.

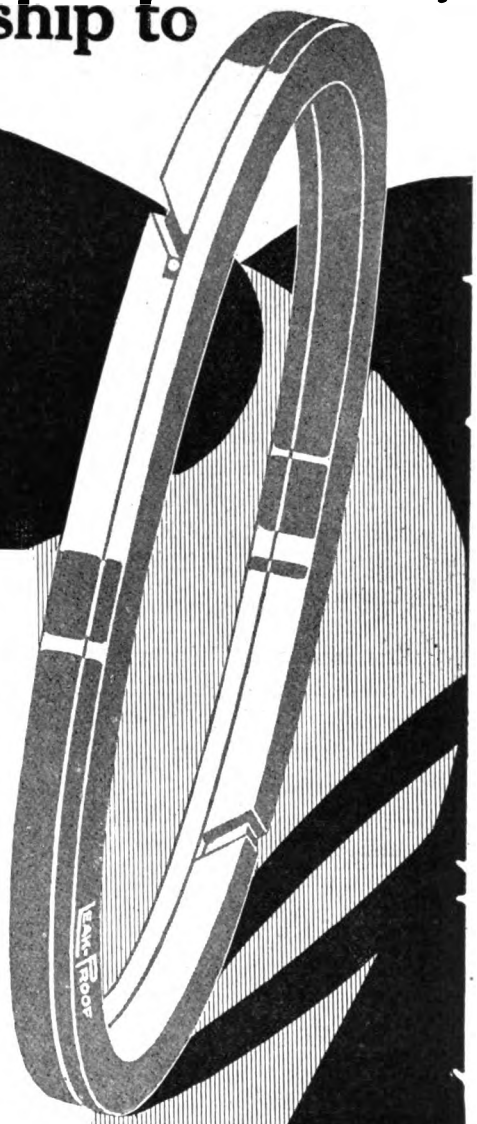
There is a garage near you that supplies Texaco Motor Oil. Try it. The safest way, the best way, to buy is in one or five gallon cans. You can identify Texaco by its clear, clean color.

THE TEXAS COMPANY
New York Chicago Houston
DISTRIBUTING OFFICES IN MOST CITIES

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Six Facts that Give Leadership to

McQUAY-NORRIS LEAK-PROOF PISTON RINGS



Most Efficient—because the ring is designed in the only way that can insure equal bearing on the cylinder wall without wasteful friction.

Most Durable—because the processed gray iron used is made to our exclusive formula and is exceptionally strong, elastic and long wearing.

Best Known—because the education of the motorist on piston ring service was started by the McQuay-Norris Mfg. Co.—makers of the Genuine LEAK-PROOF Rings.

First Advertised—for five years national advertising has built up prestige and confidence that makes them sell.

Largest Range—covering every size and over-size, both in widths and diameters—for every make, model and type of motor or engine.

Greatest Distribution—over 300 jobbing and supply houses carry complete service stocks. Any dealer can get the exact size ring he needs in twenty-four hours.

Bring this leadership into your piston ring replacement or accessory business. It will guarantee easy selling, satisfied customers and increased profits.

OUR FREE BOOK

"To Have and to Hold Power" tells all the story. You should get and read it. Write Department R.

McQuay-Norris Mfg. Co., St. Louis, U.S.A.

Branch Offices:

New York, Pittsburgh, Cincinnati, St. Paul, Chicago, San Francisco, Seattle, Dallas, Philadelphia, Los Angeles, Kansas City, Denver



Canadian Factory:
W. H. BANFIELD & SONS, Ltd.
372 Pape Avenue Toronto

And for Your Further Protection against Substitution

Genuine McQuay-Norris LEAK-PROOF Piston Rings are only put up in this special carton, under this copyrighted label. Each ring is separately wrapped in this sealed parchment container.



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Gasoline by Air Pressure

The New Way—The Safe Way

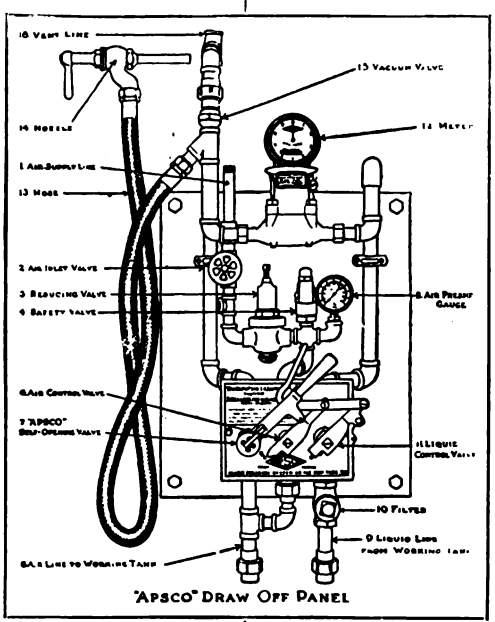
Safety: An important feature of the APSCO System which has gained for it the approval of the National Board of Fire Underwriters is its safety against fire.

This system for storing and distributing gasoline, oil, or any other volatile liquid is so constructed as to eliminate the possibility of ignition or explosion.

Economical: Economy of operation is assured. There is no opportunity for the liquid to vaporize or gases to collect—full strength and quantity of liquid is certain, because it cannot be left running, nor is it exposed to the atmosphere at any point within the system.

Permits: The approval of the National Board of Fire Underwriters means not only safety in operation, but assures lowest possible fire insurance rates, at the same time tending to obtain the co-operation of local authorities in the matter of permits and approvals.

Tested: The APSCO System is not an experiment—It is a demonstrated success, in actual operation in many garages and mercantile establishments, where it is daily giving marked satisfaction.



Accurate: The Special APSCO meter tells at a glance the amount of liquid drawn off—a meter tested and sealed by the Bureau of Weights and Measures of the City of New York.

Speedy: Speed of delivery is at times a vital factor, and the APSCO System meets all requirements in this regard.

No Labor: To operate the APSCO System you simply pull a lever. No labor is required; a small amount of air pressure does the work. There are no complicated cranks or other laborious devices to bother you.

Lift: Delivery on the third, fourth, fifth, sixth or any other floor is just as easy for the APSCO System as on the ground floor. The system is quickly and easily adapted to varying conditions of height, distance or speed of delivery without in any way affecting the accuracy or safety of the system.

Service: In a word, the APSCO System is economical, safe, speedy and accurate. The multi-storied garage, or the smallest, needs this truly efficient labor-saving, time-saving, money-saving system. Our staff of experienced engineers is ready at all times to co-operate to the fullest extent.

Write for Literature—Agencies Wanted

The Allen Pressure System Co., Inc.

20 West 61st Street - - - - New York

ALWAYS LOOK FOR THE GREEN PANEL

PROTECTION FOR BUYER AND SELLER

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10,000 MILE GUARANTEE Backs This Tire

Every Brictson Pneumatic Tire is sold under a specific 10,000 miles written service guarantee. This guarantee is the ***longest*** and the ***strongest*** ever put behind a pneumatic tire. It is the result of ten years' experience and is a positive protection to every purchaser. Try Brictson Tires on your car at our risk and learn how to cut down your up-keep costs.

"ABSOLUTELY PUNCTURE PROOF"

Brictson Tires are puncture-proof, blowout proof, skid proof, rut proof, rim cut proof, oil proof and gasoline proof. Wonderful resiliency and easy riding qualities as well as economy commend them to car owners. The service and satisfaction they give is rapidly extending their sale.

Retread Your Present Tires

If your present tires are new you should by all means apply Brictson Treads, or tire protectors, thereby making them puncture proof—rut proof—rim-cut proof—gasoline proof and non-skid.
If your present tires have been used and the rubber tread has been worn off or thin, you may get additional service by applying Brictson Treads, also making them puncture proof, oil proof, rut proof, gasoline proof and non-skid.

Free Trial Offer

To convince you that Brictson Tires will give you satisfaction we will let you try them on your car at our expense. Write today for conditions of this Free Trial Offer and full information about Brictson Tires and Brictson Treads.

THE BRICTSON MFG. COMPANY

187 Brictson Building **BROOKINGS, SOUTH DAKOTA**

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Six exceptional features make the

Victor

TRADE MARK

THE BEST SPOT LAMP EVER PUT ON A CAR!

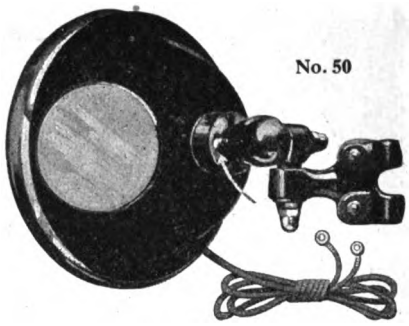
Once you have experienced the joy of reading sign-posts, finding your way easily into the garage, discovering mud-holes and ditches at night, and watching traffic in your mirror by day, you will think Victor safety and convenience wonderfully cheap at—

$5.00

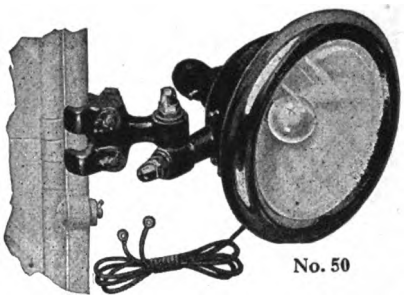
The exceptional Victor features are—

1. A hingeless, dust-proof, nickeled door that is securely locked, but released in a second by pushing a button.
2. Reflector that insures a perfect focus of the bulb.
3. A short-shanked bracket that fits any windshield support, holding lamp securely in any position.
4. A lamp socket that enables you to change and re-focus bulbs in two minutes on the darkest road.
5. Cold drawn steel body, finished in black enamel with 3-inch condensing mirror, to show traffic behind you as you drive.
6. Cutler Hammer positive switch inserted in handle, and six feet of conductor cord ready for immediate installation in any car

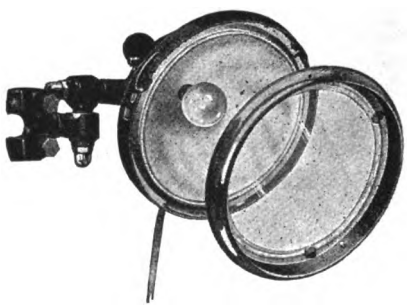
Don't postpone the greater comfort you'll take with a VICTOR!



Note the Cutler Hammer Switch right where your fingers can touch it when you adjust the light.



Note the unrivaled neatness of the rounded dust-proof nickled door, which is well in keeping with the headlight doors.



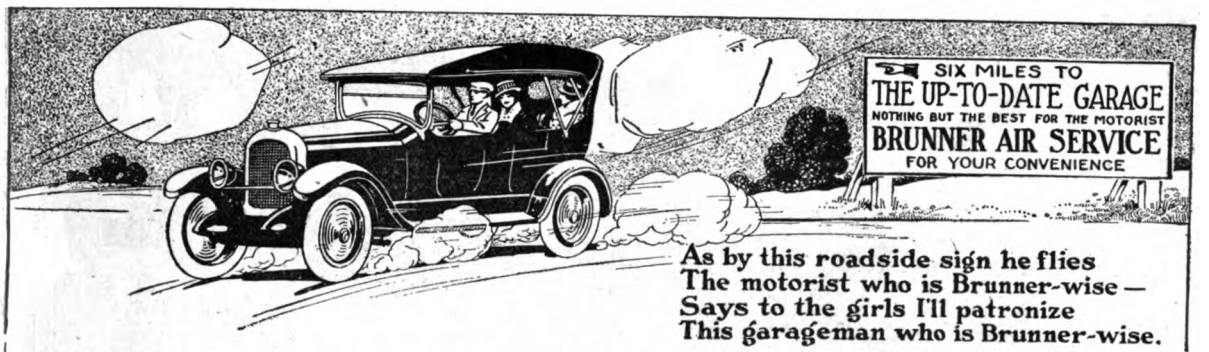
The door is shown turned over. Note lugs holding glass in place. Note cord entrenched on flange of the reflector. It presses against the glass when the door is on, and keeps lamp from rattling.

Look for the Victor trade-mark on every spot lamp.

The Corcoran Victor Company

702 Reading Court **Cincinnati, Ohio**

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As by this roadside sign he flies
The motorist who is Brunner-wise —
Says to the girls I'll patronize
This garageman who is Brunner-wise.

Mr. Garageman, is your garage up-to-date? Are the Brunnerwise Motorists spending their money with you, or are they spending their money with the Brunnerwise Garageman down the line a ways who advertises the fact that he is supplying prompt and efficient service by displaying the Brunner Sign on his garage?

If your business is not so large but that you could handle some more, Mr. Garageman, you should investigate Brunner Service—

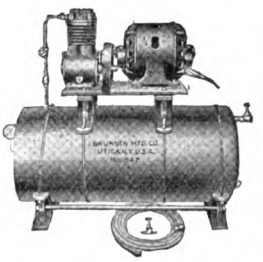
The Brunner Sign Attracts the Trade of the Brunnerwise Motorist



WE USE A BRUNNER AIR COMPRESSOR
FREE AIR
FOR YOUR CONVENIENCE



The Brunnerwise Motorist is a most discriminating individual, he appreciates good service and he knows prompt and efficient service always awaits him at the door of the garage displaying the Brunner Sign. He is a liberal spender and spends his money with the Brunnerwise Garagemen who show him that they have his interests in mind by installing Brunner Service.

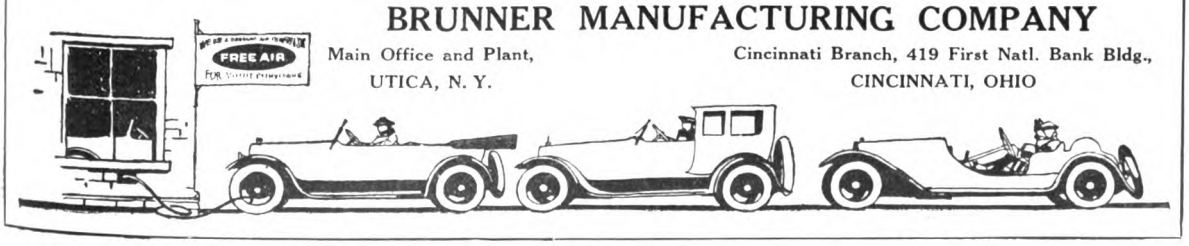


The Brunnerwise Garageman is reaping the benefit of the good advertising derived from the Brunner Sign, for his garage is the stopping place of the Brunnerwise Motorist who always patronizes the garage displaying the Brunner Sign, because he knows he can depend on real service when he stops to trade with the Brunnerwise Garageman. Are you Brunnerwise?

INVESTIGATE THE BRUNNER AIR COMPRESSOR

Be honest with yourself and investigate the garage air compressor question thoroughly before deciding on your new equipment. The Brunner will stand investigation and the more thorough the investigation the more certain will be your decision in favor of Brunner Service, because it not only insures compressed air efficiency of the very highest order, but it also insures that very desirable and liberal patronage of the Brunnerwise Motorist, which follows the Brunner Sign.

We will be glad to send you the name of the Brunner Jobber who covers your town, also our catalogue and Garageman's Handbook on Compressed Air—a book which every garageman should read carefully. They are all free for the asking.

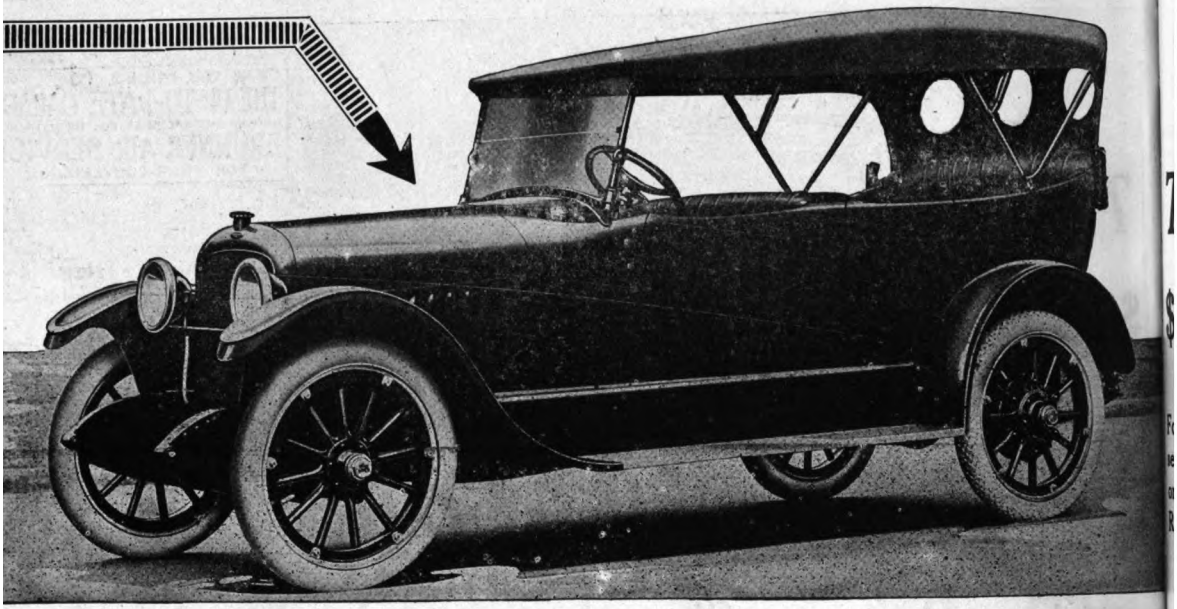


BRUNNER MANUFACTURING COMPANY

Main Office and Plant,
UTICA, N. Y.

Cincinnati Branch, 419 First Natl. Bank Bldg.,
CINCINNATI, OHIO

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The Motorist's Ambition

Isn't it the ambition of every motorist to feel that his grip on the wheel makes him master of the road? He doesn't want to race, but isn't it a joy to know that when Bill Smith tries to pass him he can let 'er out and give Smith the Ha, Ha? He buys a car for convenience, but it isn't that which increases his chest measure an inch or two and makes him crow—"Why, I took that old Bluff hill on high and never phased my little old bus. She's some car, believe me!"

He doesn't want a car for exhibition purposes, but isn't it a grand and glorious feelin' to know that when his sporting blood does crop out, his car will respond and preserve the honor of the family?

Isn't his happy brag the kind of advertising you want and the car you want to sell? Does a red-blooded man quarrel about price when he has tried out a car like that? Help him to realize his ambition.

That Kind of a Car

was what the Ross designers had in mind when they turned out their masterpiece They didn't try to build what the motorist says he wants (when the wife is listening), but what they know he does want, whether he be a college boy or banker of 60. That's why the Ross hits the real vital spot in human nature.

WHY NOT GIVE HIM

The Importance of Balanced Design

What is the reason for the speedy acceleration, the marvelous control, the ease of handling, the life and gimp of the Ross? It is not all in the motor. It's in the way the car is designed to utilize every ounce of energy in the motor and harness it for service. It's easy to get speed or some other desired end by sacrificing something else to get it, but to make a perfectly balanced car requires ingenuity. Perfect balance between motor and car is what makes the Ross a joy to its possessor, and him an unconscious booster of the dealer who sold it to him.

The Ross Automobile

Builders of Six and

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ROSS

The Balanced Car

$1750.00

For 7 Passenger, 4 Passenger Suburban Type or 3 Passenger Roadster

WHAT HE WANTS

Looking Down the Road

Every dealer is driving down a road seeking to reach the destination of success. He sees his goal ahead and steers as straight for it as the stones, ruts and curves of business will permit. His speed will be handicapped or hastened according to the car he has selected to carry him toward his object. The right kind will level the hills, ease the jolts and carry him forward with the least strain on his physical, mental and financial resources. That car must have the strongest appeal to the motorist.

Ironing Out the Hills

A Ross with a load of 1,103 pounds (7 passengers) climbed Lookout Mountain, Colorado, officially locked in high, at an average speed of 20 miles per hour.

A Ross traveled 1,000 miles, from Detroit to Topeka, over all hills and all kinds of roads, in heavy rains and thru deep mud, without shifting from high even when starting car. One 45% grade had stumped many cars on low, but the Ross ate it up and gained speed in the ascent.

A Ross recently followed the band in a parade on high gear, and at the conclusion of the march the motor had not heated in the least.

A Ross won $100 in a Milwaukee hill climbing contest by easily taking Milwaukee's worst hill (19th Street) on high, loaded with passengers.

A Ross climbed the famous Filmore Street hill in San Francisco, chained and padlocked in high, and finished at 20 miles per hour, a feat never before accomplished by any car.

And so it goes. We can show newspaper clippings of these and many other like performances that characterize the Ross car.

Is that the kind of car you want to sell?

Speed 'er Up

Speed up your business by adopting the Ross—the Balanced Car, as your business booster. Let's get together and discuss the proposition. Send the coupon today.

Company, Detroit, Michigan

Eight Cylinder Cars

COUPON

ROSS AUTOMOBILE CO.
Dept. 20-B
Detroit, Mich.

I wish to accelerate my business. How can I do it?

NAME.....

ADDRESS.....

CITY.....STATE.....

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Six Styles

each designed and constructed with **Study, Experiment, Test and Experience**—to meet in every way the requirements of present day motors.

No one plug can possibly fit every engine—so there are six styles of

MASTER CALORITE SPARK PLUGS



Master Calorite Spark Plug Regular Length, $1.00 each

The engineers responsible for the manufacture of Master Plugs—with years of experience in the manufacture of Spark Plugs and Spark Plug Parts, thoroughly conversant with present motor car requirements and ignition demands—have persistently kept Master Calorite Spark Plugs up to the minute in:

Quality of materials. Potential resisting power against strains from sudden, violent temperature changes. Improved design. Thoroughness of testing. Sturdy construction and excellent workmanship—justifying the claim that they exemplify the highest achievement in spark plug construction.

Their plainly evidenced quality has been a a shield against any degradation to the cut price class.

Our Liberal Guarantee ["We guarantee Master Calorite Spark Plugs against all defects of material or workmanship and will replace free of charge any Calorite insulators broken by heat which are returned to us transportation prepaid."]

Proves our faith in their ability to make good in the severest service and warrants your recommending them unreservedly to your best customers.

There is a Master Calorite Spark Plug for every variety of service—
And the retail price is amply justified by their quality and ability for service—

$1.00 and $1.25 Retail—Depending Upon the Size

Let us send you full particulars on our proposition to the trade. You will find it most attractive.

MASTER CALORITE SPARK PLUGS
Made in U. S. A. and guaranteed by

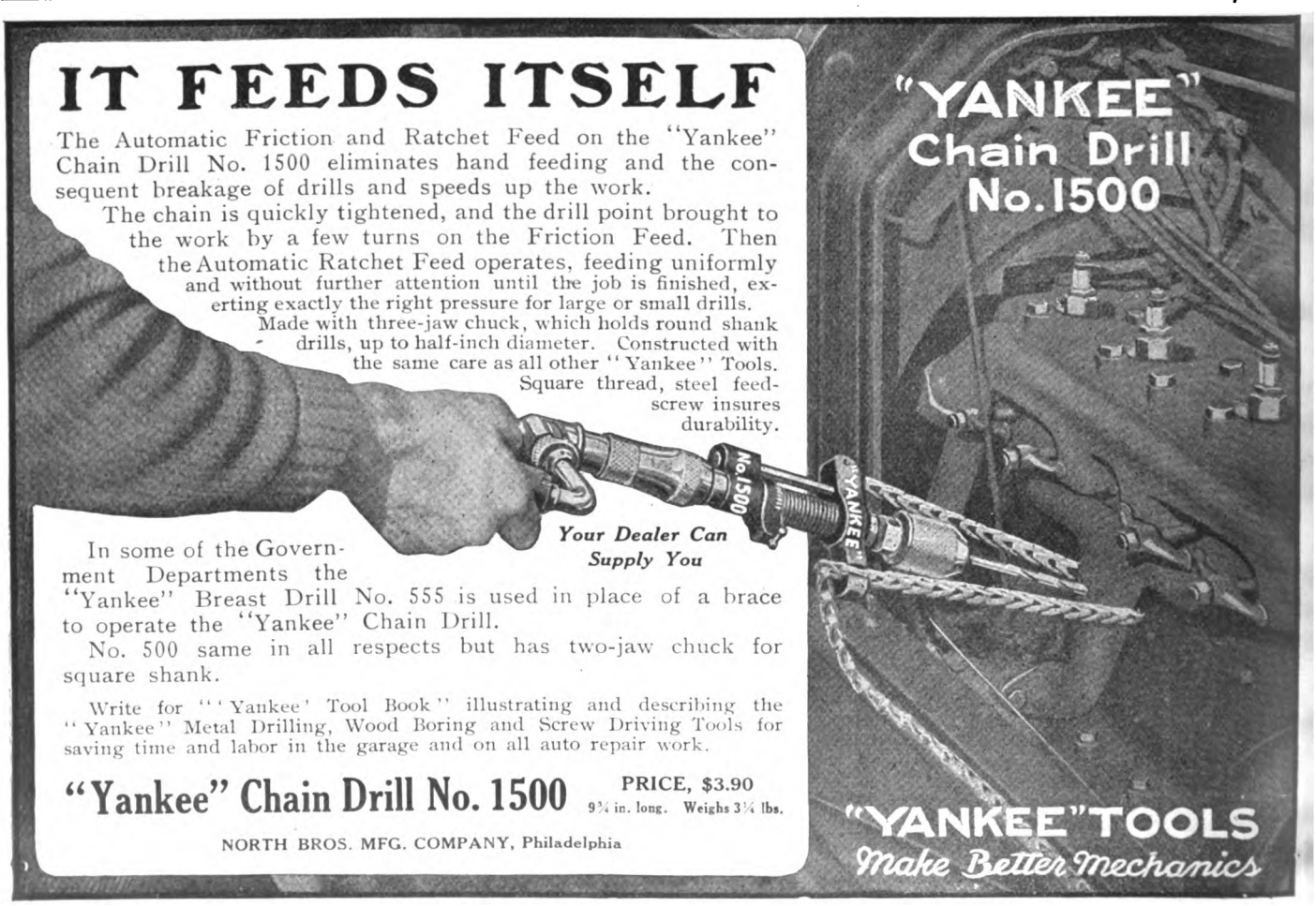
HARTFORD MACHINE SCREW CO., 514 Capitol Ave., Hartford, Conn.

IT FEEDS ITSELF

The Automatic Friction and Ratchet Feed on the "Yankee" Chain Drill No. 1500 eliminates hand feeding and the consequent breakage of drills and speeds up the work.

The chain is quickly tightened, and the drill point brought to the work by a few turns on the Friction Feed. Then the Automatic Ratchet Feed operates, feeding uniformly and without further attention until the job is finished, exerting exactly the right pressure for large or small drills.

Made with three-jaw chuck, which holds round shank drills, up to half-inch diameter. Constructed with the same care as all other "Yankee" Tools. Square thread, steel feed-screw insures durability.



Your Dealer Can Supply You

In some of the Government Departments the "Yankee" Breast Drill No. 555 is used in place of a brace to operate the "Yankee" Chain Drill.

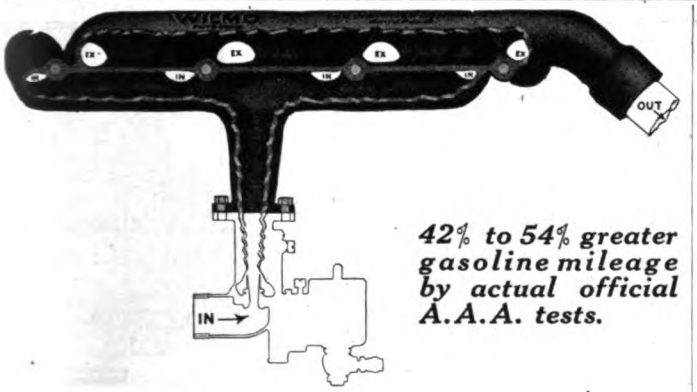
No. 500 same in all respects but has two-jaw chuck for square shank.

Write for "'Yankee' Tool Book" illustrating and describing the "Yankee" Metal Drilling, Wood Boring and Screw Driving Tools for saving time and labor in the garage and on all auto repair work.

"Yankee" Chain Drill No. 1500 PRICE, $3.90
9¾ in. long. Weighs 3¼ lbs.

NORTH BROS. MFG. COMPANY, Philadelphia

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42% to 54% greater gasoline mileage by actual official A.A.A. tests.

More Miles From Gasoline More Business For You

with the

Wilmo Manifold

The best service you can render your customers is the service that saves them money.

And that is just what the Wilmo Manifold does.—

Saves money by increasing gasoline mileage 42% to 54% by actual official A. A. A. tests.—

Saves money by practically eliminating all troubles due to carbon.—

Saves money by giving a smoother running engine on all roads, at all speeds and in all seasons.—

Saves money by keeping the car *in* commission and *out* of the repair shop.—

Saves money because it completely vaporizes gasoline of whatever grade, transforming every vestige into clean, abundant, full-bodied power with no residue to choke the engine and spoil the riding.

Prices, $7.50 (Ford size) to $15, depending on the make of car. Quickly attached with a monkey-wrench. No holes to bore.

Write for full particulars of this money saver and money maker.

THE WHITTIER COMPANY

Dept. 228, First National Bank Building **Chicago, Illinois**

One Dealer Made $221.43

during June, selling—

A·B·C

TWO-UNIT

Electric Starting and Lighting System

FOR FORD CARS

You Can Do As Well!

Our dealers don't work *for* us—they work *with* us. *Co-operation*, not competition, is the life of *our* trade. Our slogan *"On and Off Your Shelves"* is a *promise*. We're with you, Mr. Dealer, with sales helps, advertising literature, follow-up letters—assistance to the limit. We furnish our dealers with names of prospects, and help them turn prospects into *sales*.

A Strictly 2-Unit System

The *two-unit* is the only practical electric starting and lighting system for *any* car. The A. B. C. is two unit—built especially to fit the Ford Car—after careful study and experiment by A. B. C. engineers. It positively starts and lights the Ford car. It generates electrical energy without "stealing" Ford power. Note even balance of starter units and belt-driven generator.

A. B. C. Starters Stay Sold

Dealers are enthusiastic over the "Trade Satisfaction" the A. B. C. brings them through satisfied users. The A. B. C. *stays sold.* Ford owners like its dependability, its accessible location under the hood—its economy and durability. It's a money maker for dealers, because it contributes to their business the greatest of commercial assets—satisfied customers.

There's an unsatisfied Ford starter market right at your door. The A. B. C. System opens that market for you. Equip for a successful campaign. Get on the firing line—TODAY.

Don't be a "Slacker"

Clip the coupon—NOW

A·B·C STARTER·COMPANY DETROIT

INFORMATION COUPON

A. B. C. STARTER CO.
Department H, DETROIT, MICHIGAN

Gentlemen: Please send full information regarding the A. B. C. Two-Unit Starting and Lighting System, including literature, prices, terms, discounts, etc.

Name .....

Address .....

City ..... *State* .....

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"NORMA" BALL BEARINGS

(Patented)

A trouble-proof car may be an ideal impossible to be realized. It can be approached, however, if every care is exercised to make every detail that enters into the construction and equipment of that car as nearly trouble-proof as possible. This emphasizes the important part that so-called minor details play in the performance of any car. Manufacturers of high-grade magnetos and lighting generators have found by experience that "NORMA" Bearings give them dependable bearing service—and they have standardized on "NORMA" Bearings. Makers of cars of the better class have learned by experience that the electrical accessories that give them the most dependable service have "NORMA" Bearings—and they have standardized on these magnetos and lighting generators.

Be *Sure*—See That Your Electrical Accessories Are "NORMA" Equipped

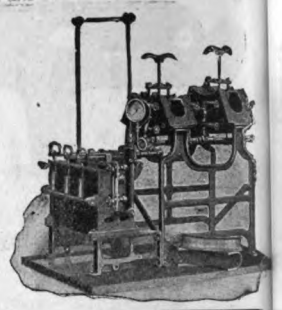
THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

Ball, Roller, Thrust, Combination Bearings







THE Akron-Williams line includes every approved time and labor saving device for modern tire and tube repairing, and there is a complete outfit for every kind of work and size of shop. No equipment is too large, no tools too small.

Akron-Williams equipment enjoys the unique distinction of being designed and perfected with the active co-operation of experts employed by the various tire factories of Akron—the largest in the world.

Akron-Williams

TIRE REPAIR EQUIPMENT

Used and Endorsed by More Than 60 Leading Tire Manufacturers.

The equipment we offer you is the same in every way as used by 90% of the leading tire companies in their factories and recommended and sold by them to their dealers throughout the country. With this equipment anyone can follow the latest and most approved methods.

DO TIRE REPAIRING

It offers wonderful opportunities for building up an established and profitable business with a small investment—either as an individual business or a department of a garage.

Your success or failure depends largely upon the outfit you use. You will want Akron-Williams equipment later on—Get it *at first* and make money *Right from the Start.*

Send for new catalog illustrating the latest devices and equipment.

THE WILLIAMS FOUNDRY AND MACHINE CO.

GLENDALE STREET AKRON, OHIO

Exclusive Distributors for California:
THE WATERHOUSE & LESTER CO.,
San Francisco



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This Better Battery Means Better Business

USL STORAGE BATTERIES

U.S. LIGHT & HEAT CORPORATION



Here is a battery for which you won't have to apologize to your trade—the USL Starter Battery with Machine-Pasted Plates.

Automobile manufacturers are using more of them than ever before. Thousands of USL Battery owners naturally want to do business with USL dealers. So, if you are looking ahead, it will pay you to line up with the other live ones now making money with USL Batteries.

USL power and durability comes from the exclusive Machine-Pasted Plates. These plates are denser and tougher and are built to resist erosion longer than most battery plates.

USL Batteries in sizes for all cars are sold on a 15 Months' Guaranteed Adjustment Plan which practically amounts to battery insurance at a moderate cost.

We have a profitable proposition to make regarding Service Stations and dealers in towns where we are not represented.

If there is no USL agency in your town, write us for our proposition.

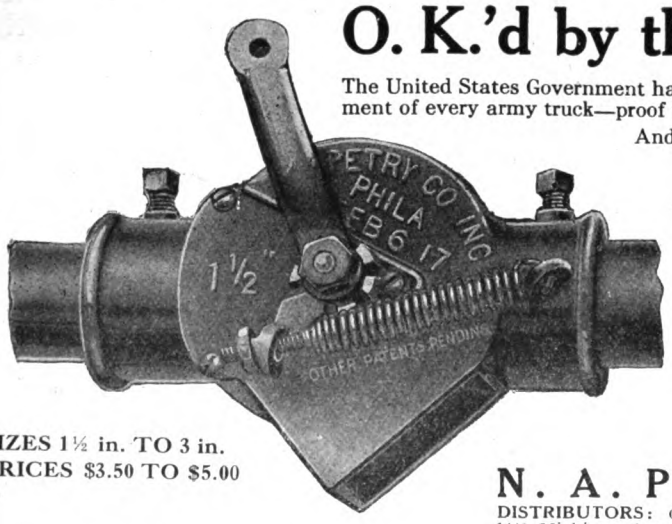
U S Light & Heat Corp.

Drawer "G," Niagara Falls, N. Y.

Branches in: NEW YORK CLEVELAND DETROIT CHICAGO KANSAS CITY SAN FRANCISCO WASHINGTON, D. C.

Service Stations in Principal Centers

O. K.'d by the U. S. Government



SIZES 1½ in. TO 3 in.
PRICES $3.50 TO $5.00

The United States Government has decided that a cut-out *must form* a part of the equipment of every army truck—proof that it is a necessity for full motor efficiency.

And the Petry Cut-Out meets every Government requirement.

The constructive features which decided the Government in favor of the Petry Cut-Out are the same that have influenced motorists throughout the *country* to use and recommend this scientifically designed, efficient and dependable device.

Positive Cut-off — Valve Cannot Flutter
Spring away from heat
No back pressure — Noise-proof when closed
Adjustable lock-nut on spring
Light in weight—excess strength
Big leverage insures easy action on strong spring
Large megaphone-shaped vent intensifies sound
Adjustable lever makes attaching easy

Write for literature and information

N. A. PETRY CO., Inc. 1313 Race Street PHILADELPHIA

DISTRIBUTORS: Geo. L. Holmes, 1733 Broadway, New York City; Grey-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Hughson & Merton, Inc., San Francisco, Cal., Los Angeles, Cal., Portland, Ore., Seattle, Wash.

PETRY CUT OUT

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O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

1/4[20], 5/16[18], 3/8[16], 7/16[14], 1/2[13], 5/8[11], 3/4[10], U. S. Standard

1/4[28], 5/16[24], 3/8[24], 7/16[20], 1/2[20], 5/8[18], 3/4[16], S. A. E. Standard

LIST PRICE — $20.00

This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies. This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

F. E. Wells & Son Company Division

Greenfield Tap and Die Corporation

Greenfield, Massachusetts

GTD

Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

This Tirefiller is made of the finest quality of pure rubber treated under special processes, never gets "flat" and will last indefinitely.

One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

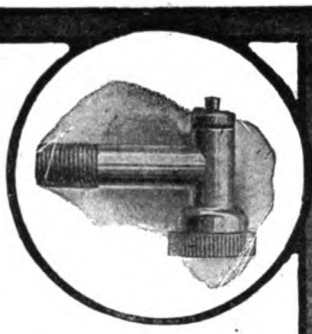
National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.

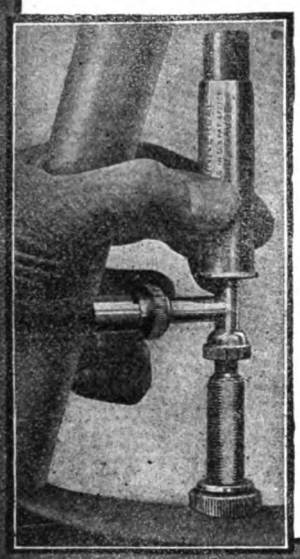
National Rubber Filler Co.

MIDLOTHIAN . . . . . TEXAS.

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You Can't Tell How Much Bengal Tiger there is in a White Rabbit Until You Put Him on a Meat Diet.





.... and you can't tell how many miles your tires *can* give you until you put them on a REGULATED, MEASURED, air diet.

Just so many pounds pressure, no more and no less.

If you pumped up your tires every time they fell below the pressure specified by the tire-maker they would last for the maximum distance.

Don't say pumping is too much trouble. With a

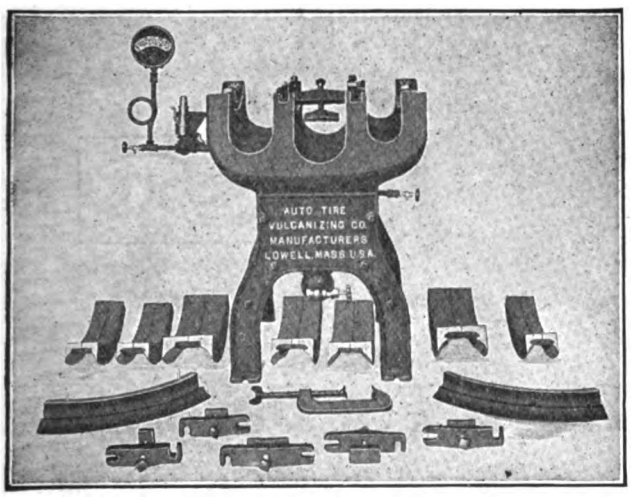
SCHRADER UNIVERSAL PUMP CONNECTION

it is no trouble at all.

Ask your dealer to show you how it works

Price, Thirty-five Cents

A. SCHRADER'S SON, Inc.
783-803 Atlantic Ave.
BROOKLYN, N. Y.



Exceptionally Large Profits can be made by Repair and Garage Men with

No. 8 Lowell Adjustable Sectional Vulcanizer

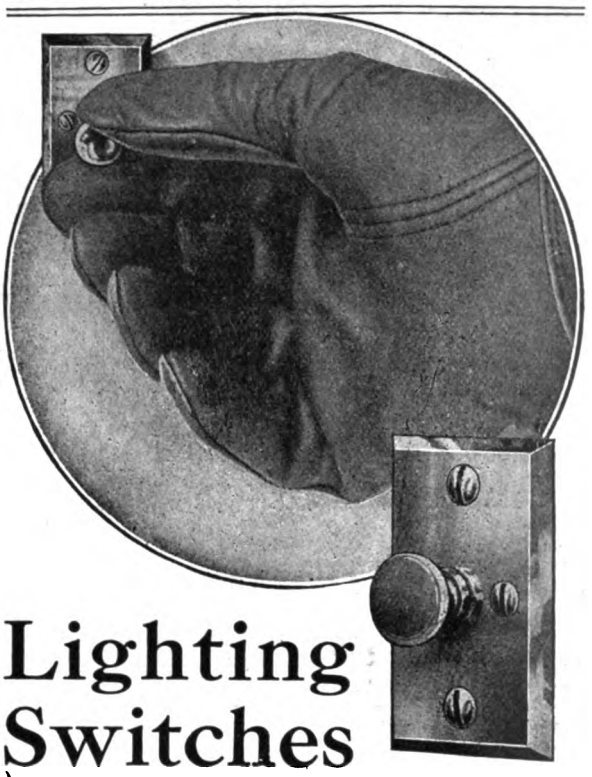
It's different, superior, economical in operation, in fact beyond comparison.

Complete and thorough work can be accomplished with this vulcanizer at all times.

DON'T LOSE A MINUTE—WRITE TODAY!

Auto-Tire Vulcanizing Company,
140 Powell Street - - - Lowell, Mass.

CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

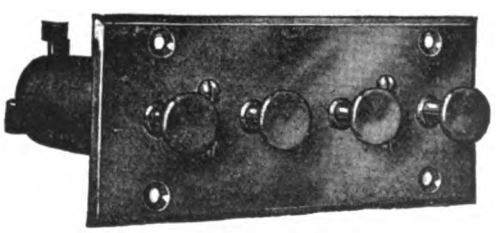
One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

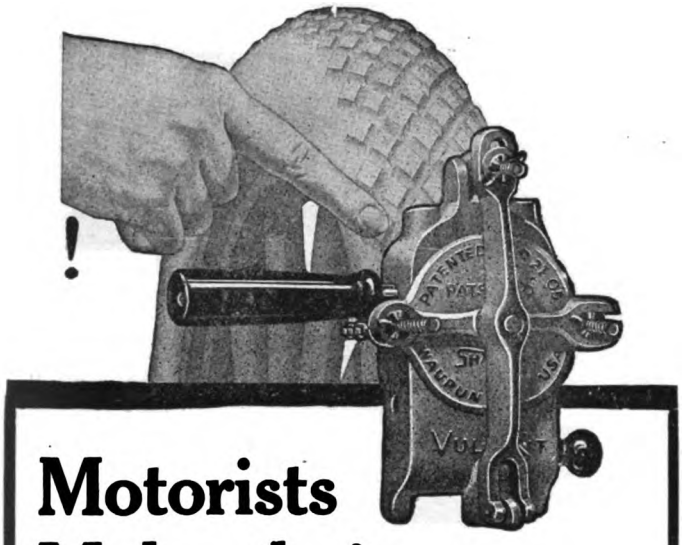
DASH LAMP
Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.

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Motorists Make their own Tire Repairs!

Thousands of motorists who thought they could never repair a tire are now using the Shaler Vul-Kit. They find it easy to mend tubes and casings with this wonderful vulcanizer. They carry it right with them in their tool box and they're always ready for any blow-out or puncture, no matter how far out in the country it happens. With a Shaler Vul-Kit, you can seal the small cuts in time—before sand, dirt and moisture have been pounded into them to rot the fabric and ruin the tire.

SHALER

Vul-Kit For Tubes and Casings **$3.50**

Simple to use. Automatic heat control. No need to watch or regulate it. No chance to overcure or undercure the tire. No exposed blaze or liquid fuel to spill. Seals the cut in the tire with new rubber, protecting the fabric and making the damaged part like new.

Dealers—Write! Besides the Vul-Kit shown here there are other models of Shaler Vulcanizers for Motorists and Garages from $1.50 up, as well as complete plants for public repair shops. Write on your letterhead for our new catalog.

C. A. Shaler Co.
807 Fourth Street
Waupun, Wis.



This is one of the Shaler big family

For Motor Truck Upholstery

DU PONT FABRIKOID
REG. U. S. PAT. OFF.

TRUCK SPECIAL

Satisfactorily meets the scarcity-of-leather situation. Costs less than even the poorest split leather but wears better.

Comes in 60-yard rolls, 50 inches wide. Cuts in multiples without waste.

You should use it to save money.

You should use it to save leather.

It is waterproof, washable—and its fine leather appearance and "feel" leave nothing to be desired.



Write for Truck Special Booklet, Samples and Prices

Du Pont Fabrikoid Co.
WILMINGTON, DEL.
Works at Newburgh, N. Y., and Fairfield, Conn.
Canadian Office and Factory: Toronto

World's Largest Makers of Leather Substitutes



MOSCO

Timer For Ford Car

Extra heavy pressed steel shell, aluminum finish. Insulating ring of gray bone fibre.

Terminals insulated all the way through. One-hand, self-closing oiler. Pressed steel arm and compression spring on brush assembly. Brush assembly sold separately. Interesting prices.

IMMEDIATE SHIPMENT GUARANTEED

MOTOR SPECIALTIES CO.
MANUFACTURERS
WALTHAM MASS.

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PYRAMID
STARTING AND LIGHTING BRUSHES
Are Standard Equipment
On Large Majority of Installations

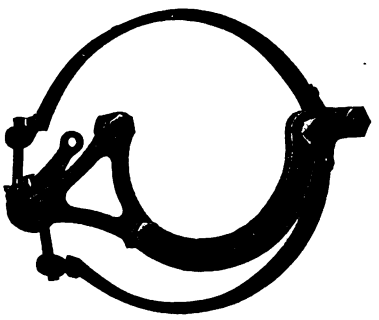
Are you ready to supply renewals of Pyramid Starting and Lighting Brushes when your customer needs them? There is a special brush for every installation—every one bearing the standard trademark of the brush industry.

Our Automobile Specification Sheet, lists the brushes for practically every car equipped with a starting and lighting outfit.

NATIONAL CARBON CO., Inc.,
CLEVELAND, OHIO

HOLDFORD BRAKES
SAFETY FIRST

PRACTICAL



POSITIVE

ASSURES YOUR SAFETY

HOLDFORD BRAKES are high-grade external contracting brakes for Ford cars which can be easily and quickly installed to act from the hand lever as emergency brakes, or from the foot pedal as service brakes. Designed in accordance with the best engineering practice; the band and brace are of steel, the toggle crank and bracket are dropped forgings and the lining J-M non-burn. Do not drag when released, no readjustment for wear is necessary and oiling is easy.

HOLDFORD BRAKES save wear and tear and will be attached by the wise owner on his pleasure car, delivery car or truck. They will positively stop a Ford with locked wheels on *any grade, at any speed, with any load.* Not necessary to remove old brakes.

When Ordering State Whether for Hand or Foot.

THE G. H. DYER COMPANY, Cambridge, Mass.

For Fords



50¢
Complete Holder and Button

Every Known Record For Quick Sales
HAS BEEN BROKEN BY THE

HANDY
Holder and Push Button FOR FORDS

This astounding statement holds good in cities, towns and villages. Everywhere Ford owners are buying the Handy on sight because it's practical and sells for but 50c.

Think of it—for a half-a-dollar they get the convenience of having the signal button on the steering column—no reaching through the wheel or around in front of it. The Handy can be attached by anyone in five minutes—mounts on top of steering column in center of the wheel, right where the button is mounted on the high-priced cars Driver touches button without removing hands from wheel. It's a boon to safe driving.

Dealers and Garagemen—

Here is the Handy Story in a nutshell.

Small Investment
Right Discount
Quick Turnover
Good Profit

You've heard of Ford Accessories that were supposed to sell on sight—but here is one that does.

Handsome Handy Salesman

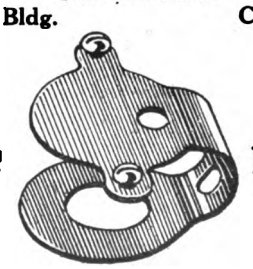
That's what our dealers call the Handy display card which we furnish our dealers. It's really a salesman who is on the job constantly in your store.

For the people who want to use their own Ford horn button, we have the Handy Holder retailing at 25 cents. Everyone will spend a quarter—most motorists though want the Handy complete.

Write at once for discounts—don't delay. If your jobber hasn't the Handy, write us and we will see that you are supplied immediately.

THE FRANCIS-RAND CO.
Sole Manufacturers
400 Erie Bldg. Cleveland, O.

25¢



Holder Only

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PIMBLEY'S AUTO TOP NEWER

A New Top For Your Old Top

New, fresh and clean—the kind of a top you admire on your neighbor's *new* car; a splendid, lustrous finish. All you need is

PIMBLEY'S
AUTO-TOP-NEWER
For Pantasote, Mohair and Leather

—a black liquid compound that you put on with a brush. It dries instantly—doesn't rub off—weatherproof—waterproof. Wears marvelously well and long. For Leather, Mohair, Pantasote. For seats, cushions and trim. Also fine for axles, running-board and under parts of car. At garages, drug and supply stores: 50c—85c—$1.50.

PIMBLEY'S
AUTO-NEWER
"Cleans and News any Exterior Finish"

It is unequalled for youthifying your car. Not an oil, polish or wax—just *a* **RENEWER.** Brings to life and newness the manufacturer's first finish. At garages, drug and auto supply stores: 50c and $1.00.

*A Fine Dealers Proposition—**Get busy! Write!***

Pimbley Paint & Glass Co.,
ST. JOSEPH, MO.

DEARBORN TRUCK UNITS

The Logical Truck Units for You

You can *sell* the Dearborn Universal Truck Units. They are made in one and two ton capacities that fit any make of car. Their superior mechanical features make them easy to sell. Either capacity carries a 50% overload safely.

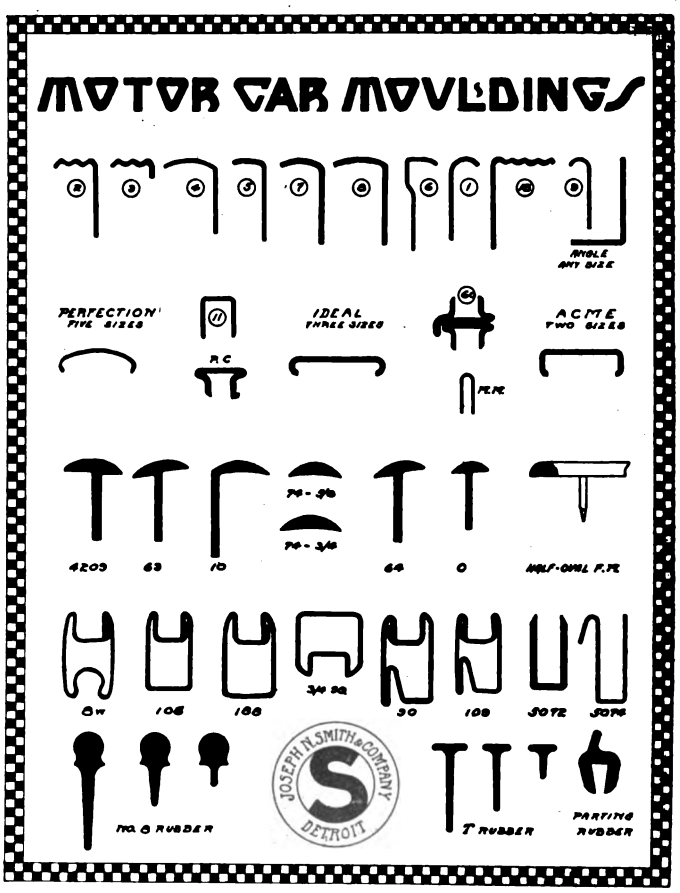
Price $350 and Up

All Dearborn Truck Units are designed to carry 90% of the load on the heavy Dearborn rear axle, the heavy springs and Pruden Artillery type wheels. Write us for full specifications and our proposition to dealers.

Dearborn Truck Company
1252 So. Campbell Avenue Chicago, Ill.



MOTOR CAR MOULDINGS



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An Inefficient Engine

is a continual strain on the operator. No matter what adjustments are made, if the ignition system is inherently lacking, the motor is handicapped.



HIGH TENSION

SIMMS MAGNETOS

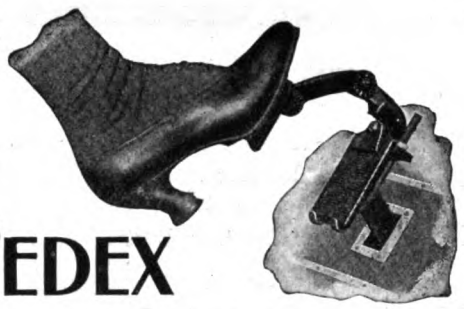
with their ability to produce the same intensely hot spark in the full retard or advance will increase the power, flexibility and efficiency of any engine.

Write for literature

The SIMMS MAGNETO COMPANY

274 No. Arlington Avenue
East Orange, N. J.





PEDEX

BRINGS THE PEDAL TO YOUR FOOT

Why use a pillow to get the proper leverage on your brake and clutch pedals when PEDEX, the Pedal Extension, serves your want exactly.

Also, it does not interfere with the "longer legged" member of the family using the car, he (or she) uses the regular pedal as before.

10 DAYS' FREE TRIAL
When ordering—name the ***make, model*** and ***year*** of your car.

PRICE **$5.00** PER SET

SLOCUM, AVRAM & SLOCUM LABORATORIES, INC.
AMERICAN CAR ACCESSORIES DEPT.
531 West 21st Street
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There are no better accessories made





The same company that built the Au-To Air Compressor so good that no user has ever paid them for repairs is putting remarkable quality into "Oro" Bumpers and the whole line of



Oro
GOOD as GOLD

accessories. The "Oro" mark is a guarantee of those indestructible qualities which make buying worth while. It lets you know before you buy that the article will last.

Sold by all jobbers
Literature free *Write today*

THE AU-TO COMPRESSOR CO.
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CHECK MAPS DESIRED
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FITNESS

NO TOOL or machine ever entered the field better qualified for service than does each New Departure ball bearing.

After the "raw" steel passes the scrutiny of the metallurgists and chemists, and receives the most advanced heat treatment, the parts are evolved after arbitrary inspection—not only between each operation—but *during* every operation.

The final superficial inspection is the 272nd "okay" which that bearing has received.

What better preparation could there be for perfect performance?

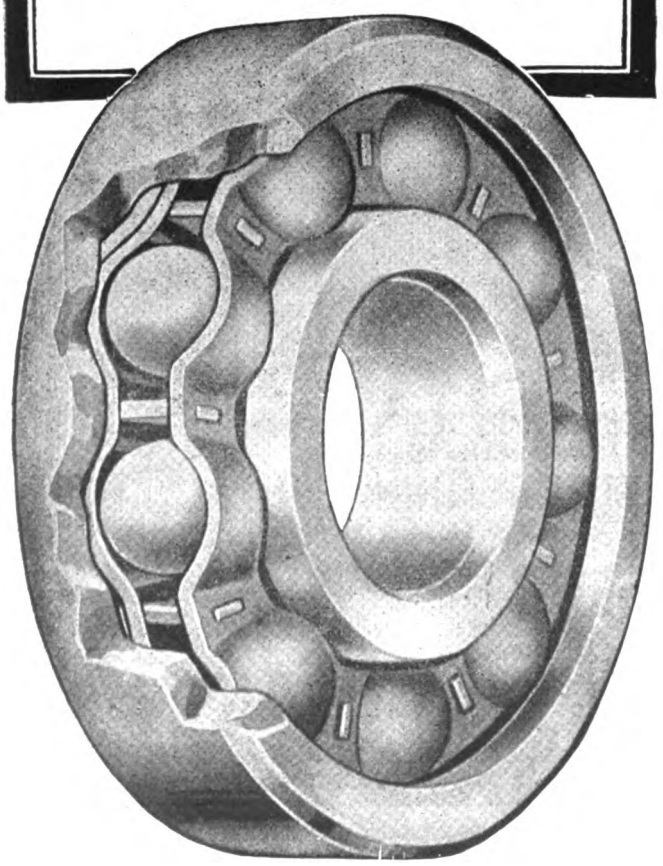
THE NEW DEPARTURE MANUFACTURING CO.

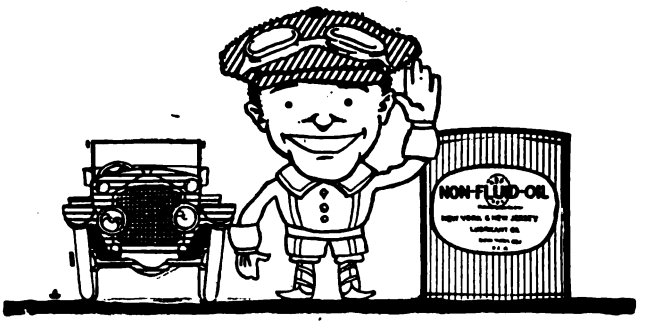
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Bristol, Conn. 818-20 Ford Bldg., Detroit

Distributors in Trade Centers throughout the United States. Sole British Agents: Drown Bros., Ltd., London and Manchester. Continental Europe: Jacob Holst, Copenhagen, Denmark

NEW DEPARTURE BALL BEARINGS





I'll Never Use Grease Again!

"No, Sir! NON-FLUID OIL for mine ALL THE TIME. I find it doesn't melt in the differential and leak to the brakes, destroying the brake lining. Neither does it thin out and leak from the transmission case. It lasts longer than any grease I've ever used—and the gears like it better because they keep mighty quiet."

TRADE MARK REGISTERED IN **NON-FLUID OIL** UNITED STATES PATENT OFFICE

Better than Any Grease

NON-FLUID OIL forms a clinging, mobile cushion upon which gears and bearings work smoothly, silently and with least amount of friction.

Unlike grease, NON-FLUID OIL contains no body-giving impurities. Every bit gives thorough and protective lubrication. Lasts three times as long as grease and costs less.

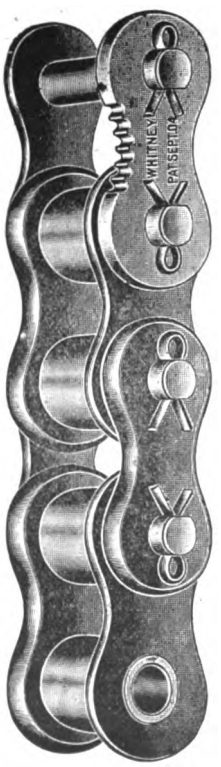
Get "K-00 Special" grade for gears; "K-000" grade for bearings.

So'd only in orange-colored cans at your dealer's.

Write for FREE samples and book, "Lubrication of the Motor Car".

New York & New Jersey Lubricant Co.
165 Broadway New York City

Whitney Chains



are used by the leading truck makers in order to insure dependable service.

You can give your customers the same maximum service by specifying Whitney Chains when replacements are necessary.

Whitney Chains may be purchased from the leading jobbers of auto supplies from the Atlantic to the Pacific Coast.

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Chains — Keys — Hand Milling Machines.

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GIVE the old top another chance. A very little trouble and some

"F-S" "Evernew" Auto-Top Dressing

will give it new looks and new life. Dries quickly and makes the fabric brilliant and weatherproof. Pliable, too.

Write for prices

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Mfrs. of Colors, Paints, Varnishes since 1803

136-140 North Fourth Street, Philadelphia

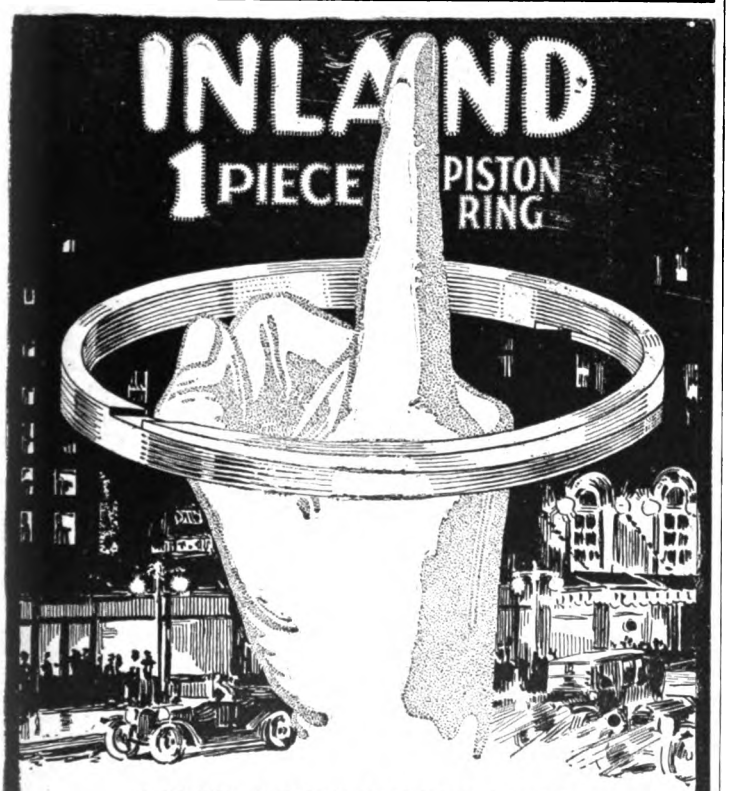
"Evernew" Auto-Body Enamel in eight standard colors. Special shades to order.

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MORE "GO" ON LESS GAS

Over a million Inlands already in use. That tells the story! Big piston ring chart free to dealers. Booklet also free. Write

INLAND MACHINE WORKS, 802 Mound St., St. Louis

TWO-STAGE AIR U.S. AIR COMPRESSORS

The Most Complete Line

of High Grade

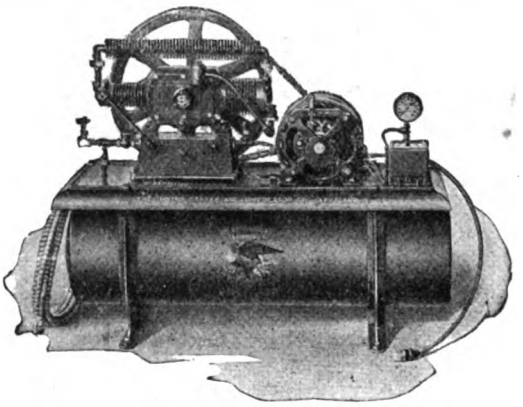
Air Compressors

COMPRISING 13 different sizes and combinations, in both two-stage and single-stage types, the United States line of air compressors affords the widest range to select from and assures absolute satisfaction as regards capacity, service and price.

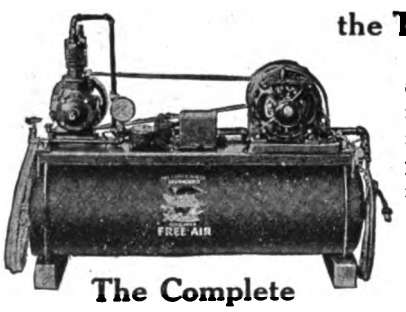
The U. S. Two-Stage Compressors comprise without question the most highly improved and refined line in existence, a statement which is amply proved by their exceptional performance in service and the reception given them wherever introduced. A majority of the best garages now contain this equipment and it has been adopted as standard by several companies of national prominence.

The Single-Stage line represents the highest developments in this type. They are built according to the most approved practice to maintain the same high standards embodied in our two-stage line.

Every prospective purchaser of an air compressor should have our complete catalog. Write today or send the attached coupon.



H-34 De Luxe—Automatic Unit—Leader of the Two-Stage Line



The Complete Automatic Unit of the Single-Stage Line

Adopted as Standard by Companies of International prominence.

Cut on This Line and Mail

Send us your Catalog.

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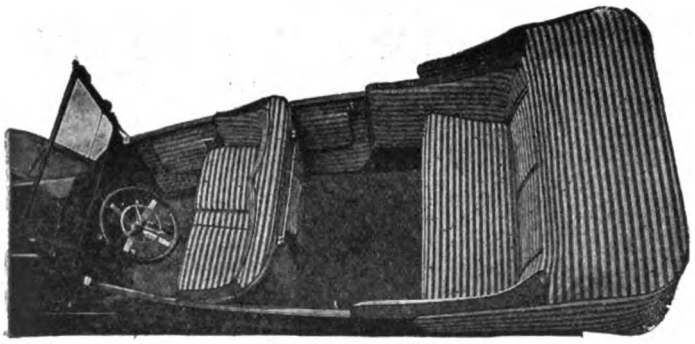
Date .....

The United States Air Compressor Co.

6542 Carnegie Avenue Cleveland, Ohio

TWO-STAGE AIR U.S. AIR COMPRESSORS

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A Look of Fresh Up-To-Dateness

Gordon Seat Covers give a look of fresh up-to-dateness that is most attractive in a motor car.

All the accumulated dinginess of travel disappears and the cushions actually seem to smile. More and more motorists are coming to appreciate this added elegance of Gordon Covers.

They fit smoothly; are cooler in summer than leather cushions and warmer in winter. Besides, they save wear on upholstery and protect motor coats from soiling. Can easily be kept fresh and clean with soap and a brush.

GORDON Seat Covers TAILORED TO FIT

are inexpensive. As low as $7.15 for Ford touring cars. Other cars in proportion. They are "tailored to fit" every American-made motor car and model. Twenty-four distinctive fabrics are used in exclusive Gordon patterns—browns, grays and tans. Weaves are especially firm and close to insure wear.

Gordon Easy On Tire Covers Are Tire Insurance



Thoroughly well made of long-wearing fabric. Give just the protection from sun and weather necessary to insure full mileage from every tire you carry. It's good business to save tires; therefore protect yours with Gordon Easy On Covers.

Dealers—Cash In On Gordon Reputation

Gordon Seat Covers have won a permanent place for themselves in the estimation of motorists. The saving, by their use, on motor clothes alone, is an item of great importance; and the further fact that they protect upholstery and add to the resale value of a car makes their use a real economy. Motorists are learning this, and also the fact that a Gordon-dressed car is a better looking car than one with bare cushions.

All these facts point clearly a way to a larger accessory business and more substantial profits.

We would like to tell you more about the Gordon line and the opportunity it offers. Write us!

The J. P. Gordon Company
306 N. Fourth Street Columbus, Ohio



Have you received your copy?

It is a *Book of Knowledge* that enables you to become an electrical expert in your automobile work. No more guessing at what you need. It is a complete illustrated catalog of contacts, starter and generator brushes. *Free* to every repair man. This is a line that will build up a splendid business. Ask about our Cash Register of contact parts proposition. Write today.

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In Stock—for Every Car



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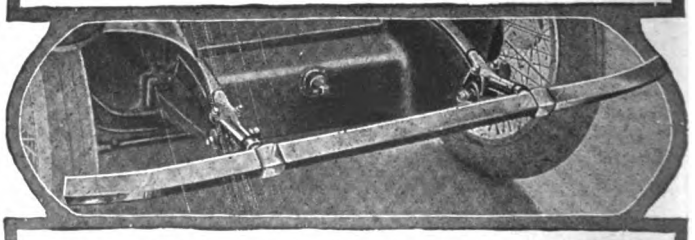
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Jenkins Vulcan Spring Co.
Saint Louis, Mo. .....1402 Chestnut St.
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Sumter, S. C.....29 Caldwell St.

Gemco MILWAUKEE
End Thrust Bumpers

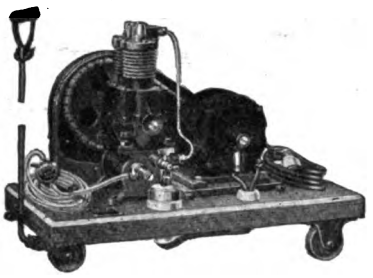
Make more money selling Gemco Bumpers for front and rear. Built on correct end-thrust principle. Diamond or channel bars—extra heavy, can't rust.

Ask Your Jobber or Write Direct



GEMCO MFG. CO., 656 So. Pierce St., Milwaukee, Wisconsin
POPULAR AUTOMOBILE ACCESSORIES

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With competition among garages and repairshops getting keener every day, SERVICE is becoming the biggest factor in *getting* and *holding* new customers.

MAYO ELECTRIC GARAGE PUMP

will put your garage or repairshop in a class by itself. in your town—attracting enough new business to shortly pay for itself. Portable—can be taken anywhere about the garage—out to the curb or into the street.

Operated by ¼ h.p. electric motor with silent chain drive. In ordering state whether for alternating or direct current. 110 or 220 voltage motor is required.

Send for prices and full details

MAYO-SKINNER MFG. COMPANY
2115 Elston Avenue CHICAGO

GIVE YOUR MOTOR A CHANCE

Of course it lacks power, if leaky piston rings allow loss of compression or keep it choked with carbon.



PAT. MAR. 2 '15. FEB. 29 '16.

PRESSURE PROOF PISTON RINGS WILL RESTORE ALL THE POWER

These rings, correctly installed, will transform your motor into a live, alert engine, that will eagerly respond with all its former "pep" the instant your foot touches the accelerator—not for a few weeks but permanently.

The delightful sensation of taking that "hill on high" will again be easy.

Garage and repair men are restoring motors, that have practically been discarded, to a high grade of efficiency with Pressure Proof Rings.

If you want to know the facts about these rings, send for "New Facts About Piston Rings." It's yours upon request.

PRESSURE PROOF PISTON RING CO.
167 MASSACHUSETTS AVE. BOSTON, MASS.

DO YOU HEAR

the UTILITY KID signaling you to go ahead and get



UTILITY VARNISH RENOVATOR

ONE OF THE REASONS

The Particular Auto Owner

Uses, Utility
Values, Varnish
Requests, Renovator

It is guaranteed not to injure any varnish finish on which it is used.

The best sales proposition of the year for jobbers and dealers. A business increaser and a money maker. Write for it.

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46 Winnikee Ave. POUGHKEEPSIE, NEW YORK

We stated in our advertisement earlier this Spring and Summer, "It will be advisable to place your order early, as we are in position now to sell this outfit for $125, but cannot tell how long we can maintain this price, as raw material is going up so fast."

We said it would have to come, but-

that in the meanwhile tire repairmen would be getting the benefit of phenomenally low prices

NOW it has become necessary to advance the price of our

TYPE F

BIG CAPACITY VULCANIZER

SELF-CONTAINED OUTFIT

from $125 to $150. The steadily increasing cost of raw materials has made this absolutely unavoidable, AND NOW WE SAY this is better value equipment by far than is offered elsewhere at anywhere near this price.

Auto Tire Repairing—A Better and Surer Business Than Ever

Regardless of whether people do or do not buy pleasure cars, they will drive the cars they already have—this fact, together with high prices of tires, will greatly increase the demand for tire repairing over what it has ever been before.

WE MAKE A COMPLETE LINE OF TIRE REPAIR EQUIPMENT. Catalogue on Application.

Write today for free booklet, "How I Would Conduct a Tire Repair Business—By an Old Tire Repair Man."

The Akron Rubber Mold & Machine Co.
Manufacturers of Tire Repair and Tire Builders' Equipment
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AD&R

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—is the reason practically all racing drivers lubricate with Dixon's.

—is the secret of Dixon's growing popularity among motorists.

—is the dealer's guarantee that he can build business of the better kind by banking on

DIXON'S GRAPHITE Automobile LUBRICANTS

Write to us for Dixon's Dealer's Deal No. 184-G

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ESTABLISHED 1827

Sell Harvey Springs

—and Gain Good Will

The **good will** customer is the greatest asset you can have. Every time you sell a Harvey Spring you make a life-time customer—you gain his good will because you *satisfy* him. Our guarantee—on every spring—protects both you and your customer.



Harvey Springs Do Not Break

They're guaranteed from end to end against *all* defects. Made in all sizes for over 600 of the leading makes and models of cars. Every Harvey Spring is an exact duplicate of the one it is intended to replace and fits with an accuracy that will surprise you.

FREE

The Harvey Spring Book shows sizes, weights, measurements, prices, etc. It enables you to tell at a glance just what spring you want and prevents mistakes in ordering replacements. Write for a copy and name of nearest Harvey jobber. 9

THE HARVEY SPRING CO.
849 17th Street RACINE, WIS.

REFLEX SPARK PLUGS

Reflex spark plugs are *dealer-sold*—they are *bought* by the motorist who is looking for a better plug than he usually gets with his car. Therefore Reflex plugs have to depend for their sales on *their worth to the motorist* and it is the repeat orders that account for the tremendously increased volume of sales.

Of course there are reasons—for instance, Chromite porcelain, the most durable insulating ever discovered, resists the most intense heat and eliminates the possibility of short-circuiting; the scientifically correct design assures a spark that will not only start the engine but "keep the car on the go" long after the ordinary, price-appeal plug would have been replaced. There is a model to suit every make of car and the unvarying excellence of workmanship assures the motorist of getting Reflex plugs that are all equally good.

SELLING REFLEX PLUGS is not only profitable but easy—send for our dealers' proposition and a sample plug for your own car—tell us the make.

THE REFLEX IGNITION CO.
1711 Payne Ave.
CLEVELAND
OHIO





"KEEP THE CAR ON THE GO"



OSTER

Bulldog Die-Stocks:

SPEED YOUR WORK WITH THESE FIVE FEATURES

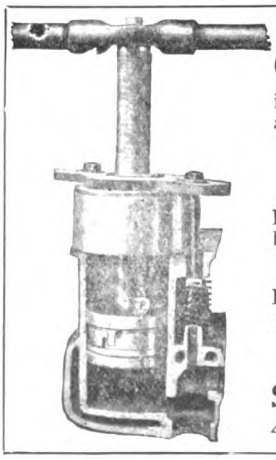
1. Self-locking, adjustable dies.
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4. No loose bushings to lose or mislay.
5. No small, breakable parts.

Send for free catalog of die-stocks and power machines.

Send for List 29, (free).

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The Tools With 5 Big Features



THE STORM & O'HAIR

Cylinder Reboring Machine

is adjustable and will rebore practically all makes of

Automobile, Aeroplane, Motor Cycle, Light Marine, Tractor and Stationary Motors

It is simple, speedy and accurate and can be used by anyone familiar with tools.

Indispensable in any repair shop.

FOR SALE BY LEADING JOBBERS

We furnish oversize pistons for all makes of Motors.

For further information address

Storm & O'Hair Company
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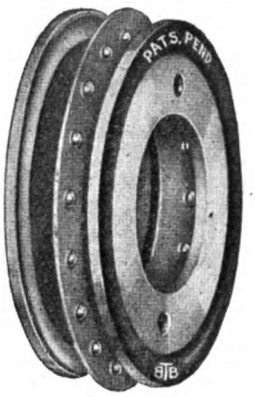
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BAILEY BALL THRUST

Replaces Thrust Washers at Left (Gear) side of

FORD and CHEVROLET 490 DIFFERENTIAL

Here is the real answer to that far reaching cry for an efficient remedy of axle difficulties, noisy or broken gears—the answer to that need for a bearing that will replace the old style, inefficient thrust washers used as standard equipment in Ford and Chevrolet 490 differentials, that through their sliding contact wear thin in no time, and cause drive gears to shift away from the drive pinion, creating havoc with the gears.



THIS NEWEST INVENTION

Of a master engineer, the BAILEY BALL THRUST BEARING is an exact replacement made to fit to the thousandth part of an inch, and will positively keep gears in proper mesh, make them run quietly and last indefinitely. They will not wear thin.

DEALERS GARAGEMEN REPAIRMEN

All over the United States and Canada, wise men are stocking this bearing. Go after this replacement business. It is a source of profit for you and yours providing you can supply the customer's needs at a moment's notice. It will not do to order at the last minute, because the car-owner insists upon immediate service, and you must be prepared.

LIST PRICE, $3.75

LIBERAL DISCOUNT TO DEALERS. ORDER TODAY

LOS ANGELES DETROIT SAN FRANCISCO NEW YORK ST. LOUIS

Ahlberg Bearing Co.

Sole Distributors for U. S. A

2634 Michigan Avenue . CHICAGO

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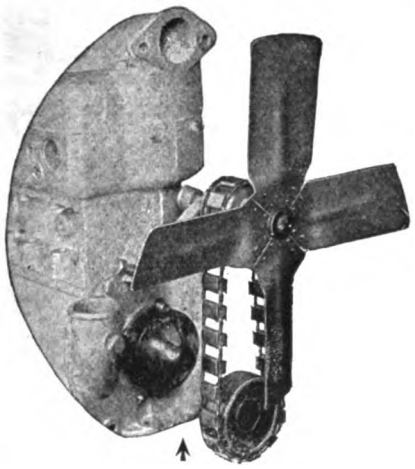
Carried in Stock at All Branches

Manufactured by GEO. D. BAILEY COMPANY, CHICAGO

75,000 Ford Owners Have Discarded Leather Fan Belts

FOR THE

CROWE MECHANICAL FAN BELT



Proper Position for Maximum Efficiency

WHY? Because they last longer than any other fan belts ever made and drive the cooling fan at maximum speed **all** the time. Constructed of oak sole-leather blocks set into a steel chain background. Noiseless and unaffected by oil, heat, dirt, or water.

Service records of ten to fifteen thousand miles are not unusual with a CROWE belt.

Regular Ford Size, 24 Links, $1.00 1917 Ford Size, 27 Links, $1.10

Ask your dealer, or write for our descriptive circular

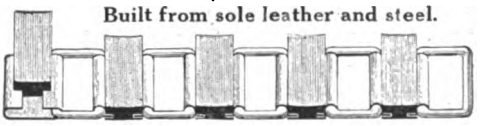
Any Ford Fan Belt Which is Too Long Will Strike the Timer

This often causes slipping, which results in a loss of power, an overheated motor, and sometimes even wears a hole in the commutator case.

The Crowe Mechanical Fan Belt Offers a Simple Way to Overcome this Trouble

Drive out one leather block endwise as shown in illustration at right. Take out one entire link, reconnect belt and adjust to **medium tension.** This draws the adjusting bracket down and pulls belt away from timer. No other fan belt can be shortened so quickly and easily.

Built from sole leather and steel.



MECHANICAL BELT COMPANY ::: ST. JOSEPH, MISSOURI

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The Symbol of Satisfaction

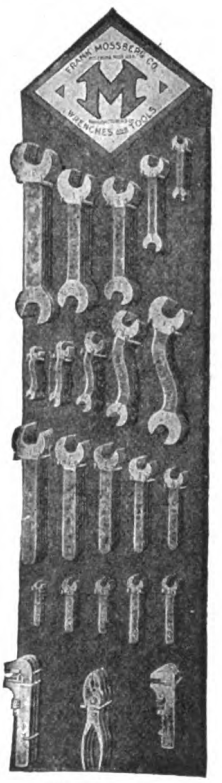


MOSSBERG TOOLS

Yield Quicker Turnovers

Attractively arranged on the Dealers Display Boards, they have a distinct pulling power. Prospective customers quickly and easily find just the wrench they want. Fine tools tastefully displayed on nicely finished stands offer an appeal that cannot be denied. The impulse to buy can't be resisted.

The "X" board displays regular Double End, and "S" Wrenches with openings ¼ in. to 1¼ in., Single End Wrenches with openings ¼ in. to 1 in., Adjustable Sleeve Wrenches and Slip-Joint Pliers.



"X" Board



"R" Display Board

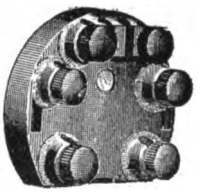
"R" Board for Fords displays 27 Tools for Ford adjustments. Each Tool does a particular job well.

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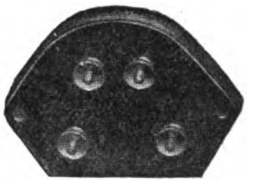
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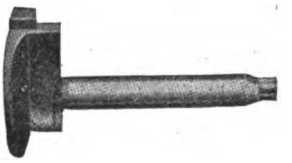
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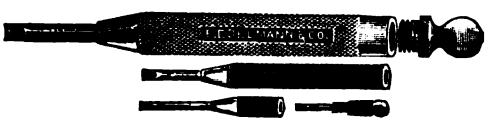
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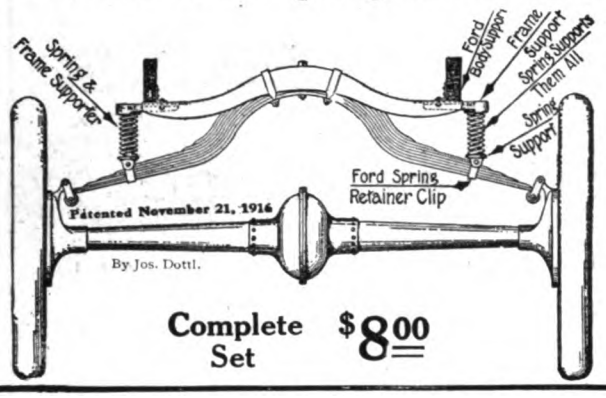
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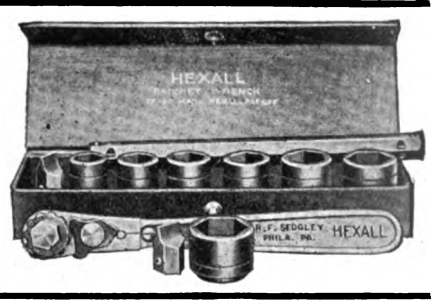
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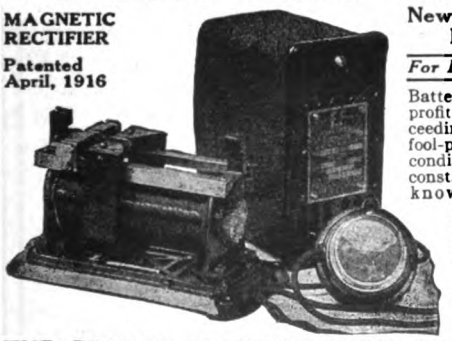
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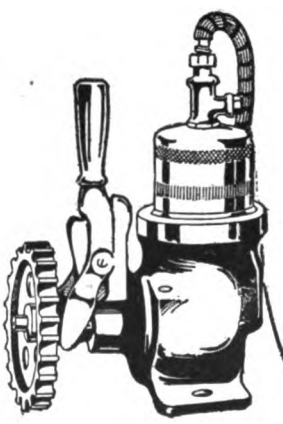
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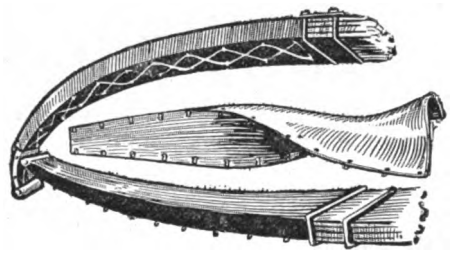
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MORE BATTERY FACTS.

The Rheostat, Resistance, Heat, the Aid of Auxiliary Brushes, Etc.

BY SYDNEY F. WALKER, M. E.

No. 4.

The rheostat is an apparatus that is very much employed in electricity generating stations, to vary the current passing in the field magnet coils of both

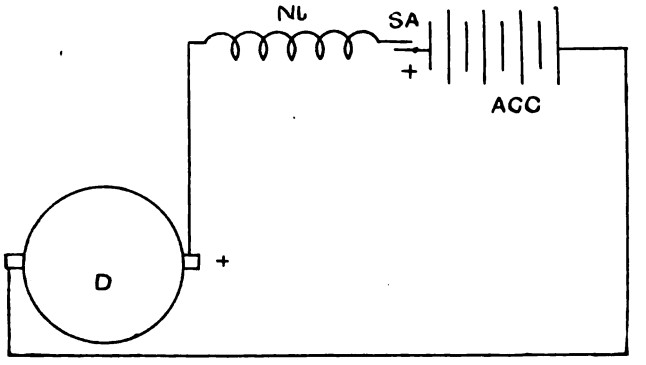
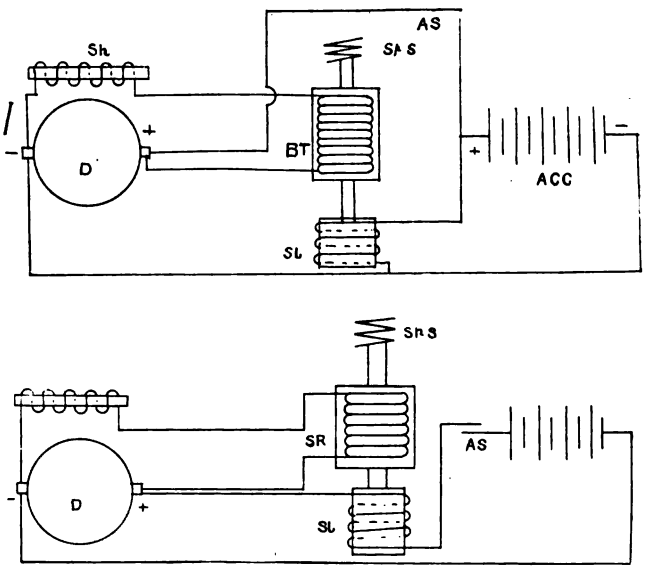


Fig. 15.—Diagram showing the method employed by the Lithanode Company of London, in which a nickel wire absorbs the increased pressure due to the increased speed.

continuous current and alternating current dynamos; it is a very convenient apparatus indeed, and gives the engineer in charge very full control over his machines, and the pressure they furnish; but rheostats made for electricity generating stations can be constructed on very much more generous lines than is possible in a motor car, and their contacts are under constant supervision. The rheostat itself consists usually of a length of wire, drawn from a metal whose coefficient of increase of resistance, with increase of temperature, is very small indeed, almost negligible, and it is constructed so that the heat liberated in the resistance wire by the passage of the current is able to get away freely. The dimensions are such that the heat liberated is not great. The quantity of resistance thrown into the field magnet coil circuit is varied by moving a contact bar over successive points in the wire itself, or over metal blocks attached to points in the wire.

The great danger with contact arrangements of this kind is the possibility of sparks passing between the contact bar and the metal block it is leaving, or the point of the resistance wire it was leaving, and of sparks passing between adjacent contact blocks. For electricity generating stations, all of this has been carefully worked out, so that these dangers are well guarded against; but to ensure doing so requires space, and space is not available usually in the motor car. In the motor car also the variable resistance has to be thrown in and out, its amount varied automatically, while in the electricity generating station it is usually done by hand, and this introduces another considerable difficulty into the problem. Automatic apparatus have been worked out during the last twenty years for starting motors from a distance, for starting dynamos that charge accumulators, when the pressure at the accumulator falls below a certain figure; and in all of these a contact arm is made to move over a number of contact blocks, the contact arm being operated by an electro magnet. The majority of these work very well, but again there is plenty of space, and the contact bar and the stationary contacts are usually in sight, so that they can be examined periodically. The contact arrangement of a motor car can of course, and ought to be examined periodically, but the conditions are very unfavorable for using a variable resistance. The most favorable case the writer has seen is that in which the property of iron wire is employed to govern the current flowing through the shunt wire field coils. It is not employed directly; it does not act directly as the resistance in the shunt field coil circuit, but the effect is the same; the current flowing in the field coils is reduced owing to the resistance of the iron wire in a portion of the circuit having increased, this again being due to the attempt of the dynamo to furnish a larger current in the outer circuit. It is shown in Fig. 16 as employed. Iron wire and nickel wire have peculiar properties that have been found very useful in con-



Figs. 16 and 16A—Diagram showing the method suggested by the writer for using a number of carbon pellets in a brass tube, to vary the resistance of the shunt field magnet circuit, by varying the pressure between the pellets. Normally the pellets are kept closely pressed together by the spiral spring shown above the tube; when the pressure rises above a certain figure, the solenoid electro magnet below releases the pressure by pulling the plunger downwards. The arrangement is shown with the operating electro magnet excited by a shunt coil, and a series coil.

nection with electrical apparatus. Iron and nickel have each a critical temperature, at which any increase of temperature gives a large increase of the resistance offered by the wire, while any decrease

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of temperature gives a comparatively large decrease of resistance.

It will be remembered that when a current flows through a wire, the passage of the current causes heat to be liberated in the wire, raising its temperature; with the iron and nickel wire employed, the current passing is arranged to raise their temperature to the critical figure under normal conditions; that is to say, when the pressure is at the proper working figure; any attempted increase of pressure, by causing a rise in current strength, causes an increase in the temperature, and a large increase in resistance, sufficient to reduce the pressure to the proper figure. Nickel wire, so far as the writer is aware, is not used for controlling the current flowing in the shunt field coils, but for controlling it in the main circuit leading to the accumulator; a length of nickel wire of a sufficient size to carry the full charging current to the accumulators, and to be raised to the critical temperature when that current is flowing, is placed in the main circuit. It is of sufficient length to choke back any attempted increase of current due to a rise of pressure. With this method, shown in Fig. 15, the use of the nickel wire in the

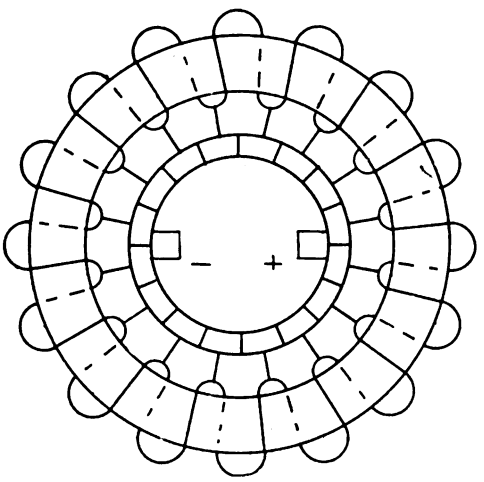


Fig 17—Diagrammatic sketch showing the arrangement of the coils of wire on an armature, and their connections to the segments of the commutator, also the brushes bearing upon the commutator.

main circuit, the pressure at the brushes is allowed to increase, but the increased pressure is absorbed by the increased resistance of the nickel wire, in accordance with the law stated in an earlier part of the article.

When finely divided carbon is compressed, its electrical resistance may be reduced to a very small figure, depending upon the amount of compression; when the compression is removed, and the grains of carbon can move more or less freely, the electrical resistance offered increases very rapidly. Small pellets of carbon might be employed, held in a tube, and arranged to be squeezed together or released, according to the requirements of the service. For the low pressures employed in motor car lighting, the carbon pellets might be held in a brass tube, greased with kerosene oil on the inside, without any appreciable leakage of current. Figs. 16 and 16-A show the writer's idea of an arrangement for using a number of carbon pellets, held in a brass tube, to act as a variable resistance in the circuit of the shunt field magnet coils. As will be seen, the carbon pellets are inserted in the circuit of the field coils, and they are kept pressed close together, either by a spiral spring, acting upon a plunger which forces them together from below, or a weight from above. The plunger which forces them to-

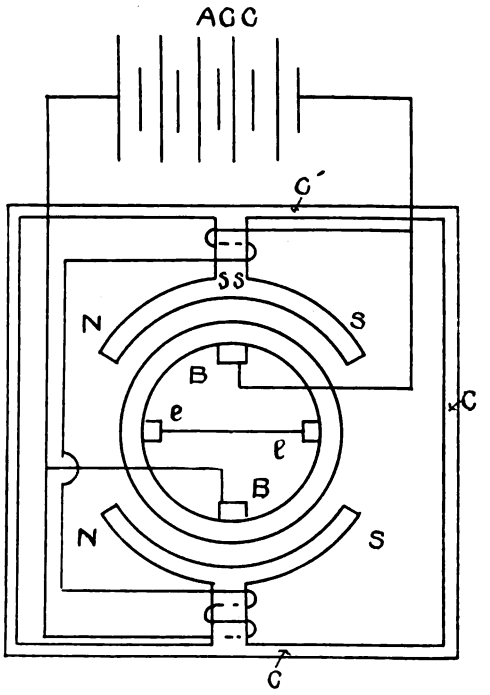


Fig. 18—Diagram showing Mather & Platt's arrangement of a self-regulating dynamo.

gether, in either case, is mechanically connected to the iron core of a solenoid electro magnet, whose coils are of very fine wire and are connected across the brushes; they may be in the same circuit as the fine wire coils of the automatic cut-in-and-cut-out. The spiral spring would be sufficiently strong to keep the carbon pellets very firmly pressed together, under ordinary running conditions, in spite of the pull of the solenoid electro magnet upon its iron core; and the solenoid would not be able to overcome the tension of the spiral spring, until the time arrived when it was required to insert resistance in the shunt field coil circuit; that is to say, when the pressure of the dynamo reached a certain figure, say 2.5 or 2.6 volts. On the arrival

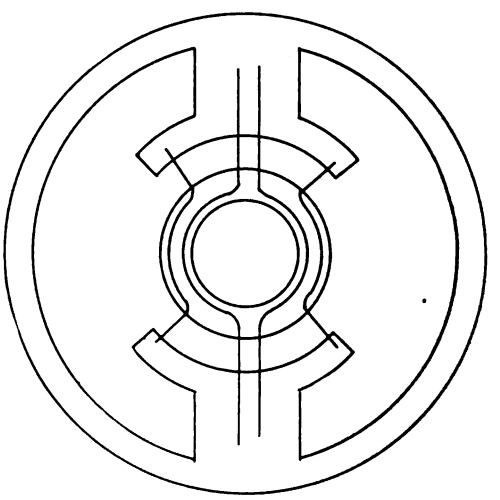


Fig. 19—Diagram showing the lines of force due to the fiel magnets of a dynamo.

of that pressure, the pull of the solenoid would over come the spiral spring, and the plunger would b pulled downwards, allowing the carbon pellets t

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nove more or less freely, and increasing the resistance offered by them. With apparatus of this kind, in which carbon blocks, finely divided carbon or carbon pellets are alternately pressed close together, and allowed to move by the relief of the pressure, there is often a diifficulty in obtaining the requisite movement to give the increased resistance; the writer's view is that the vibration of the car would give this movement. The solenoid electro magnet could be wound with a thick wire, included in the main circuit, between the dynamo and the accumulator, if preferred, as shown in Fig. 16-A; it would then come into operation when the charging current exceeded a certain figure, and would be increased as the charging current tried to increase.

The Aid of Auxiliary Brushes.

There are at least three methods employed for maintaining the pressure at the dynamo brushes at the figure required at the moment, by the aid of additional brushes. In order to understand them, it will be as well to consider the arrangement of the coils of the armature of a dynamo. They are shown diagrammatically in Fig. 17. The coils represent those on the armature; the divided up cylinder represents the commutator; and the blocks represent the

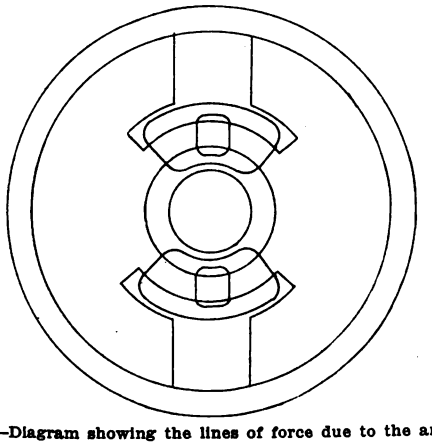


Fig. 20—Diagram showing the lines of force due to the armature current.

brushes. For simplicity, a two-pole dynamo is taken, but all the reasoning that follows applies equally to a four-pole machine; also the arrangement of the coils is given in the very simplest form. There are several methods of winding the coils on the armatures, designed to give greater efficiency to the machine, and for convenience in construction; the differences in the methods employed do not affect the problem involved in the use of auxiliary brushes.

When a dynamo is generating current; with a two-pole machine two distinct currents are flowing through the armature; the armature coils are divided into two halves by the brushes, and the currents that are being generated flow through the two halves, from the negative to the positive brush. Consequently the pressure existing between the two brushes is, say 12 volts with a 12-volt set, or 6 volts with a 6-volt set; the even figures are taken for convenience in calculation; there is a continual fall of pressure along each half of the coils of the armature, from the positive to the negative brush. Suppose, for convenience in calculating, there are 24 coils, counting all round the armature, 12 on each side; there will be a difference of pressure of 1 volt between the two ends of each coil. The adjacent ends of adjacent coils are connected to a segment of the commutator, as shown in Fig. 17, so that there will

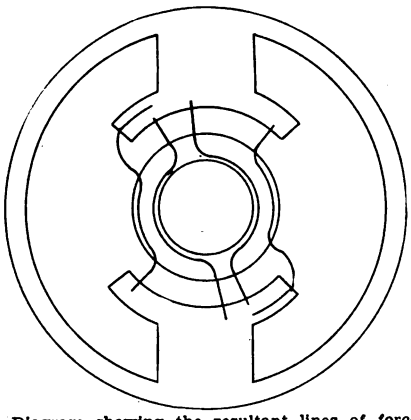


Fig. 21—Diagram showing the resultant lines of force, due to the operation of the two magnetic pressures.

be a difference of pressure of 1 volt between each segment of the commutator, and at a point say half way between the brushes on either side there will be a difference of pressure equal to half the total pressure between the brushes.

To understand the working of these systems, it will be necessary to go a little deeper into the operation of a dynamo machine. Electric current and pressure are produced by the passage of the coils of wire on the armature, through the magnetic field created by the field magnets in the cylindrical polar space in which the armature revolves; electrical engineers are accustomed to say that the armature conductors, the copper wires on the armatures, cut the lines of force passing into the armature, and across the air space between the pole pieces and the armature core. But, immediately the armature conductors have currents flowing through them, those currents create their own magnetic pressure, so that there are two magnetic pressures acting within the polar space in which the armature revolves. The magnetic pressure created by the currents flowing in the armature coils is not directly opposed to that created by the field magnet coils; a resultant magnetic pressure is produced, very much on the lines of the resultant force in mechanics, where the old rule of the parallelogram of forces comes in.

Fig. 19 shows the lines of force due to the field

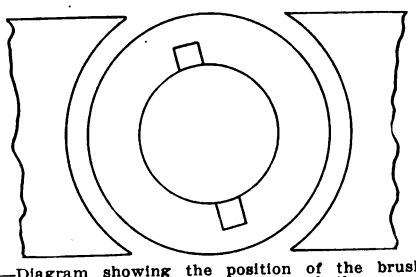


Fig. 22—Diagram showing the position of the brushes of a generator, when no current is passing through the armature; this is what would take place, if it were possible for no current to pass through the armature, when the machine is furnishing current. It is very nearly correct for a shunt wound dynamo, with no current in the outer circuit.

magnet coils; Fig. 20, those due to the armature currents, supposing there were no field magnet currents; and Fig. 21 the resultant lines of force. Elec-

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trical engineers are accustomed to draw the direction of the lines of force in the way shown in these figures; and approximately to indicate the number of lines by the density of the lines in the drawing. The direction of the lines of force, as shown on the drawing, is that which a small needle magnet would take, if it was free to move, and it was placed anywhere within the magnetic field. In the ordinary continuous current dynamo, the only effect of the presence of the magnetic pressure created by the armature currents, is an alteration of the position of the brushes. If there were no magnetic pressure

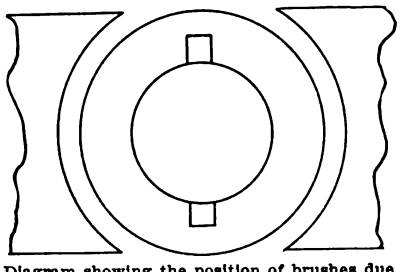


Fig. 23—Diagram showing the position of brushes due to the flow of the armature current; the position is slightly exaggerated to make the operation clear.

due to the currents in the armature coils, the brushes of a two-pole dynamo would be placed at opposite ends of the diameter, lying between the pole pieces, as shown in Fig. 22. Owing to the magnetic pressure created by the armature current, the brushes are thrown slightly forward in the direction of rotation, in the case of a generator, as shown in Fig. 23; and slightly backward in the case of a motor.

(To be Continued.)

AMONG NEW JERSEY GARAGES.

Air Pumps and Tanks and the Care Necessary for Buying An Automobile Truck.

BY JAMES F. HOBART, M. E.

There seems to be a growing disposition among garages and repair shops to dispense with the fixed compressed air tank and its piping and to use instead a small air pump, electrically or gas engine driven, which may be readily taken from place to place and attached directly to the tire to be inflated.

A little while ago, there was described in these columns, an air-tank on wheels, truck fashion, which was filled with air at a fixed pump, then the tank was trundled around the shop, out of doors, or anywhere in fact, where a tire needed air. In this way, all the expense and losses pertaining to pipe lines with possibly leaky valves and fittings were obviated.

But the above described arrangement still kept the tank, which, as usually provided, seems to develop leaks. Recently the writer saw an air pump which seemed to fill the bill from every point of view. The apparatus consisted of a little three-wheel cast iron frame to which were fastened three wheels or casters, each about 4 inches in diameter, thus enabling the truck to be readily pushed in any direction at will.

Upon the little truck was located a combined gas engine and air compressor, both elements being attached to the same crank case and the pistons being opposed to each other. The gas, or working cylinder was enclosed by a water jacket which carried a vertical addition about 10 inches deep, forming the water reservoir or tank, directly above the working cylinder, rendering pipes, radiator and connections unnecessary. The top of the water jacket tank was open so the quantity of water therein could be seen at any minute.

The little compressor cylinder, as stated, opposite the power cylinder, was air-cooled, being surrounded by the usual radiating rings for that purpose. Right on top of the air-tight cast-iron crank case was a small vertical cylinder or can, evidently made of pressed steel, in which the gasoline supply was contained. The capacity of this tank was evidently about one quart.

Adjacent to the air compressing cylinder, and very close to it was another closed steel vessel or can, about as large as the gasoline tank. Air direct from the compressing cylinder was led into this last named vessel, the pipe entering at the top and evidently passing down inside nearly to the bottom at which level there was located a drip pipe and valve.

The air pipe to which the filling tube was attached, was taken from the side near the top of the "settling tank", as the little vessel above described may be termed, the object being to catch and hold as much as possible of the water which always makes itself present when air is compressed. The water being caught in the little separator, can be drawn off through the drain pipe and valve when too much of the liquid has collected. The blowing off is performed very quickly by opening the drain valve while the compressor is working, the moisture being driven out in a hurry by the air pressure.

A balance wheel about 11 inches in diameter rides on the end of the crank shaft which projects from the crank case. A starting handle is attached to the balance wheel in such a manner that it may be used to turn the wheel while starting the engine, but as soon as the wheel revolves under its engine power the handle turns upon a pivot and disappears inside of the wheel-rim where a recess has been provided to receive the handle.

A battery box is also mounted upon the little cast iron truck and a switch upon the side of the box is so located that it may be operated by hand or by foot when it is desired to stop the engine and compressor. This little machine works so nicely that it should be adopted by many shops and garages. It is easily pushed to a wheel, the switch thrown and a turn with one hand starts the engine almost instantly, then the air tube may be attached to a tire and a 35x4 inch tube pumped up in a very short time—in almost as little time as is required to attach the tube from an air cylinder and open the necessary valves.

I tried to discover the "pedigree" of this little air compressor but the folks of the garage could tell nothing save that they "bought it for five dollars from some man who brought it around." No name could be found on the machine but perhaps some automobile worker will recognize the machine and advise the Editor of the Automobile Dealer and Repairer where the machine is made or where it may be procured. The machine is worthy of extensive use in garages and automobile repair shops.

Electrically operated air-pumps are to be frequently found in Newark auto shops. These pumps

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are built much upon the same principle as noted for the gas-engine driven affair but they may necessarily be made much smaller and more compact. There is only one disadvantage in connection with the electrically operated air pump without receiver or storage tank, and that disadvantage is the cord or wire with which the little machine is connected to the source of electricity.

There is no getting away from the fact that an electric connection under foot all the time is most awfully in the way, and with the necessarily long connection required for the electric air pump, there is frequent trouble from breaking of the connection wires, from their tangling up and from the time necessarily lost in keeping the wires or cord clear of the garage tools, machinery and vehicles.

A considerable amount of this annoyance might be avoided by fitting the portable electric air pump with an attachment plug and then arranging sockets at frequent intervals around the premises so that the pump could be connected almost anywhere and everywhere, thus doing away altogether with the long cord necessarily under foot.

But for ease of connection and operation, the writer has never seen anything which compares with the little gasoline-driven air pump described above. It surely was on the job every minute and as it was in a repair garage where cars are coming and going every minute of the day and night, the machine surely did a good deal of work. And never yet, during any of my visits, have I found the little machine out of order or fail to respond instantly to a throw of its battery switch and a turn of the balance wheel.

Buying An Automobile Truck.

The writer has recently watched with much interest the acquiring of an auto truck by a small concern engaged in a combined express, grocery and green-grocery business which made bi-weekly trips between Newark, N. J., and New York, and on all other days of the week, Sundays excepted, was delivering goods to local patrons.

The horse, an old-timer from the fire department, which had been released by the auto-fire truck, was a good animal, strong and willing, but necessarily a bit slow when loads of a ton were to be hauled around Newark all day and loads of two tons or two tons and a half hauled from New York twice a week over the twelve miles to Newark.

The firm of dealers got an idea that a motor truck would enable them to increase their business and began to look around for a second-hand automobile which they could have changed over into a commercial vehicle. They looked at several Fords, but wisely decided that, although a Ford made a very nice delivery wagon for light local work, that it was not heavy enough for 12-mile trips with two tons or more of goods on board.

Next, they looked over a Studebaker car of 1914 and liked the looks of its rugged construction very well. The writer was asked to go along and look the car over with a view to its being transformed into a delivery vehicle. Apparently the machine was in pretty good condition, the paint was not scratched and the upholstery was whole, not torn or badly scratched, thus showing that either the car had been pretty well taken care of or it had been newly "done-over" at some very recent date.

The engine was declared by the dealer to be "in good working condition", but there should be a clause in the license of each and every automobile dealer defining exactly what was implied when an engine was guaranteed to be in "good working condition". That clause would cut out some of the "horse-jockey gospel" of "used" gas wagons. Anyway, the "good working condition" went in at one ear and out at the other so quickly as to certainly justify a statement by the dealer that "there was nothing inside the head to stop it!" The steering gear was tested out for wear and lost motion by placing a man at the wheel to move the wheel gently back and forth varyingly increasing distances, beginning with a very small arc which was increased until, with a hand on either forward wheel, they were felt to move slightly as the steering wheel was turned.

In this way, the amount of lost motion in the steering connections was quickly determined and found to be about a four-inch movement of the rim of steering wheel. The wheel movement was repeated with the writer's hands upon the front part of each forward wheel just level with the axle. A slow movement of the steering wheel showed that one front wheel began to turn a trifle before the other one started, more evidence of wear in the steering gear and knuckles.

A close survey of the wheels from front and from rear showed that the left front wheel had more "gather" than its mate. The garage man of course could not be induced to see it, therefore a carpenter's square was procured and placed against a strip of straight board, one end of which rested on the floor, the other end against the rim of the suspected wheel at the top. The strip of board was brought against the square until exactly perpendicular, then with a scale, the distance was measured perpendicular to the strip of board to the wheel rim, both top and bottom. It was found that the distance at the bottom was 1 1/16 inch greater than at the top of the wheel, thus showing conclusively that something about the axle or knuckle was worn or "sprung". A test of the other forward wheel showed but 1/16 inch more distance at bottom than at the top, this wheel being practically vertical. By this test, even the garage man was forced to acknowledge that something about the front wheel was "leery." Both ends of the front axles were then jacked up at the same time and a vigorous shaking of each wheel showed conclusively that a good bit of work must needs be done on the axles and knuckles before the car would be fit to be rated as in "first class mechanical condition."

The front wheels were released and the rear ones jacked up, both at the same time and the transmission thrown into gear. Then, with a man at one of the rear wheels, the writer at the other wheel was able by various movements and shakings of his rear wheel, to form a pretty good idea of the amount of lost motion in the transmission, and that there was more than a-plenty, was quickly in evidence.

The jacks were removed from under the rear axles, and solid blockings put in place of the jacks and the engine started with the wheels free from the floor. A little squirt of gasoline in each priming cup, and away went the engine at the very first pull of the starting crank. This must have been the reason for the garage man's statement that the engine was

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in "excellent working condition". If noise means capacity for work—which it doesn't—there certainly would be ample grounds for his assertion.

Did you ever run an automobile with both rear wheels held free from the floor? Well, if you haven't, and if you want to find out just how much looseness there is in the engine, try it. It seems as though each and every bit of play or lost motion was accentuated and made more prominent by the "backlash" of the many moving parts. The scheme worked well in this instance and showed the writer that there was a whole lot of work to be done on the engine and the transmission before the apparatus was fit for a truck foundation.

The running of the engine at various speeds with the clutch open, also told a story of its own about looseness and wear of engine parts. Don't let the garage man fool you during this test. Better pull him out of the machine and take the wheel yourself, then you can run the engine steadily at various rates of speed and note the rattle at the various revolutions. The garage man will probably be "on the job" and during this test, he will keep the gas lever moving, slowing the engine down, then quickly speeding it up with a rush and with a clatter of the exhaust in a manner which prevents almost entirely a careful study of engine noises at various speeds. Just pull him out of the car and make the engine test in your own way and you will be able to tell far more about the condition of the engine than if the garage man was allowed to do this "monkey business" at the throttle.

The asking price of this Studebaker car was $250. The writer advised the prospective purchaser that he would have to spend at least $50 for engine repairs and $50 more for axle, knuckle and transmission overhauling, including the steering gear. It was also shown that at least $200 must be expended for a truck body and top and for fitting same to the old machine. This totals $300, and added to the asking price of the old car, amounts to $550 for the truck when complete.

For this reason, the would-be purchaser was advised that he could not afford to pay more than $150 for the old car with a view of converting it into a commercial vehicle. He also asked the writer to look over a "used" jitney which had been running around town for a year and had been discarded for a larger vehicle.

The writer very promptly "sat down" upon the proposition to purchase the old jitney and use it for a truck by changing the rear door. Being pressed for reasons, the purchaser to be was told that a light machine which had been converted into a "jitney" would in all probability be found badly worn and pretty well racked to pieces. The jitney must stop at about every street corner it comes to, and the strains of stopping and of starting again almost continually are so great the light mechanisms are very quickly worn out by the hard service and that it very seldom will pay to purchase for improvement or for permanent use, any automobile which has been used in jitney service.

Finally the purchaser to be was advised to buy a new commercial truck and be sure then of getting his money's worth. But, should it be beyond his present means to obtain a new vehicle, to purchase outright a used motor truck and not to bother with the changing over of a pleasure car into a commercial vehicle.

He was also informed that used motor trucks could be obtained for almost any sum from $50 up—the writer actually finding one for sale at that figure, the advertisement reading:—"Two-cylinder Buick delivery wagon; closed body in running condition, $50." I didn't advise the parties who wanted a truck to invest in this vehicle, but it shows what can be had in the truck line.

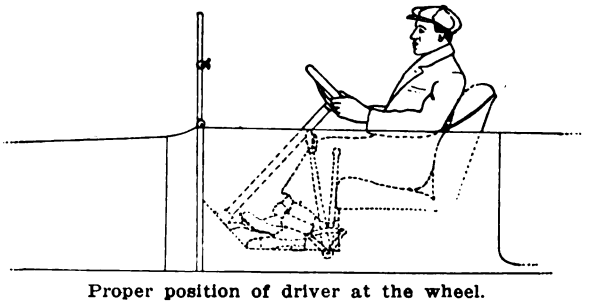
The writer did advise, however, that the purchase of any vehicle which might be selected, should be based upon the report of a disinterested repair man who would be willing to contract to make the repairs he might specify after a thorough examination, the engine being dismantled sufficiently for that purpose, but to always remember that auto trucks which are good for much are seldom sold until they are badly worn out, except occasionally when replaced by larger vehicles. Therefore, when negotiating the purchase of a used motor truck, accept solely upon the exact physical condition of the mechanism as revealed by actual inspection.

If the owner will not permit a dismantling examination, or will not give a guarantee, then it will not be for your interest to bother with the used car and you had best save your time and look elsewhere. It is no more than right that the man who wore out the vehicle should pay therefor, as the wearing out has or should have netted him considerable profit and he should be willing to sell the used car at its actual value to the purchaser. This course will prevent "scalping" of used cars by the unscrupulous dealer—or rather the "scalping" of the purchaser who does not see for himself exactly what he is to obtain.

STEERING THE CAR.

How to Do So Easily and to Avoid Liability of Trouble.

The question of steering a car is one which embraces a great number of small points. In the first place, if one is buying a new car it should be a primary consideration that the driving position is



Proper position of driver at the wheel.

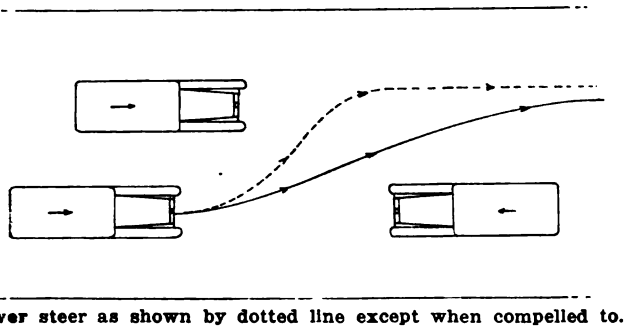
a suitable one. The position assumed has to be a compromise between what one may term the most efficient one and the most comfortable one, and where there is any question of doubt precedence should be given to efficiency.

In an ordinary touring car one should neither have to lean forward nor should one loll in a too backward position, but the seat should be so arranged as regards height and slope that, while one has a good support for the back on the rear of the seat, the

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feet are in a "powerful" position to control the pedals. At the same time, the reach to the side brake lever must not be too great.

A choice of two methods of pedal-control movement may be offered, according to the available length in the driver's seat and the pressure necessary comfortably to operate the pedals. If the clutch pedal is stiff and the reach is fairly long, then the action comes more from the upper part of the leg, and suitable purchase is obtained with the small of the back in order to get sufficient pressure on the brake pedal, or to hold the clutch out for any length of time. If the pedal-control is easy and the leg-



Never steer as shown by dotted line except when compelled to.

room is shorter, then the ankle and lower portions of the leg are the chief controlling factors.

Then, again, one should so sit that the line of vision is quite clear ahead, and it is certainly preferable, if one has much traffic driving to do, to be able to see the tips of the wings, although the present fashion in coachwork often renders this difficult or impossible.

The steering wheel should also be in a handy position, and, while not too close to the body, should not be so far away as to make it necessary unduly to hang the hands out at a distance. Yet again, if one habitually drives by the accelerator pedal, as the majority of drivers do, and that movement is not thoroughly comfortable, the pedal should be altered, if necessary, so as to be in a position where the right foot is more or less at rest. If a long drive tends to give one cramp in the ball of the foot it shows that the requisite depression of the accelerator pedal is either too great or else at a wrong angle to the ankle, and a little longer pedal will probably be found an improvement.

The driver should also endeavor to cultivate a comfortable appearance at the wheel, which is not merely a matter of looks, as in addition to appearing at home with his work—and therefore calm and collected as a good driver should be—it is an attitude likely to encourage the actual obtaining of such a desirable state of affairs.

Many car drivers have a nervous appearance, which gives a bad impression from the mere point of view of looks and does not promise well for actual fact. The capable driver usually has the appearance of being as much at home at the seat of the car which he is driving as one would expect to find him when comfortably ensconced in an armchair by his own fireside.

With Regard to Steering.

With regard to the actual question of steering, the best general rule that can be laid down is never to steer suddenly except when such action is absolutely necessary.

For example, having followed a cart which it is desired to overtake, do not come up to within 10 yards of it and then suddenly swing out to the other side of the road to pass it. It is far preferable gradually to work one's way to a position on the off-side of the cart, starting, say, when 50 yards from it. Not only is it safer, enabling a more complete view of the road in front of the cart to be obtained—and obtained in good time—but it is also distinctly better both for the steering gear, the tires, and the car in general.

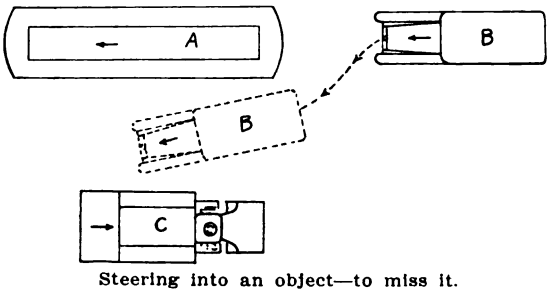
When the road is greasy this point is of even more importance for several reasons. In the first place, if one has not a metallic non-skid tire on one of the front wheels, a greasy road may mean a front-wheel skid (this matter is dealt with more fully in a later chapter devoted to skidding), while even if this should not occur one of the more ordinary type of skids may be caused.

How to Hold the Wheel.

This, again, is a subject in which there are many variations, and the personality of the driver must necessarily enter into the subject. For instance, when giving any hints on this subject, the size of the driver's hand and the strength of his fingers and wrist must all enter into consideration. A large number of motorists make a habit of driving a considerable proportion of their time with only one hand on the wheel, but really it is just as easy, when one is accustomed to it, to use both without any fatigue.

One is almost justified in stating that it is preferable to make a habit of using both hands for steering, as then, in case of emergency, the right hand is instantaneously ready and in a handy position to grasp the side brake, while the left hand is already on the wheel and the grip merely wants tightening a little in order to perform the work demanded from it.

If one is in the habit of using first the right hand and then the left, it may so chance that when the right is being used a sudden emergency case crops



Steering into an object—to miss it.

up, when it is necessary first of all to get the left hand to the steering wheel, and then remove the right hand to the brake lever. It may be that it only takes a fraction of a second so to do, but the value of a fraction of a second as frequently constituting the difference between having an accident and just missing one has already been shown.

Quite a good plan is to hold the steering wheel with the back of the hand upwards, the fingers going round the top of the wheel with the thumb underneath. Alternately, this grip may be reversed, though in each case the grip, although being reasonably firm and instantaneously ready to be very firm, should not, under ordinary circumstances, be too tight.

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The actual place on which the hand should rest on the wheel is also of importance, and it should not be held on that portion of the wheel next to the driver's person. On the contrary, it should be more to the side of the wheel, as in this position the rotation of the wheel is caused by a direct push or pull from the arm, which is far more powerful, and quicker in action, than the lateral motion possible if the wheel is held at the bottom.

If nature has provided one with a large hand and fingers, the grip in which one of the steering arms is always between the first and the second finger is a very powerful one, and is more quick in its ability to grip and control the steering wheel than the other type. Unless, however, one has got a big hand and fingers, this grip may prove too fatiguing. It should, however, be tried, as it is undoubtedly an excellent grip when one can manage comfortably to span the steering arm.

Some Alternative Grips.

Whatever position one takes with regard to holding the steering wheel, on a long journey one wants a change. What the writer terms the tension grip is quite sound as a change for open country work, and is also quite restful. It is not so suitable for town work or for very quick manoeuvring.

The grip in question is only properly permissible when it so chances, as frequently is the case, that, while the direction of the car is straightforward, the steering wheel has an arm each side of it at right angles to the direction of progression, or, say, parallel with the dash. In this case, one places the fingers of each hand over the steering arm on the respective sides of the wheel, the fingers gripping the wheel and a slight tension being put on the arms —what one might term just a hanging tension. As each arm is now in tension to check any irregular tendencies of the steering, the change arm is quite a distinct rest for the arm, as it is not called upon now to do any compressional work. If an obstruction to the right wheel tends to throw the steering to the left, then the fingers of the right hand resist that action in tension, although if the movement should be in the opposite direction then the left hand is called into play. The grip in this case is a little lighter than in the other types previously referred to.

With regard to the sudden tightening of the grip, if a bad road obstruction is met with and the steering wheel needs strong checking, then the increased tension is found to be quite automatic and instinctive, as the steering arm on the side in question is thrust more firmly against the fingers, which automatically in the act of restraining a forward movement also increase the grip.

While bearing in mind that this grip is not advocated for traffic driving, it will be found a very restful change for ordinary touring work in the country.

Yet a fourth method of holding the wheel, which can also be used as a change, is that in which the first finger and thumb grip the steering arm from above, while the rim of the wheel is between the first and second fingers. This grip again is similar to the last-described one, and is more what one may term a checking grip than an actual steering grip, and is not recommended for town use but only for country use, where the road is fairly open and no sudden maximum movement of the wheel is at all likely to be required. Both hands may be used simultaneously, or if the driver does not find that he can conveniently train himself habitually to use both hands for steering, then for open country work it may even be safe to use the one hand.

Perhaps, however, one ought to add even another qualification to this type of grip: it should not be used either for high-speed work or on rough roads. The reason why both these latter grips are only advocated for resting purposes, and for what the writer terms check steering, is that there is only direct power over a very small arc of the steering wheel's travel. Obviously, when one has made a little more than an eighth of a revolution of the wheel in either direction further movement has to a large extent to be caused by lateral pressure from the arm which is nothing like so powerful as the direct pull or push.

Passing Other Vehicles.

As a general rule leave a fair amount of space between yourself and any other vehicle which you are passing. To be able, in case of necessity, successfully to pass some object with only an inch of clearance is a most excellent attribute to a driver's skill, but if such a proceeding is indulged in habitually then it is nothing more nor less than crass stupidity. There are all sorts of clever things which the really capable driver should be able to accomplish but which the really capable driver never does accomplish except in cases of necessity. Tight corners do occasionally occur, due either to one's own semi-recklessness or to the stupidity of some third party.

A Not Uncommon Tight Corner.

When such a thing as a "close shave," as it is usually termed colloquially, has to be encountered with regard to steering, do not endeavor to look at both sides at once. This is a fatal mistake, yet it is one which the vast majority of drivers seem to make.

If, for the sake of example, you suddenly find yourself with what you doubt to be sufficient room to pass between the wheel of a steamroller on one side and a brick wall on the other, it can serve absolutely no useful purpose to try and look at both sides of the car when making the attempt.

It will serve no useful purpose to enumerate the many occasions when, from one cause or another, one is faced with an unpleasant proposition of this kind, so we will merely consider the example quoted as a criterion of other similar situations.

Assume, then, that the brakes have failed on a hill, or that for some reason or other we see in front a road bound on the one side by a brick wall and on the other side a steamroller. It is entirely out of the question to be able to stop in time, and the only chance of safety is to pass between the two obstructions. Is there room to pass? Primarily, so far as possible, keep quite cool. That advice is easy to give, but of course we all know that the ability successfully to keep one's nerve in a case of emergency varies with the person in question.

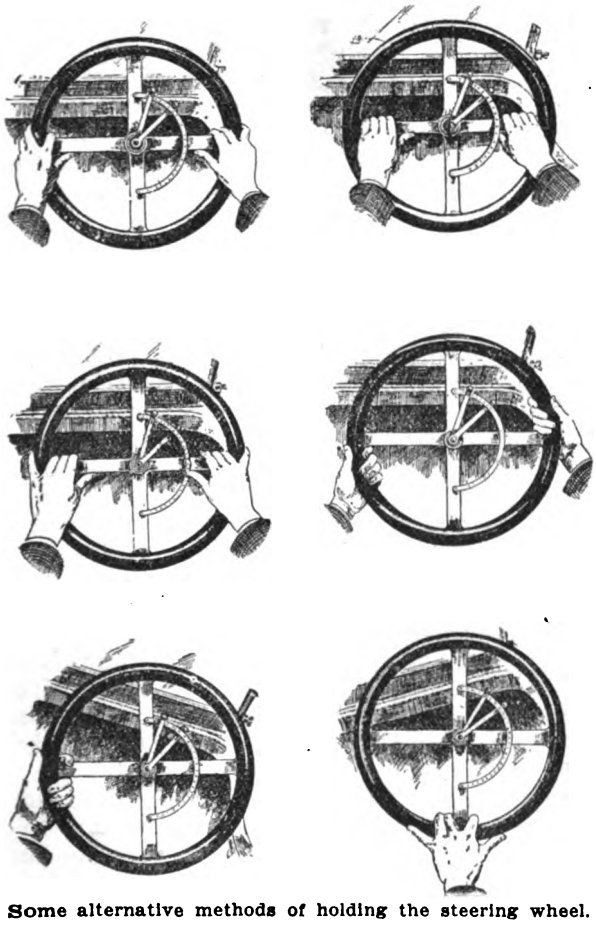
We are assuming that it is impossible to stop, therefore do not jam the brakes on too much, as this is sure to upset the steering, and anything in the nature of a skid may render a successful passage through the narrow imaginary spot an impossibility. Apply the brakes then only so much as they do not

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affect the steady direction of the car. If a pretty expert driver, they can be put on fiercely some distance away, the car straightened up again, and then the secondary application made of only such strength that it will not now affect the steering.

Do not look first at the brick wall and then at the steamroller and try and figure out whether it is possible or whether it is not. The assumed circumstances are such that one has either got to get through or have a smash-up. If there is to be a smash-up the more nearly you get to passing through, the slighter the accident is likely to be.

Take, then, the left hand object (we will assume it is the wheel of the steamroller) and steer just to miss it with your front wing and try and brace yourself to the knowledge that if the first few inches of the front wing successfully pass the wheel of the roller the rest of the car will do likewise. This fact



Some alternative methods of holding the steering wheel.

is important, as in such cases there is always an idea which rushes to the mind that although the thing has just been missed at the beginning, one is steering into it, and therefore it is necessary to steer away from it.

Do not, then, steer out through sudden alarm, because you imagine you are too close to it, but keep the eye firmly on that front wing and the steering quite steady until you are through. If there is room, then, by adopting this means you will get through. On the contrary, if, as so frequently is the case, one glances first to the right and then to the left the manoeuvre is by no means so likely to prove successful.

If in point of actual mechanical fact there is not room for the car to pass, then an accident must, of course, ensue, but the fact that you are, so to speak, in the middle of the two objects is likely to minimize the accident rather than if you hit one of them fairly full and altogether cleared the other.

For example, a somewhat inexperienced driver, or one who lost his (or her) head, might clear the wall on the left by a foot, through the powers of vision not being so capable of precise judgment on this side of the car, only to catch the mudguard against the wheel of the steamroller and also perhaps the axle cap. This would, of course, swing the car round and probably dash it into the wall.

More than one case somewhat similar to this has come under the writer's notice, where the driver has absolutely ripped off mudguards and splintered the running boards both sides of the car yet come through without any further damage. It must always be remembered that if an accident is, through any set of circumstances, absolutely inevitable, it still remains the duty of the driver to face that accident and reduce its ill-effects to the minimum.

Remember, then, in all cases where it is a question of a "tight squeeze" not to glance first at one side of the car and then at the other, but go as close to the object on the right as you possibly can, and then, if there is in actual fact room to pass the other side will look after itself and you will get through successfully. If there is not room to pass no amount of looking from side to side could possibly help you; it only makes matters more difficult.

Steering Into An Obstruction—To Miss It.

There is one other little point which really quite frequently proves useful to those drivers who know it, and that is the apparent paradox of steering into an obstruction in order to steer out of it. This again is a situation which only crops up in tight corners and is as a rule only serviceable in saving a minor accident.

Sometimes it happens that one has for some reason or other to make a sudden dive from behind the vehicle just in front to pass it on the right but finds that there is not so much room on the right as one wishes in order to enable a complete sweep-out to be made. Say, for instance, that one has to dash out in this way from the rear of a street car and that on the other side of the road there is our old and imaginary friend the steamroller. Now, the distance between the street car and the steamroller, is, say, not very much more than the width of one's car. If the start of the steering manoeuvre referred to had been made in good time everything would be quite in good order and there would be ample room.

Suppose, however, that, contrary to instructions in previous chapters, the driver is hugging the street car in question and the driver of the street car for some conceivable reason has suddenly to apply all his brakes. The stoppage of that street car A, will be very much quicker than any ordinary motorcar B could possibly hope to stop. Therefore, it is a sudden swerve at the last moment, and perhaps one's front wings only just skim the rear of the street car and one feels intuitively that the back of the car is going to strike the bigger vehicle.

Now, it is rather natural to assume that to steer out as far as possible towards that steamroller, C, is one's only chance of making the best of the situation. In point of fact, however, such is not the case. When the car is about half-way past the dangerous "corner" of the street car the steering should be quickly reversed so as to make the direction of the

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car a dive for the front portion of the street car and give a sharp but decided "dab" to the pedal brake.

This will have the effect of bodily swinging the rear of the car out anything from a few inches to a couple of feet, or even a yard, according to road conditions and weight, or lack of weight, at the back of the car, the tires in use, etc. The manoeuvre sounds a difficult one, and admittedly it is not a novice's feat, but at the same time it is a perfectly sound piece of driving, not, of course, to be used for the benefit of amusing people, but to be resorted to in cases where circumstances, over which perhaps one has absolutely no control, have rendered the choice of such a manoeuvre or an accident inevitable.

Steering Points in Epitome.

Summarizing, then, as a general rule, give vehicles which you are overtaking reasonable room, and allow cyclists, and more especially if the road is greasy, plenty of room. So far as passing cars going in the opposite direction, reasonableness is here again the keynote of instructions. It is to be feared that many drivers are in the habit of hugging the middle of the road and leaving the other one to go into the gutter. This is bad driving, and the writer must confess that in such cases he does likewise, generally to the final disconcerting of the other driver, who usually makes somewhat of a wild swing away to his proper side of the road at the last moment.

Such, however, should not be the case, and both should take to the side of the road so far as may be necessary to leave, say, a yard between the two cars. It is ungentlemanly behavior and bad driving to force the other man into the gutter, or to cut him too close.

Those who are tempted to adopt this bad type of driving (it is to be assumed that they have unknowingly got into the habit of it because respectable folk should always share the necessary "giving way") may find every now and then someone who is more at home with an inch to spare between the two cars than they are, and in such cases they may find themselves forced—as they think, in order to avoid an accident—to make a sudden swerve just as the two vehicles are meeting. The other driver, however, who is only endeavoring to teach them a lesson, is quite comfortable and knows that he is just missing the other car and is not at all worried. Let the motto then, when passing a vehicle going in the opposite direction, be that both give way a little, which is, of course, precisely as it should be.

Remember always to steer gently and in good time, not leaving the movement to the last moment, when it is necessary to steer suddenly. In conclusion, on no account ever move the steering wheels through the medium of the steering wheel when the car is stationary. It is a very bad practice and imposes an excessive strain on the steering gear, which it is neither designed nor intended to take.

If wire terminals break off and become lost make an eye as follows: Remove enough insulation so that the bare wire may be turned around the sharpened end of a pencil, and the end wrapped around the wire itself. This alone makes a good terminal, but it will be much improved if it can be dipped in melted solder.

GEAR CHANGING.

The Change Down Is Considered Most Difficult by Most Drivers.

In viewing the aspect of the case of gear-changing when going to a higher ratio, we have seen that it is the easier part of the work, the chief desideratum being a pause before making the change, which in most cases is provided automatically by the nature of the movement to be made, so that very much skill is not needed in effecting these changes in a reasonably good manner.

A four-speed gearbox has been dealt with, as it is easier to argue from the four to the three than vice versa. The only difference worth recording is that with a four-speed gearbox the pauses to be made are less than with a three-speed gearbox, as the difference between the ratios is naturally smaller. There is another small point, which may be mentioned to complete the substance of the main variations, and that is the necessity of taking into consideration the diameter and weight of the revolving portions of the clutch mechanism. If they are heavy then a longer pause will be necessary. If they are light the momentum stored in them is not so great and they will come to rest more quickly, and consequently a shorter pause is requisite.

Finally, there is the question of the clutch stop which has to be considered. It is provided to minimize the pause which is requisite, and there, of course, the same line of argument carries weight. If the clutch stop is efficient, the pause will be small; if not, slightly longer. In some few cars, within the realm of the writer's practical experience, the clutch stop is so efficiently arranged that a deliberate pause is quite unnecessary and the movement can be made almost as quickly as one cares to make it. This question of pausing must not, of course, be overdone, as, if it is, it is often a more difficult matter than it is when going too quickly. Occasionally one does do this, and finds difficulty in making the change up, and under these circumstances the only thing to do is to leave the change speed in the neutral for a moment and slightly accelerate the engine and have another go.

As to the precise moment in which to make the change gear upwards, it is rather difficult to lay down a definite law. The writer makes a practice of changing up on what may be termed a "rising note." That is to say, observe if the "hum" is on a rising scale, and the change should be made shortly before this becomes a fixed tone. If the car is kept on the low gear until such time as the fixed tone is brought into being, the gear change will always prove a difficult one, and one that necessitates a fairly considerable pause. Briefly, this means that on the level the low gears are not left in engagement for very long, and, excepting on a very steep hill, it generally means changing up again before the actual summit is reached.

In conclusion, always remember that, under any circumstances, if the time of changing gear is not successful and a grinding noise is the result, do not force the gear in, but try again gently. If the cause is through too long a pause it is better to go back into the gear which one is endeavoring to get away from, and make an attempt to change into the next one over again. Never force the gear lever.

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Trick Changing.

As a general rule it is safe to say that the clutch should always be partially or wholly disengaged for gear-changing. As a matter of fact, however, gear-changing can be effected without disengaging the clutch, although the writer would certainly be the last to advocate a general adoption of such a manoeuvre. For the sake of example, however, one can, while the car is accelerating well, suddenly close the throttle, which causes a very momentary over-running of the engine by the car, and this considerably reduces the pressure between the teeth of the wheels in the gearbox which are transmitting the drive, and so enables the lever to move them out of engagement without undue force. The movement, if properly executed, will on some cars really make a thoroughly good change.

However, this sort of gear-changing should not be attempted by the novice or even an ordinarily good driver, and experts would be better advised if they left it alone, as it must inevitably put more strain on the change-speed mechanism than when it is moved with the clutch disengaged.

Changing Down.

It is in the changing down that the majority of drivers find their greatest difficulty. We will deal again with a four-speed gearbox, as the advice in connection therewith may, when taken with minor modifications, be held to refer to a three-speed gearbox also. The state of affairs is now entirely opposite to what it is when changing up, and, instead of making a pause, it is necessary, in order to make a good change, to accelerate the layshaft. Now, there are several ways of doing this, but the whole of the writer's experience has tended to confirm his original belief that the double declutch method is better, and more universally reliable than any other, consequently the advice will be mainly restricted to this movement. Therefore, in the vernacular, we will "tick off" the method of layshaft acceleration, which will not be recommended for general use, quite briefly.

The Slipping Clutch Change.

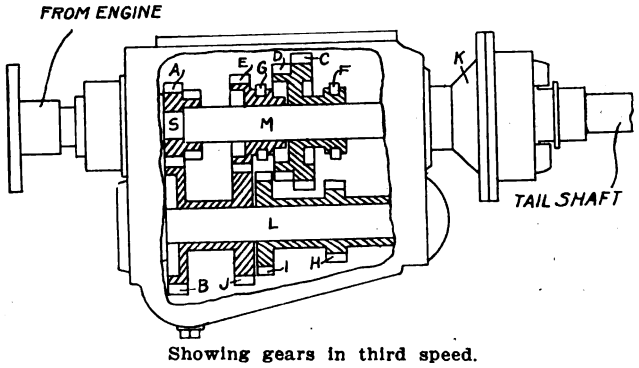
Instead of wholly disengaging the top gear to go into the third, the clutch is slipped, and the gear lever can then bring the gears out of engagement against this slipping drive. When the two gear wheels are quite disengaged the layshaft is automatically speeded up by the engine running faster, and the next gear can be engaged. In many cases this works quite well, but in a good many more it does not, and it must always entail a certain amount of wear on the clutch which cannot benefit it, and also a certain amount of strain on the gear change mechanism, which is likewise sure to be the reverse of beneficial.

The throttle is, of course, left pretty well open, but the movement, even in the hands of an expert, is not always so successful as expected. Some people argue that this is the quickest way of changing in a scientific manner, but the writer, while giving due deference to the other opinions, does not altogether agree. Admittedly, the movement is simpler than that which is going to be primarily advocated, but it is necessary to make the declutching movement with a certain amount of deliberation an care, and also to make the depression movement slowly: thus time is taken up. So much, then, for the slipping method of changing down.

How to Double Declutch.

It must be admitted, before starting to describe this, that it will sound a little complicated on paper, but when once mastered the action is almost instantaneous, and the writer, without wishing to appear in any way to vaunt his prowess, has accustomed himself so to do it that the several movements are accomplished so quickly that occupants of the car are frequently difficult to convince that the series of movements have actually been accomplished. As stated, this is not meant in a boastful manner, but more to encourage the novice to study the movement and practice it, and not to be frightened by it.

Assuming, then, that we are running along at a good speed on top gear and encounter a hill. It is obvious, even at the bottom, that, before we can surmount it, it will be necessary to change to at least the third gear. Well, instead of waiting until the last ounce of the engine's power has been expended on the top gear, and then making the change when it is comparatively easy, we are going



Showing gears in third speed.

to show how it can be made at any car speed and any engine speed with perfect precision and silence. The movements may be enumerated thuswise:

1—Declutch and allow the accelerator pedal to come up to the ordinary slow running position.

2—Gear lever to neutral.

3—Let the clutch in and accelerate the engine by depressing the pedal for, say, a full second.

4—Clutch out, and gear lever into the third speed.

5—Let the clutch in again and accelerate in the ordinary manner.

One must admit that, written out in full, it is in appearance rather complicated. The whole series of movements, however, can, when one is really familiar with them, be accomplished well under two seconds, which, if one is to make a scientific and silent change at any required engine or car speed, is not an excessive time in which the car is to lose momentum. The neutral position has to be regarded as if it were another gear between the top and the third, though in practice, of course, it is nothing more than a mechanical movement utilized to serve a scientific purpose.

Let us now come to our diagrams again and find out the why and wherefore of the movement in theory. In top gear we have the wheel (e) in engagement with the dogs on the wheel (a), the only connection with the layshaft (1) being through the medium of the constantly meshing pinions (a and b). We remember, however, that the wheel (a),

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if revolving at 1,000 r.p.m., means a speed to the wheel (b) and the layshaft of only 500 r.p.m. Now, to come from this top gear into the third, it is necessary to engage the two wheels (j and e). We remember, however, that j has 30 teeth and e 30 teeth, so that, in order for a change to be effected silently, the speed of the layshaft (1) must be in a proportion of 30 to 30, or, in other words, must be just the same speed as the primary shaft, which is, of course, 1,000 r.p.m. Assume, then, that we are going along with the wheel (a) (and therefore on top gear of the wheel e) doing 1,000 r.p.m., and it is desired to change into the third gear. Then, if we assume that the loss in momentum is such as to bring the speed of the wheel (e), which, of course, is connected all the time to the tailshaft, down to 850 r.p.m., then in order for j to mesh with it quietly it must be going at just this speed, in other words about 850 r.p.m. We remember, however, that when the engine is doing 1,000 r.p.m. the layshaft is only doing 500 r.p.m. We see that for a good change to be made, it is absolutely necessary that the layshaft should do about 850 r.p.m., in other words, to go faster. Herein lies the whole secret of the movement, and while the gearbox is in the neutral position the clutch is let in and the engine accelerated, so that the layshaft is speeded up to the requisite amount to allow the change to be made scientifically and silently.

In any gear change made within reasonable limits this method will always be found effective. In fact, one may almost say that it is so without any qualification, as to change into the third speed when the engine was doing its utmost on the level would be quite an unnecessary procedure, and also a foolish one. Even under these adverse circumstances it can be done, unless the car is actually on the down grade, because the engine will always run faster when disengaged than when driving the car.

As we have so fully gone into the necessity of having this balance of speed between the wheels mounted respectively on the primary and secondary shafts when we were studying changing up, it is unnecessary to go through the other gear changes downwards.

Exactly the same line of procedure is to be followed. In each case the layshaft wants speeding up in order to enable a silent change to be effected. On a four-speed gearbox the amount of speeding up requisite is naturally less than a three-speed gearbox, and in some three-speed gearboxes, where the drop from top to second is a very big one, quite a large amount of speeding up is requisite to make a silent change at speed.

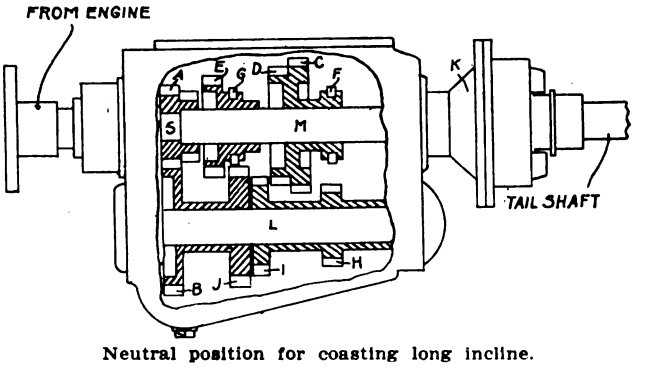
How to Learn It.

This art of double declutching is the one question above all others which the writer would ask those of his readers who are not already quite masters of it carefully to study and successfully to learn. Superficially, it seems a little difficult; but when one masters it it is the acme of simplicity, and one's feet and hand operate in perfect sympathy and without a shadow of thought from start to finish of the manoeuvre. First of all try it quite slowly, sitting in the seat of the car without the engine running at all. Merely practise the proper series of events and practise them until they can be accomplished in the proper order without anything in the nature of a stop from one movement to the other. When this has been learnt, essay first of all to make the attempt on an easy gradient, whereon a change from the top gear is not even necessary. Do not do it at great speed. Try for sake of example first of all at 15 miles per hour. When fairly practiced in the movement under these conditions, then try it on ordinary hills where a change is requisite, and when finally proficient it will be found that a change from top gear to third can be made just as easily and accurately at 30 miles per hour on a steep hill as at 15 miles per hour on a gentle grade—and always quietly to boot.

Coasting.

Coasting is not really a portion of the work of gear-changing, but the question of how to coast may suitably be considered here, relatively to a long down grade under average touring conditions where one does not wish to "blind all out," with the engine accelerated to its utmost. People frequently declutch and let the engine thereby run at its ordinary slow-running speed. However, the mere fact of holding the clutch out for a long period on end is always fatiguing in a greater or lesser degree, while it is likewise putting unnecessary strain on the clutch withdrawal mechanism and its usually unfortunate ball bearings (how many people think regularly to lubricate these bearings?).

Both these defects can be overcome when coasting by declutching in the first case, and putting the change-speed lever into the neutral. So far this is



Neutral position for coasting long incline.

the acme of simplicity, and on a nice road of fancy we will continue the coasting until we arrive safe and sound at the bottom of the hill, when the road conditions are such that it is necessary to call upon the engine to take up the drive again. We are faced with a little problem. How are we going to get a gear in again and which one?

Coming back to theory, if we study the illustration in the neutral position we see that the primary shaft (m) is being driven by the tailshaft, and no gears are in engagement, except the constantly meshing pinions. Now, the tailshaft may be revolving at, say, 800 r.p.m., which we will assume to be the equivalent of about 20 miles per hour. As the engine is only "ticking round," the gear wheel (a) is probably only turning at about 200 r.p.m. Obviously, then, if we endeavor to engage the wheel (e) with the dogs on the wheel (a) under these circumstances we are in for trouble. One obvious solution to the difficulty is to wait until the wheel (e) has slowed down to 200 revolutions, which, of course, would be silly, as it would mean waiting until the car is only crawling. Why not accelerate the wheel

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(a) up to 800 r.p.m., which can be done quite easily by depressing the accelerate pedal?

The latter course is the one to be adopted, and practice alone can train the driver to know by the "feel" through his body, or the sound of his engine, the approximate speed at which it is running, but it is really not so difficult in practice as it would seem in theory.

It is generally easier to over-accelerate a little and then wait the necessary moment or two while listening to the sounds which tell of the reducing speed of the engine, and then with the clutch disengaged gently move the change-speed lever into the top-speed gear notch. To learn this, again try at slow speeds on the level. For instance, amble along gently at, say, about 15 miles per hour on the top gear. Declutch and put the change-speed lever into the neutral. Coast for about 20 yards, accelerate a little until it is thought that the speed of the engine is above what it would be if it were driving the car in the top gear, declutch, wait a moment, and gently re-engage the top gear.

Practice alone can make perfect in this manoeuvre, but when one knows the car well perfectly quiet changes can be made from neutral into the top gear, or into the third if under extreme circumstances it should be requisite (naturally by greater acceleration), at pretty well any speed desired.

AUTOMOBILE ENGINE COOLING.

The Water Jacket, the Circulating System, the Radiator and the Fan.

From A. K. Schanze, before the Society of Automotive Engineers at Cleveland.—This paper will deal with water-cooled engines only; air-cooled systems will not be discussed.

The cooling system of the internal-combustion engine as now applied on a majority of passenger cars normally divides itself into four main units: the water jacket around the engine cylinders, the circulating system, the radiator, and the fan.

The order in which these have been named seems to be the order of their importance in the minds of most engineers, consciously or otherwise. It seems also that this is the historical order in which real scientific research and practical development have taken place on the cooling systems now in use.

The author is of the opinion that no order of relative importance can be assigned to these four divisions of the cooling system. They form a chain whose strength is only that of the weakest link, and wherever one of the four falls below its proper standard there lies in the system an imperfection that should be remedied.

Cooling systems give outward evidence of imperfections in two general ways; they overcool or they undercool. Of the two, the latter is far the more common.

Water-Jacket Problems.

The function of the water jacket is to carry such volume of water that it will take from the cylinder walls only that heat that cannot be converted directly into mechanical energy, and the accumulation of which would be destructive to the cylinder material. From such a definition it would appear that, given the number of heat units generated, the mechanical work to be done, and the heat units in excess of the latter requirement, a water jacket would be a simple matter to design.

Perhaps it is, but its simplicity is a secret in possession of a limited number of engineers. The author, during fan tests that he has conducted on cars of many different makes, has found only three or four apparently ideal water-jacket designs. In the main, water jackets leave some room for improvement.

The mere solution of the problem of what volume of water a jacket must contain does not give the answer to the cooling problem. The distribution of the water layers around the cylinder walls may be of even greater importance than the volume. Ignition takes place in the top of the cylinder, which is longest exposed to fire and becomes hottest. Modern engineering practice has placed the deepest layer of cooling water over the top of the cylinder, which is as it should be. However, it seems to be the foundry practice in some cases to interpose stiffening ribs or small columns on top of the cylinder, which act to retard the circulation, with the result that steam pockets seem to be formed. These are evi-

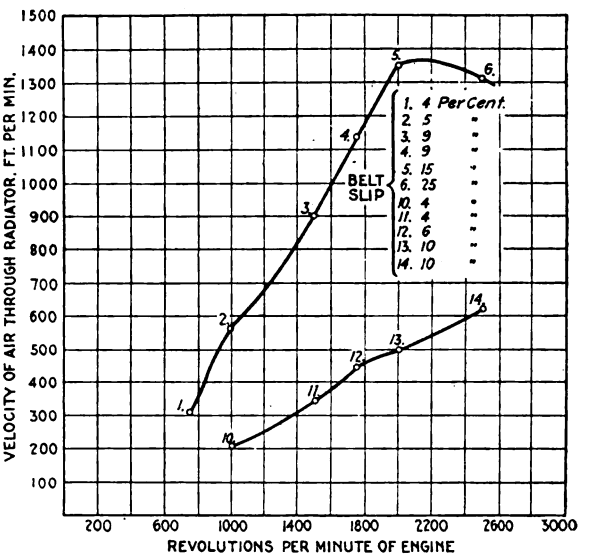


FIG. 1—AIR DELIVERED BY FANS AT DIFFERENT ENGINE SPEEDS
Curve A—Three-arm multi-blade fan; diameter, 16 in. Curve B—Two-blade (curved blades); diameter, 17 in.
Fan speed, 1½ engine speed. Pulleys, 3 by 1 in.; belts, ¾ in. flat.

denced in some engines whose water-jacket volumes are adequate, in the sudden increase in temperature that takes place when the engine stops.

The author has noticed in several tests that when the engine was stopped the temperature recorded by a thermometer placed in the filler cap mounted 20 deg., from 200 to 220 deg. Fahr. We lost two thermometers through having them blown from an improvised bushing in a hole in the filler cap, a jet of steam shooting 20 feet into the air from a radiator the water in which a moment before had not been near the boiling point. Thermometers lashed in place indicated temperatures of 220 deg. Fahr. Repeated experiments could lead only to the conclusion that the whole mass of water was not being raised through that range of temperature in 40 or 50 seconds, but that some little patch on top of the cylinder was being converted into steam so fast that the filler neck, which was being used as a steam dome, could not act through the overflow to relieve the pressure.

Whenever a design of water jacket permits such a condition every effort should be made to get rid

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of it. The condition is dangerous to the mechanical structure of the machine and also to people working around a car. The mechanical danger is present in radiators in which large areas and thin structures are not designed to carry pressures above the atmosphere. Steam above 212 deg. means such presures. Many a radiator manufacturer has undoubtedly been called upon to replace leaky radiators that were not really defective.

The danger to human beings lies in the possibility of a clogged overflow pipe and an unsuspecting person looking into the filler neck at the psychological moment. The author saw this happen about a year ago, when a man had his face severely scalded.

Tests conducted by authorities on internal combustion engines indicate that high compression contributes largely to the efficiency of the gas engine. High compression is always attended by the danger of preignition unless the cooling system can overcome the tendency.

If the cylinder walls are cool, the gas entering on the suction strokes does not immediately expand, fill the cylinder, and thus prevent the full calculated quantity entering. It tends to keep its density at a value in accordance with that established by the carburetor, and then the engine gives more nearly its maximum capacity.

In order to prevent the overheating tendency immediately following the shutting down of an engine, it would seem necessary then to give the water in the jacket such volume and distribution as to enable it to absorb the last heat accumulation in the cylinders, independent of the circulating system.

Jacket design, therefore, should be such as to allow liberal distribution of water and freedom of circulation. Since the circulating systems in general use are what may be classed as pressureless systems, the water will only follow the lines of least resistance within the cylinder. Short turns will at least materially resist circulation, and may even prevent it, and thus cause "steam pockets."

The design must be followed up by close inspection of the casting as it comes from the foundry. Too much stress cannot be laid upon this. The outside of a cored casting receives careful inspection to prove its freedom from flaws, but too often the inside is passed as being hopelessly inaccessible to inspection, and is assumed to be satisfactory if the exterior shows that there are no cracks.

Types of Circulating Systems.

Between the pump system and the gravity (thermo-syphon) system of circulation there is at present somewhat of a race for supremacy. The pump system frequently overcirculates, or tends to, while the gravity system undercirculates. Both faults are conducive to trouble.

In practically all pump systems the speed of the pump varies with the engine speed. This is logical enough, and conforms with good engineering theory and practice. Rotary pumps must attain a certain minimum speed before they do any effective work. This means that the starting point is considerably above zero, say about 250 or 300 r.p.m. Their efficiency increases after they get up to 500 r.p.m., usually until the speed is 800 or 900 r.p.m.; the result is that when the engine speed is such as to result in heating the pump, which was designed to do its circulating at a car speed of 20 m.p.h., is working at high efficiency. In such cases, however, the water is thrown up into the top of the cylinder and the radiator tank faster than the internal friction of the radiator will allow it to return to the pump. The bottom of the radiator is thus one moment empty and the next full, or it may be simply allowing a small part of the water to pass into the pump and a large part to be lost through the overflow pipes. When the radiator is thus, in part, deprived of water, it cannot perform the full amount of cooling action of which it is capable. Overheating, or at least inefficient cooling, results.

It would appear, then, desirable to select a pump speed designed to circulate the water within the limits of the radiator frictional resistance and then always run the pump at that, regardless of engine speed.

In marine work, circulating pumps are used in connection with the steam condensers in exactly the same manner in which they are applied to automobiles, and it has been found that pumps have to be controlled independently of engine speed. Such practice is now universal. The automobile engineer might well investigate the experience of marine engineers along these lines.

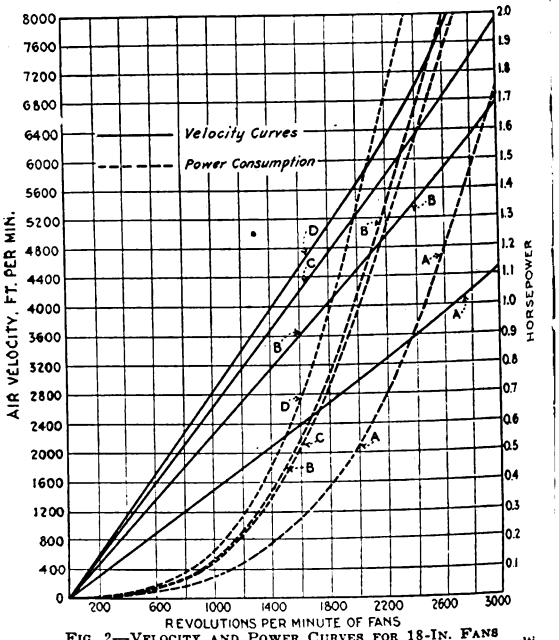


FIG. 2—VELOCITY AND POWER CURVES FOR 18-IN. FANS Curve *A*—Four-blade fan (flat blades). Curve *B*—Three-arm multi-blade. Curve *C*—Five-arm multi-blade (special). Curve *D*—Five-arm multi-blade (standard)

The gravity or thermo-syphon system of circulation, which is in its infancy as regards practical development, has been used with varying success. At best, its impulse is feeble, owing to the lack of head. On this account it succumbs readily to any abnormal frictional resistances that may result from solid matter in the water. It recommends itself because of its simplicity of construction, low initial cost, manifest economy of operation, and the advantages derived from the fact that it continues in operation for some time after the engine stops.

Its practical application to the car so as to realize these advantages is difficult. At present too many of these systems are arranged in almost the same way as the pump system, but with the pump

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omitted. Best results in gravity circulation, as applied to the heating of dwellings and other buildings, are obtained with the horizontal runs comparatively short as compared with the head pipe. The principle is identical in the automobile. The head pipe must always remain well submerged. This latter feature cannot be accomplished without the use of a reserve storage tank attached to the top of the radiator.

Radiator Requirements.

After the body designer has established the shape of the radiator, and the purchasing agent has fixed its cost limit, the designing engineer can go as far as he chooses. Frontal area should be a maximum, and upon this depends net radiating area.

Radiating area can be considered from a horsepower basis, as the radiating action is exactly the process of doing work. Of the total heat of the engine absorbed by the water we have only to deal with the small residue that would cause overheating if not carried off by the radiator.

A cubic foot of air, in passing through a radiator and being raised 50 deg. Fahr. in temperature, absorbs 1 B.t.u. A horsepower represents 42.4 B.t.u. per minute, and upon this basis we can arrive at the other results.

The radiator, whose heat-transferring qualities are such as to give a uniform rise of temperature to all air passing through it, regardless of the velocity of the air, is an ideal not beyond our reach. Some are in existence that so closely approach this condition as to be considered perfect for all practical purposes.

For efficiency not only is it necessary to have the air passages free from solder obstructions, but it is just as important that they be of a size and shape that will give a good smooth run to the air. The more air that can be passed through a radiator the greater will be its cooling power.

We must also look carefully at the inside of a radiator to determine its capacity and the freedom with which water can circulate. On several occasions tests have shown that capillarity was preventing free circulation. This condition is too well konwn to radiator designers to need comment, but the fault does occur occasionally, and is probably due more to workmanship than design.

Core depths of as much as 4 inches are in common use, and have their purpose. Since expense is increased with core depth it is well to regard the radiator and fan together; moreover, the power of the fan will make a large difference in the core depth. Just what conclusions to draw on this phase of the subject the author is at a loss to know. It would seem that a 4-inch core was too deep for greatest efficiency, and this has at various times proved to be the case. Yet upon some tests conducted on two different makes of radiators the 3⅞-inch core proved to have greater capacity than the 3⅜-inch core.

As a practical suggestion to car builders, the author offers that every purchaser be furnished a special card cautioning him to keep the exterior of the radiator as clean as he possibly can. Much heating complaint would be avoided if radiators were kept clean. Tests go to prove that when a film of oil gathers enough road dust the radiator efficiency becomes about one-quarter normal.

Selecting the Fan.

Researches made by radiator manufacturers have shown that cooling varies directly with the quantity of air passed through the radiator, other conditions being uniform. It has, therefore, been the long-time hope of many of the radiator manufacturers that an improvement be made in fans.

Experiments conducted by the writer (see Figs. 1 to 5) have confirmed the theory that cooling varies directly with the quantity of air drawn through a radiator.

Some engineers place little stress upon the value of air as a cooling agent, except within very wide latitude. They apparently are of the belief that it requires a large increase in air delivery, say 300 or 400 per cent., to make any noticeable improvement in the cooling apparatus as a whole.

In contravention to this argument it need simply be pointed out that a certain time-honored practice among some engine builders proves that the contrary is the case. When engines are placed upon the dynamometers to be "run in" they are usually connected with their standard radiators, and carry their regular fans. Experience showed in some cases that this did not provide sufficient cooling to make safe running, so the simple expedient of placing an electric fan on a bench in front of the radiator and directing its air current into the radiator is resorted to with satisfactory results.

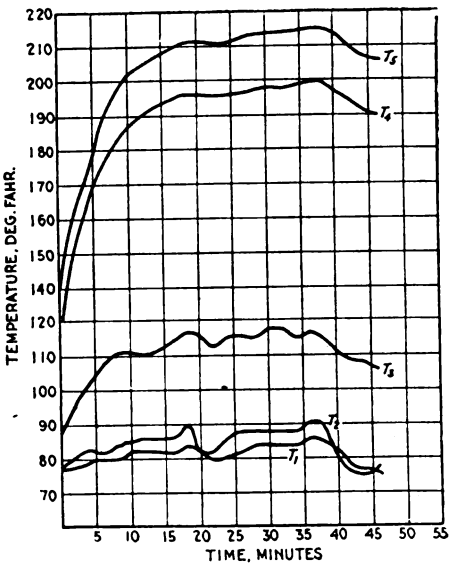


FIG. 3—VARIATIONS OF AIR AND WATER TEMPERATURES

T_1—Free air in room. T_2—Air entering radiator (4 in. from face). T_3—Air leaving radiator (¼ in. away). T_4—Water at pump. T_5—Water in top of radiator

Fan, five-arm multi-blade; diameter, 18 in. Engine speed, 1010 r.p.m. Fan speed, 1610 r.p.m. (3.4 per cent belt slip). Load on dynamometer, 12.6 hp. Velocity of air through fan, 1300 ft. per min. Radiator, diamond pattern. Belt, built-up V-type.

First and foremost in the selection of a fan should be considered the element of quantity of air delivery. The ideal radiator, as has been stated, is the one that will give off its heat at such a rate that the air that passes out of it can absorb no further heat units. In combination with this radiator the ideal fan is the one which will draw air through the radiator at such a high velocity that the air undergoes no measurable increase in temperature as it passes through.

The rate of heat transmission from one medium to another is directly proportional to the difference in the temperatures between the two mediums. This rule applies exactly between all the variations met

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with in automobile practice. Therefore, the efficiency of a radiator and fan system combined would be greatest when the mean temperature of the air passing through the radiator were lowest; or, in other words, when the difference in temperature of the water in the radiator and the air passing through it were greatest.

As an illustration, assume the case of a radiator on a summer day, with atmospheric temperature of 85 deg., mean water temperature of 200 deg., and a rise in temperature of air passing through the radiator of 50 deg. The mean air temperature through the radiator is, therefore, $85 + 50/2 = 110$ deg. and the differential between the water and air is 90 deg. Heat will be transmitted in its proper ratio to this differential.

Take, then, the case when all other conditions are the same as in the foregoing case, but increase the air velocity 40 per cent., and thereby reduce the temperature rise from 50 to 30 deg. The mean air temperature through the radiator then is $85 + 30/2 = 100$ deg., and the differential becomes 100 deg. Heat will be transmitted at a faster rate in the proportion of 100 to 90, or an increase of 11 per cent.

The foregoing demonstrates that if one fan has twice the capacity of another it does not follow that a 100 per cent. increase in the engine-load capacity can be looked for.

As a matter of practice, then, the rule can be set down that the fan is of vital importance, and that the best fan obtainable should be installed. The question that follows is, What is the best fan obtainable? The answer to this is the fan that on any limit of diameter will give the maximum air velocity per revolution is the best fan.

Air velocity depends upon a fan's ability to build up pressure, and pressure overcomes the normal friction in the radiator and drives the air through at a velocity proportional to the square root of the pressure.

Fans of any one design increase their capacities in approximately geometric progression with the increase in diameter. Best practice would therefore suggest the use of the largest diameter possible on any particular model of car.

Classification of Fans.

There are several distinct types of fans offered by the various manufacturers, classified for description as follows: Rim fans, which are those whose periphery is bound by a circular rim; flat-blade fans, which are usually of three or four flat blades built out from a central spider; curved-blade fans, which are similar in construction to the flat-blade fans, except that the blades are curved somewhat after the manner of a garden trowel; and multi-blade fans, which are of two or more arms, up to six, and in which each arm consists of two or more blades.

Taking them in the order named, we note two types of rim fans, namely, those having a thin rim almost like a wire, and those having a broad rim equal in width to the sweep clearance of the blades. In the former type, as nearly as the author can ascertain, the rim is supposed to add strength in the resistance both to centrifugal force and to bending. It is also intended to act somewhat as a safeguard to the radiator, should the fan become bent or out of line and strike the radiator. In the latter type of rim fans it appears that the intention is to reduce noise.

The author has conducted air-delivery tests extensively on both types of rim fans and has found them very inefficient.

Flat-blade fans are the most common in use at the present day. They are usually of the four-blade type, built upon a central spider. Their air-delivering qualities are not good at low speeds, say a peripheral speed less than 5,000 feet per minute, consequently they have to be run at very high speeds. High-speed fans are noisy, and consume a large amount of power. These two factors will be discussed later in this paper. It is safe to say that the flat-blade fans are very efficient when working at peripheral speeds in excess of 15,000 feet per minute, which for 16 and 18-inch fans is close to 3,000 r.p.m.

Curved-blade fans, as a class, are similar in their construction to flat-blade fans; that is to say, they are normally built up on a central spider and are of three or four-blade design, generally. In capacity and efficiency they are much ahead of the flat-blade and rim fans for automobile use. Of course, they do not show a constantly increasing efficiency at very high speeds, 4,000 and 5,000 r.p.m., but then good engineering practice would counsel against the use of any such fan speeds where it were possible at all to get away from it. These fans are good because their efficient speeds are generally comparatively low, and they handle a considerable volume of air.

Only one multi-blade type of fan is at present in existence. This consists of groups of blades placed one behind the other, and presenting somewhat the appearance of two fans upon a single hub. Experiment has demonstrated that this is far and away the most powerful and efficient type of disk fan yet produced. The capacity is from 50 to 100 per cent. greater than that of other types, and its most efficient speed is from 800 to 1,200 r.p.m. for 16 to 20-inch diameters. It develops a high velocity pressure which drags air through the radiator even under adverse conditions. Its power consumption per cubic foot of air handled is at least 40 per cent. less than that of any other type of automobile fan it has been the author's experience to test. It also has another quality that recommends itself to the automobile engineer, namely, it develops a high suction at its periphery. This quality brings the edges and corners of a radiator into use. The advantages of this feature are self-evident.

Another type of fan very little used in the automobile industry, but worthy of notice in a paper of this kind, is the centrifugal fan. This is a fan that takes air through the line of its axis and discharges it in the plane of its perimeter. It develops a high pressure, but is of comparatively low volumetric capacity. On air-cooled engines it has been found satisfactory, but its adaptability to water-cooled systems remains to be worked out.

The engineer, in making his selection of a fan, should take into serious consideration the amount of power necessary to handle maximum air velocities through the radiator. This phase of the question has been considered by very few engineers. A study of the accompanying power curves will show that an astonishing amount of power can be used by a fan when its speeds are excessive.

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Fan Power-Consumption and Speed.

Take, for example, the 18-inch fans for which the power, speed and air delivery are plotted. At 1,000 r.p.m. the flat-blade fan was delivering a velocity in free air of 1,423 feet per minute on a power consumption of 0.077 hp.

The multi-blade (five-arm) fan, at 1,000 r.p.m., was delivering air at a velocity of 2,580 feet per minute on a power consumption of 0.18 hp. under the same conditions.

Now compare this with what took place at double the speed (2,000 r.p.m.). The flat-blade fan handled air at 2,826 feet per minute velocity and consumed 0.524 hp., and the multi-blade fan generated

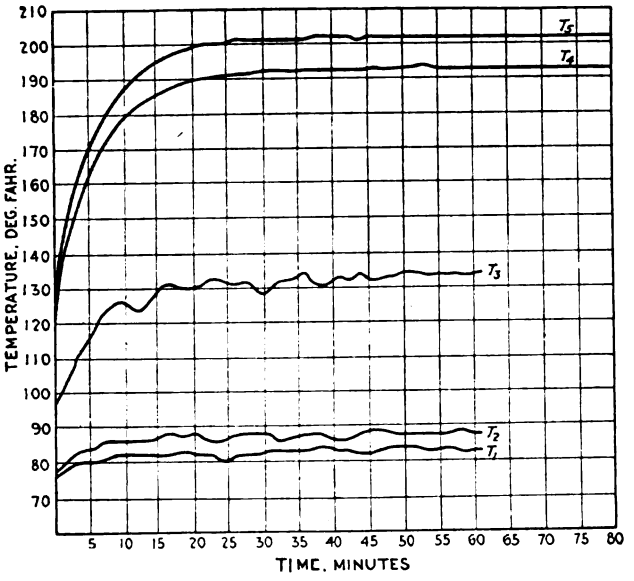


FIG. 4—VARIATIONS OF AIR AND WATER TEMPERATURES

T_1—Free air in room. T_3—Air entering radiator (4 in. from face). T_2—Air leaving radiator (¼ in. away). T_4—Water at pump. T_5—Water in top of radiator

Fan, five-arm multi-blade (std.). Diameter, 18 in. Engine speed, 998 r.p.m. Fan speed, 1591 r.p.m. (3.4 per cent belt slip). Load on dynamometer, 12.5 hp.. Velocity of air through radiator, 887 ft. per min. Belt, built-up V-type. Radiator, square air tube, 3¼ in. core.

a velocity of 6,060 feet per minute and consumed 1.4 hp.

The increase in power, it will be noted, was almost in direct proportion to the cube of the speeds.

Many engines are so geared that the fans at times are supposed to be making as many as 4,500 r.p.m., and the power consumption theoretically increases to 6 or 8 hp. It is the author's contention that such a power expended on driving a fan is completely wrong, and that its practice should be discontinued without delay. Engines running up steep hills or through heavy roads are frequently shifted into low gear in order to let the cylinders do the work possible at high piston speed. Under such circumstances, then, the fan is demanding one-sixth to one-eighth of the engine's power. This 6 or 8 hp. generates its quota of heat, which again has to be extracted. It is a good fan that will assume this additional burden without allowing boiling.

Fan Belts and Pulleys.

In looking at the situation from a practical standpoint we must investigate the medium through which this high power reaches the fan. This transmission is usually through either a flat or V belt. Can a leather or canvas belt, whose contact width is between ¾ and 1¼ inches, transmit much over 3 hp.? The best authorities on the subject say it cannot be done. This answer is probably correct.

Many pulleys in use are too small in diameter. While theoretically pulley diameter has no effect whatever on power delivery, it does have a material effect on belt slip, and consequently upon fan speed. Much fan trouble arises from this cause.

The experience of belt makers shows that a pulley should never be of a diameter less than 30 times the thickness of the belt. This is practically out of the question in most automobile designs, as it would necessitate a 4-inch pulley. However, the fault of going to the other extreme and using a pulley 1½ to 2 inches in diameter should be corrected, and must be before the automobile manufacturer can feel assured of getting the designed performance from fans. A minimum diameter of 3 inches is earnestly recommended.

Much remains to be done in selecting belts, and from recent reports it appears that some types of V belts are giving superior service.

Experiments conducted by the author demonstrated that with a 1-inch flat belt a 15-inch fan could not be driven at a speed greater than 3,200 r.p.m. without a large percentage (over 30) of slip, which soon proved destructive to the belt.

The summary of the whole situation, then, is that when the engine gets beyond a certain speed, so that the fan makes 4,000 r.p.m. or over, the belt begins to slip, and once this condition has set in the fan becomes worse than useless. A slipping belt does itself much harm, and in addition polishes the fan pulley so as to make the percentage of slip at normal speeds greater.

Disadvantages of High Fan-Speed.

Several hundred thousand cars are built annually in which fans are so connected as to develop a speed of from 2,000 to 2,500 r.p.m. when the car speed is 20 m.p.h. These cars, most of them, do not show a tendency for the engine to heat when traveling over smooth roads at that speed, but they do when making from 30 to 40 m.p.h., or when the engine is doing the same amount of work in one of the low gears. Then, at just the time when the cooling agents are most in demand, the fan is either slipping, or using an amount of power not at all commensurate with its cooling power.

In fan practice, both in the ventilating and in the automobile trade, it has been pretty well proved that all fans become noisy when their top speed exceeds 5,000 feet per minute. At any speed beyond that there is bound to be noise, which increases with the speed. When 16 and 18-inch fans are running at 2,000 r.p.m. or more they are far above the silent-zone speed. In many cases they produce sounds much resembling a sawmill.

When a car is racing at 35 or 45 m.p.h. the driver is too busy to notice the objectionable noises, but when the same car rolls down a smooth city boulevard at 20 m.p.h., and all of the other mechanisms are practically noiseless, it is somewhat incongruous to have a little 2 or 3-pound fan making all the fuss.

The demand from engineers who build our standard cars is daily becoming more insistent for less noise from the fan. The only way for this demand to be met is to bring the fan speeds down to somewhere within reasonable limits.

The apparent obstacle to meeting this demand

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successfully is the fact that, generally speaking, fans in use today will not deliver much air until they are buzzing at tip speeds of about 10,000 feet per minute. It is to be hoped that automobile engineers will make fan builders produce better fans.

Everything points to the necessity of reducing the fan speed; wear on bearings and belts, noiseless operation, and, most of all, conservation of power, demand fans that can deliver the air at lower speeds. In short, we must have better fans.

Types of Fan Bearings.

Bearings are of several distinct designs: the plain iron or steel bearing, similar to an ordinary wagon wheel on its axle; the bronze bushing on the steel spindle; the cup-and-cone ball bearing; the roller bearing; and finally the annular bearing.

The iron hub or steel spindle bearing satisfies the demand for a low-priced bearing. It gives satisfaction of a certain kind, but it is subject to and does have so many troubles that it really should not be used.

The bronze bushing on the steel spindle is good enough in its way, but it costs real money when properly made, and has a tendency to let its lubricant run out at both ends and spatter things with grease. The saving in cost over one of the types of roller bearings is so little as to make it hardly worth while.

The cup-and-cone ball bearing has been the most widely used of the so-called "better bearings."

The author has never been able to comprehend just how this type became so popular since its basic principles are wrong for most fan applications. For shafts or spindles that present a uniform vertical thrust the balls take the load in a normal line because their obliquity to the axial line is compensated for by the opposition of one set to the other. Such is the case in motorcycle and bicycle axles. The belt on fans exerts a heavy downward pull, usually from the line half way between the cups and the fan, then exerts a thrust at right angles to the belt pull. The whole arrangement, therefore, seems wrong.

The cup and cone bearings apparently are always looking for trouble. As a matter of fact, a good cup and cone bearing ought to be the most expensive kind to make, but again the element of reduction in first cost has influenced conditions to a point where the greatest criticism that can be made is of the quality of the materials used.

The annular bearing is the ideal for those who are willing to spend the money for quality. Good annular bearings cause no trouble and good ones can be found. They are noiseless, and reduce friction to a minimum. They can also take up the thrust without the interposing of thrust washers. The automobile engineer should, however, look out for cheap imitations as there is a wide difference in quality among the many makes of annular bearings. The best that can be had is none too good.

Roller bearings of several types have been offered for fan use. The application of these on fans has been comparatively limited, but there will be a decided increase in their use during the next year. One make in particular has stood the test of continuous running and meets the price qualifications within reasonable limits. It consists of a series of helical steel rollers held in place by two end disk washers. The latter are rigidly held in their planes by small rods that also serve as spacers between the rollers. The whole presents the form of a hollow cylinder 2 inches long. This is placed over a carefully machined steel spindle. Into the pulley hub is inserted a seamless or split steel sleeve that acts as an outer path for the rollers while the steel spindle is the inner path.

It is earnestly recommended that this subject be considered by the society with a view to standardizing one or two types of bearings. The engineers could then write uniform specifications and fan makers would be free to devote more effort to the fans proper.

Applications of Fans.

Taken, then, as a whole unit, the fan should be considered with all the care given any other part of the car. Other parts of the chassis and body should be constructed with a view of letting the fan do its

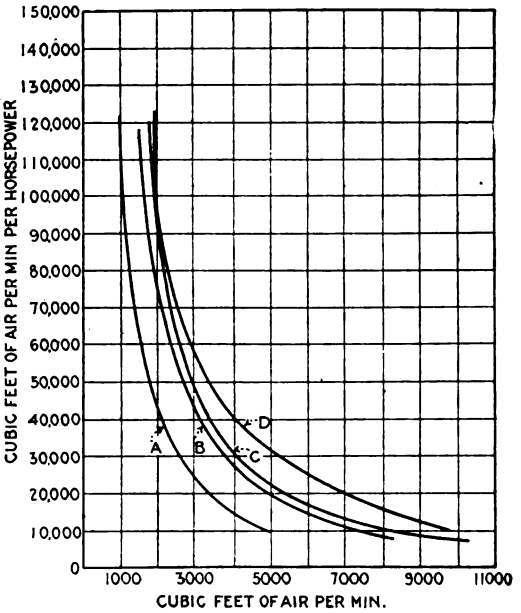


FIG. 5—RELATION OF HORSEPOWER AND FREE AIR DISCHARGE BY 18-IN. FANS

Curve *A*—Four-blade fan (flat blades). *B*—Three-arm multi-blade. *C*—Five-arm multi-blade (standard). *D*—Five-arm multi-blade (special)

work in the most efficient manner. Assuming, now, that a fan has been selected, the nature of its application must be studied.

The air intake through the radiator should present as little friction as possible; there is a wide difference in this respect. The distance between the fan and the radiator should always be ½ inch.

The air "getaway" will bear much improvement, and such improvement can be made. For best results, the discharge area should exceed the intake area by at least 20 per cent. This rule assumes, also, that the discharge space will be in one location and unobstructed. No automobile known to the author presents such a condition. Moreover, in every car thus far measured, the discharge areas are less than the free radiator supply area.

Spaces under the dash are hard to alter, but plenty of louvers can be inserted in the hood, and these should be figured as the primary means of air escape. Why the car designer objects to louvers is not altogether clear, but their necessity is so great that appearance can well be sacrified.

The air passing through a radiator expands a

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great deal under the hood. With an inadequate escape area, the static pressure builds up to a point beyond the fan capacity and relieves itself by backing out through the radiator.

To overcome this, shrouds have been placed around fans in some cars. The effect is then to increase the air distribution over the front of the radiator, but the shrouds are inefficient because of the sharp angle they necessarily make with the rear face of the radiator; furthermore, they cannot increase the capacity of the fan.

The air velocity will be greater than it was through the deep radiator because the friction has been reduced. Thus the fan has even more than compensated for the reduction in core.

TO WOMEN FROM A WOMAN.

Good Advice for Either Women or Men Automobile Drivers.

From Mrs. A. Sherman Hitchcock, Rhode Island. —Every woman who intends becoming the driver of a motor car should familiarize herself thoroughly with the rules of the road and traffic regulations and never deviate from them. There would be fewer motor accidents if they were all operated in strict accordance with the rules I am about to give.

Pass any moving vehicle going in the same direction on the left. Even if there is room on the right always pass to the left. Do not attempt to pass anything unless you can see a clear fifty yards ahead. If obliged to pass to the left of a trolley car, whether it be standing or in motion, be sure the view is unobstructed and do not pass a standing trolley car without slowing up or stopping entirely; also be sure to give warning. Do not attempt to pass a vehicle going in the same direction when about to turn a corner or curve. Someone may be coming from the other direction. Better wait until the view is clear. If another vehicle is trying to pass you, keep well to the right. Do not pass anyone on the street whose back is to you without giving warning, as they may step backward at any moment.

In turning into another street do not cross from right to left without looking back. If another car is following hold out your hand. Traffic from a by-road in all cases gives way to that on the main road. Unless you can see 100 yards clear both ways when coming from a by-road to a main road, come very slowly and sound your horn. If there is other traffic on the main road it is for you to keep clear of it, and not for it to keep clear of you. Never approach a curve at greater speed than will permit the car to be stopped within its own length. Nobody knows what may be coming in the opposite direction, and if anything is coming the chances are its driver will not be observing the rule of keeping to the right. Take all corners slowly. Those you think you can see around may conceal a child. Take all corners to the right as close to your own side as possible. In taking corners to the left keep as close to the right side of the road as possible. The sharper the turn and the more difficult it is to see around, the slower the pace must be and the more necessary it is to observe these rules.

Be careful about running fast on slippery or sandy roads. Even the experts are careful in such cases. Remember that even non-skids will slip upon a very dry road if you are taking the corner at high speed. They will also skid freely upon wet asphalt. A front-wheel skid calls for the application of the brakes; a back-wheel skid never. If your car be given to skidding upon the front wheels, have a non-skid upon the off fore-wheel. It will hold you around the corners. Tires are saved by coming slowly over the top of a hill before the descent begins, taking corners slowly, and using the brakes gently. Tires are injured by coming fast on to a descent and then checking; by going fast around corners and putting on brakes hard and suddenly, or in starting too fast or with a jerk.

Keep in the middle of the road. You can't run into a ditch unless you first get dangerously near to that ditch. Avoid any spot in the road or at its side where underbrush appears. Underbrush thrown on the road often covers dangerous holes. Underbrush growing at the roadside is very likely to have its roots in a ditch that means trouble if your car approaches too near. If the road is narrow and you are approaching another vehicle, slow down. When you see any likelihood of a horse becoming restive, stop. If necessary, do this even before the driver holds up a warning hand. Horses have become so accustomed to motor vehicles that it is seldom necessary to be obliged to stop, but when touring one is quite apt to encounter cases of this kind and it is well to always act quickly before there is any possibility of an accident.

It is unwise to leave your car on an incline, even with the brakes on, unless the front wheels are turned to the curb. You can never tell who may release the brakes. Never let your car stand on a hill. The average country road hill is never too wide at best and traffic needs all the available room, without having any part of it taken up by a car that could just as well stand at the top or bottom. Never let your car stand at a curve in the road. Another car rushing around the turn may ruin it and maim and kill.

Do not look backward unless you are sure that no vehicle is in your immediate vicinity ahead. Always be very sure regarding railroad crossings and never, under any circumstances, take the least chance. Some of the most deplorable accidents with much loss of life have resulted from the driver not being quite sure that all was safe. Approach all crossings carefully and when a guard is stationed at the crossing obey his signal, otherwise slow down and make absolutely sure that no train is approaching from either direction. The fatal accidents resulting from this one thing seem especially dreadful when we realize how easily they might have been averted.

Test your brakes every morning. Read and study the traffic laws of your city and State. Respect the rights of pedestrians. Keep within the speed limit. Always remember that it is better to cause a delay than an accident. Life is too short to take chances.

A source of noise that is frequently overlooked is the case covering the timing gears. It should be kept filled with lubricant, but if it becomes empty it acts as sounding board and intensifies the noise of the gears.

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WHY NOT BE PROUD?

There was never a greater slander than to accuse us as a nation of vanity and self-glorification. If the United States is given more to these qualities than either Germany, England or France, then we fail to see it, but if this is a proud nation there is abundant reason for it.

We have more than 100,000,000 people. Our territory touches two oceans a thousand leagues apart and stretching through all productive degrees of latitude. We can grow every product of temperate and torrid zone. There is nothing that enters into the consumption of civilized life that we cannot produce. We can raise wheat enough to feed the world; corn enough to supply its wants; cotton enough to clothe it; cattle enough to supply it with meat. We have coal fields enough to warm the world; petroleum enough to run its engines; timber enough for twice over our needs; gold, silver, copper and iron practically inexhaustible; fisheries that swarm with food—enough for ourselves and as many more. We can grow better apples and better oranges than can be found in all Europe or Asia.

We have made more automobiles than all the rest of the world besides, and our people are using three times as many as the world elsewhere is using. We have laid nearly as many miles of railroad and stretched quite as many miles of telegraphic and telephone wires as in all the world put together.

Our internal commerce is simply stupendous. Thousands of steamers may be counted on the Mississippi river and its tributaries, and the great lakes are dotted with the largest of craft, loaded with our own products.

We have the largest seaports in the world; factories that can spin and weave all this nation and several others can wear; shops that can make all our shoes and many more; furnaces that can smelt and forges that can roll all the iron we can use, and supply much to other less fortunate nations.

We can make any article of machinery from a tiny watch to the biggest engine. And what a contribution to the world's agriculture are our harvesting and farm inventions! We invented the sewing machine, the steamboat, the telegraph, the telephone, even the submarine boat that is just now being turned against us.

We give so liberally to charity, to education, and to religion, that it should inspire the admiration of all other civilized countries, and so much that our intellectual and moral culture are higher than those of any other nation in the world. More, indeed; we have taken nothing short of millions of the oppressed, down-trodden, poverty-stricken and ignorant citizens of the countries that criticize us, put them on their feet, raised them up, educated them, and made just as good citizens of them as they would let us.

Indeed, this nation may well be proud of what it has done, what it is, and what it is doing. If we are not proud of our government, of its keen sense of justice, of its power used so righteously in all cases, of its stability, of its amazing tolerance and unselfishness, then we ought to be ashamed of ourselves.

No good citizen will allow by word or deed any reflection upon the goodness or greatness of our common country.

ANYTHING THEY WANT BUT—

The grumblers and the discontented must not forget that in this country they can have any kind of government they want. In most countries they are obliged to take what is given them. Here they can choose for themselves.

If they want an I. W. W. government—whatever kind of government or lack of government that may mean—they can have it; if they want socialism they can have it; if they want a government where the utmost consideration is paid the rich and little to the poor, and where higher respect is paid to wealth than to talent or virtue, they can have that also; if they want an oligarchy they can have it; if they want a communistic government same as that which gave rise to the famous "reign of terror" in Paris, they can have it. If they want the single tax of Henry George, or free trade, or protection to our industries, or any of the other things that are so ardently desired by portions of the body politic, they can have any of them.

Yet there is but one way only to get any of these laws or forms or systems of government, and that is to secure a vote of the majority. And if the cause they so ardently champion is a worthy one, to get the necessary majority should not be difficult. Although the press may not always be depended upon to champion a cause or to oppose it, yet it can invariably be relied upon to spread broadcast the facts about it, so that the voters can make up their minds

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easily whether they want it or not. No good cause need ever be lost, no bad one need ever be gained.

Let this not be forgotten, however: Woe be to any class, or clique, or gang, no matter how good or bad their cause, who imagine they can secure what they want by force, or threats, or intimidations, or lawlessness. If they can't get a majority of the voters of the country to believe as they do, they must either get along with things as they are or get out of the country.

BUSINESS WILL BE GOOD.

What is business? Why, it is simply supplying the people with their wants and needs. Business is not begotten in the bank, the counting-room, or the office; these are but the effects of business—the response to the cause. The man who makes business is likely to be in the shop, or on the farm, in the factory, or at the forge. He is toiling and moiling to get a good week's pay when Saturday night comes so that he can purchase some groceries and dry goods, and possibly go to the moving picture show or theatre, or, better yet, put something liberal into the contribution box at church on Sunday, or take a week-end trip with his car. He may have enough in that week's pay to purchase his wife or his daughter a new dress. He may be able to save up a few dollars from that week's pay for a home of his own, or for an automobile.

And all this makes business. In fact, it is about all there is to business—this matter of food and clothing and housing, and educating and uplifting. Take these away and there would be no business. In countries where they exist in the most meagre and penurious fashion only, there is little business.

Of course, business may be anticipated. That is to say, a man may produce something like an automobile, a piano, a plow, a suit of clothing—anything that the people need or desire—with a view that the prospects are favorable for its disposal and consumption. But it is as important to be assured that the people have the means or power to consume it as it is that they have the will or desire to consume it. The people always have wants and the desire to gratify them, but they do not always have the means to gratify them.

The off-hand remark: "Let business go on as usual" has little effect one way or another. It will go on without a command, and it will not be stayed by indifference. The only question as to business is whether you as a business man are going to get it, or whether you will allow it to pass on to some one else. That it will be done by some one goes without saying. All the people are working and consequently all are spending. There has not been a time for many years when the conditions for good business were more favorable than now.

Moreover, the thing that is absolutely necessary to the execution of business—money, a medium of exchange—exists in about the same volume that it ever has. It is true it has largely changed hands, but it still exists, and this change has taken it from the rich, whose wants and needs were already well supplied, and put it into the hands of the former poor whose wants and needs are not supplied, but who will liberally supply themselves now that they have the means.

During these abnormal times of war the production of things that people need has by necessity been largely curtailed, in order to give place to the production of the things needed for war. In addition to this, a large portion of the young and able-bodied producers of the civilized world has been withdrawn from productive channels. They are now consumers only. Thus it may easily be seen how pressing the demand must be for things the people want and need, and who likewise have the means to purchase them.

How can business fail to be good then, and whether or not the war ends soon or continues long?

Of course, lack of confidence and of optimism would delay production somewhat, but as far as we can see, these qualities strongly exist among business men. Producers are handicapped by the scarcity of raw material and by the pressing necessity of making war supplies, but the need of general production is imperative and it will continue to exist for some years or until the demand has been met.

This government is likely to spend on account of the present war anywhere from $10,000,000,000 to $20,000,000,000, and possibly much more. Some of this money will go abroad, but mighty little. Most of the loans to foreign governments are in the form of credits; the cash itself will remain right here. Probably three-fourths of this stupendous sum will be filtered along down among the common people, and there it will mostly remain until it is spent for comforts and luxuries—the things that keep our mills and factories and stores and farms full of activity. And this is what makes business.

A LESSON OF THE WAR.

The venerable president-emeritus of Harvard University, Charles W. Eliot, had a page article in a recent number of the New York Sunday Times, in which he says that the "best of the lessons" of the present war are that:

"Adequate production in manufacturing industries cannot be brought about or maintained without the abandonment of the doctrine of limited output, a doctrine long carried into practice by some important labor organizations."

The war has taught no such lesson. It has taught absolutely the reverse. The situation is this: The war has withdrawn much more than one-half the able-bodied men from productive channels in the countries engaged in it, and put them in the ranks of the consumers only. It has likewise put something like one-half of those left into the production of arms, ammunition, and other war necessities. And yet the amazing fact is that these countries are keeping production well up to the demands, even with this far less number of producers. Of course, young women have helped much to keep up the necessary production. They are employed in channels never dreamed of before. But having gone into it they can't very well be turned out after the war is over simply to find work for the millions of young men who will have to work in some form or another to get a living.

Being able to supply the pressing needs of the people during war time when such a large proportion of ordinary producers are either consuming only or at work on a kind of production that will not be needed after the war is over, the question arises, what about production and consumption when all the workers of the world, including the rank and file of women, are again producing the

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things that people need of food, clothing and luxuries?

Why, production will so far outstrip normal consumption that every producing nation on earth will be eager to find some other nation that will purchase and consume its surplus. Dr. Eliot is greatly mistaken in his postulate. The doctrine of "limited output" will have to be followed out more vigorously than ever known after the war is over and as soon as the needs of the people have been replenished, or there will be such a congestion of manufactured goods of all sorts that prices will sink below the cost of production.

There will be only one way to mitigate this situation—only one way to find a market for normal production, such as will ensue with even a moderately limited output, and that is to see that the great mass of the people make sufficiently good incomes so that they can afford to purchase what they need, and to a limited extent also, what they desire and may not absolutely need.

THE UNEXPECTED.

Times like these bring out both the noblest and the meanest qualities in human beings and often where least expected. Take the matter of enlistments, for example. In one instance, a young man with a family, who did and said everything in his power to keep our country out of the war, was among the very first to volunteer his service for the army after war was declared. And although he was asked if he did not want a commission the officer in charge of the enlistment noticing at once his superior qualifications for such distinction, yet he replied that it seemed to him that the greatest need was for common soldiers and it was his desire to help fill that need. We may remark that the person we refer to has for some time been one of our valued contributors, but his modesty might not permit him to approve our mentioning his name. Another instance: This is the case of an only son, a sophomore in one of our well-known eastern colleges. He was anxious to enlist and first applied for a position in the navy and then for one in the army. Unfortunately, his eyesight was defective, and he was rejected. But nothing daunted, he next sought for a position in the ambulance corps, and his knowledge of a car and how to run it made his quest successful despite his poor eyesight. So he has now left college and will soon be in the field "somewhere in France." It is gratifying to note that despite the fact that he is the pride of his father and mother, and that they were bent on his acquiring a professional career, they were cheerful in the thought that their beloved son was to be of service to his country.

On the other hand, it is noticeable that many who complained loudly and bumptiously when strong efforts were being made to keep this country out of the war, seem to have now lost their patriotism and grumble at whatever sacrifices they are called upon to make for our common defense. It all goes to show that no one can tell what's in a man or woman until it has been called out or put to the test.

Expert chauffeurs don't care if their engine misses a cylinder once in a while so long as it doesn't miss a pedestrian.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Ran Into a Train.—Near Red Bank, N. J., a woman having taken her husband to the station, stopped her car facing a train. When she started to leave the station, she forgot to reverse the engine. The automobile started ahead instead of backward and the woman lost control of it. The car ran over the benches, smashing them to pieces and stopped at the side of the train.

Fractured Her Skull.—Near Philadelphia, a young woman jumped on the running board of a car, driven by two of her men, intending to get off when she reached her home. When she got there, the car was not stopped; she jumped off and fractured her skull.

Caused by a Toy Balloon.—Near Little Falls, N. Y., the wind blew a toy balloon held by an infant, into the face of a driver of a car. This so disconcerted him that the car was pitched over a 50-foot embankment to the railroad tracks below. A woman was killed and the rest of the party were more or less severely injured. The car overturned several times before it landed and of course was completely demolished.

Plunges Into Creek.—Two cars came into collision near Seneca Falls, N. Y., and one had a front wheel torn off. The other swerved to one side, hit an iron railing and toppled over into a creek by the roadside, taking its occupants with it. When the car landed. it was bottom side up. The front was totally under water but the man was able to get his wife and children out from under the car, and strange to say, they were not fatally injured. The owner of the car says he cannot see how his family was saved from death.

Trapped on the Railway Track.—Near East Foxboro, Mass., a lad ten years old was killed when his father's car was trapped upon the railway tracks. The further gate guarding the tracks having been lowered after the car was allowed to pass the first gates—the driver of the car saved himself by jumping for safety, but his son's body was thrown into the air and hit by flying parts of the machine. It is claimed that the gates worked improperly, and moreover, that the train was going at a tremendous speed as it approached the crossing.

His Hat Blew Off.—Death interrupted a wedding near Joliet the other day, the bridegroom having been killed while on his way to meet his fiancee. The man was a little late and his hat blew off. With one hand on the car, he stooped over and attempted to catch it with the other hand. He slipped and fell under the wheels. He was immediately killed. At the time of the accident, he was riding on the running board of the car.

A Lunatic at the Wheel.—Four were killed and seven injured in a head-on collision of two automobiles near New Bedford, Mass. A patient of a lunatic asylum on parole had seized the wheel of one of the machines and twisted the steering gear in the wrong direction. It plunged into an approaching car and scattered the occupants of both cars in all directions with the result as stated above.

Struck by a Fast Train.—Certain occupants of an automobile were hurled into the air at Port Clin

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ton, N. Y., and six of them were accidentally killed. The car is said to have stalled on the track when the collision came. One young woman landed on the locomotive and was carried a quarter of a mile before the train could be stopped. There was neither watchman nor gates at the railroad crossing.

The Axle Broke.—Two young men were in a car near Auburn, N. Y., and as it went over a railroad track at high speed, the axle broke, making the steering gear useless. The car turned over twice and one of the young men was killed.

When Too Near an Embankment.—A big car filled to its utmost capacity, slipped off the side of the road near Los Angeles, Cal., rolled into a ravine and struck a tree. One man was killed and his two sisters were seriously injured. It appears that the road was wide enough but the driver must have carelessly gone off near the edge. The machine turned over and went some twenty or thirty feet below.

Skidded and Turned Over.—A girl was killed near Schenectady, N. Y., when an automobile in which her mother and two brothers were riding, skidded and turned over three times. The rest of the party was seriously injured but it is expected they will live. It appears that another car was approaching and that a bicycle was also in the road. In some way, the car was driven so far to one side of the road that it skidded and turned over.

Dropped into a Hole in the Road.—A man and a girl were killed in Brooklyn, N. Y., when the car they were riding in crashed through a fence protecting an excavation and fell 50 feet to the bottom. Two women escaped with slight bruises and the man also jumped and also escaped but the driver of the car and a young woman were instantly killed.

Hit the Side of a Bridge.—Two were killed and two injured when a car hit the side of a bridge near Lancaster, Pa. Three other occupants were injured. The car was being driven carelessly and hit the side of the bridge, causing it to fall 25 feet to a railroad track below.

Latest Automobile Literature.

Driving a motor car with the right hand on the wheel and the left arm around the waist of a young woman constitutes negligence, acording to the ruling of Justice of the Peace A. Barnett, remarks the "San Francisco Bulletin." He gave judgment for $97.50 against G. W. Smith, jitney operator, in favor of May Goldsteiner because he had only one hand on the steering wheel when his machine collided with a car belonging to H. Allinger.

Smith's other arm was around Miss Bessie Goldsteiner, sister of Miss May.

Miss May Goldsteiner, who was siting in the back seat at the time of the accident, sued for $295 damages to her dress, eyes and nose as a result of the mishap.

How eleven automobiles were stolen in Paterson, N. J., within a few weeks was related recently to a detective sergeant of the Paterson Police Department, by George and Louis Ehlers, brothers, who are under arrest on charges of grand larceny. Some of the automobiles were taken from within a few yards of Paterson Police Headquarters.

According to the police, the brothers told him that, acting as "salesmen," they obtained orders from farmers for automobiles, and then stole machines which would fit the requirements. They overhauled and disguised the stolen cars and delivered them to their "customers." Seven of the automobiles have been recovered.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2189 **His Ford Car Creeps.**

From O. E. Lake, Massachusetts.—Will you kindly tell me what makes my Ford car creep when I start it after it has stood a while? By using very thin oil it works better, but I lose power, I find. I know of several that work the same way, but one I know of has to be jacked up until it gets warm. I suppose this is because some parts are worn. Can you tell me which ones? What do I need to remedy my trouble?

Reply.—There is a sector on the emergency brake lever that operates against a set screw linked to the clutch pedal. When the emergency brake is applied the clutch pedal is moved forward, disengaging the high-speed clutch. If this screw becomes worn the clutch will not be fully disengaged, and will give the creeping effect described. A slight turn down on this screw will overcome the trouble. A low-speed band that is adjusted too tightly or has loose or damaged lining, so as to cause a drag on the drum, will give the same trouble, as will a too tight adjustment of the high-speed clutch. It might be well to have the emergency brake bands renewed or adjusted, so that this creeping could not occur under any circumstance.

2190 **Engine Misses and Jumps.**

From R. Strehorn, Colorado.—Will you kindly give me your opinion what to do with my car with the following symptoms: I have a Chevrolet, model 490, which I have driven 9,000 miles. I am a machinist and take the best of care of my car. Of late I have had trouble with the motor missing on a speed of 8 to 12 miles per hour. I can throttle down to 4 miles on high and every cylinder will fire perfectly, but when I open the throttle the engine will miss and jump until I get up to 12 miles and then all the cylinders will fire perfectly. I have cleaned the cylinders of all carbon, reground the valves, put on a new breaker box, cleaned the carburetor, which is a Zenith, the same as when the car came from the factory. I have had some of the best auto

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mechanics in Pueblo working on this car and it will not run any better. It only misses on a speed between 8 to 12 miles per hour. The car is equipped with Connecticut ignition. The battery is in perfect condition and the valve springs are all of the right tension and I have the best of compression and a new set of spark plugs.

Reply.—As you have checked up practically everything else, we would suggest that you try a size smaller choke tube in the carburetor with the next smaller size main gasoline jet, also. It may be necessary to do a little experimenting with different sized choke tubes and jets before perfect results are obtained.

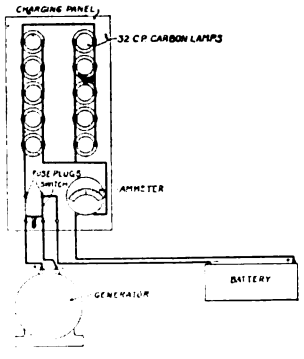
2191 **Knocks and Backfires.**

From Charles C. Barron, Ohio.—I have an Alter, model C, 1916. It has been run 4,000 miles. The engine has never been cleaned at any garage. I cleaned it myself this spring and after that it seemed to run pretty well. Not long ago it would spit back through the carburetor more or less. Now it has quit that, but the cylinders leak some compression. It seems to pull better now and picks up speed pretty well, but it has a knock at 30 miles per hour or faster with spark lever partly and fully advanced; if retarded it cannot be heard or if running at a slower speed. Please let me know if you can give me any definite location of the knock and what to do for it; also the cause.

Reply. — This indicates loose connecting rod or wrist pin bearings. It would be well to have the carbon thoroughly cleaned out of the cylinders to make sure that the trouble does not lie there, and then, if the knocking continues, the trouble is quite certain to be found in the bearings and they should be taken up.

2192 **Charging the Battery.**

From Henry G. Buschman, Oklahoma.—I am running a Fairbanks-Morse engine of 80 horsepower in a light plant. I have a 6-cell, 12-volt storage battery. I am going to use it for ignition. Now what I would like to know is, can I charge this battery with this outfit? It is a 125-volt, 10-ampere com-



pound-wound direct-current generator. Please let me know if it can be done and how you would do it.

Reply.—The battery can be charged with the outfit described by connecting in accordance with the accompanying diagram. It will be necessary to use the bank of lamps shown on some similar resistance to control the flow of current, as the battery itself does not have sufficient resistance to regulate this. The ammeter is not absolutely necessary as each 32 c.p. lamp used will allow about 1 ampere to flow or each 16 c.p. lamp ½ ampere. The battery should be charged at 10 per cent. of its ampere hour capacity, when the electrolyte is between 1,150 and 1,250, and should be cut to 5 per cent. when the electrolyte reaches 1,250, that is, if a 100-hour battery is being charged, the initial rate would be 10 amperes, which would be reduced to 5 amperes when the electrolyte reached the specific gravity of 1,250.

2193 **That Loud "Puff."**

From R. I. Cougle, Illinois.—I have a Buick light six. At times a loud "puff" occurs. It sounds as if a petcock were open, but as there are no petcocks on my engine I can't seem to determine what the trouble is. I have traced it to the intake valve in the sixth cylinder. I thought maybe the manifold had something to do with it, but upon removing it I found it to be O. K. I ground the valve and it seems to set all right. I can stop this "puff" by either changing the oil daily or squirting oil on the valve spring. Now I find the first remedy pretty expensive and the latter I do not think is a good thing to do. I was told to use a heavier oil than I am using now (medium), but I cannot see why the puff would not occur in all the other valves, too, if the oil was too thin. I have had a new valve put in the cylinder. Any information you can give me on this subject will be greatly appreciated.

Reply.—The valve cage rests on a ground seat in the cylinder. Sometimes a small piece of carbon lodges on this seat and causes the trouble described. Make sure that the valve cage is perfectly ground in, also that the beveled brass ring on top of the cage is not out of place. We are not quite certain if you replaced the cage when the new valve was installed. If not, you will possibly find that the valve stem guide is worn and the cage will need renewing. We would also suggest that you check up the valve operating mechanism to see that there is sufficient clearance between the valve stem and the rocker arm during the entire period that the valve is supposed to be closed. Sometimes a cam is a little irregular and allows the valve to close, but slightly unseats it again during the time it should remain closed.

2194 **A Missing Cylinder.**

From Jos. F. Bird, Michigan.—I own a Model T Ford of 1914, and have been bothered at times with the second cylinder missing. I have tried changing plugs and units, have put on new timer and brush; also wiring and three new units, and still the trouble is there. The motor will work fine for three or four hours, and then it will start to miss again and keep it up for ten or fifteen minutes, then work smooth again. Do you think a new unit box would help any? What would you suggest?

Reply.—It is doubtful if the trouble is in the coil box. Sometimes the valve push rod becomes worn where the cam slides against it, and if the clearance between the valve stem and push rod is small, the push rod may turn around and the cam ride on a high spot at times. This takes up all the clearance, holds the valve off its seat, causing loss of compression with consequent skipping. This may be tested out by turning the push rod to different positions and making sure in each case that there is clearance when there should be. This trouble may also

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be caused by a valve sticking in its guide. The valve stems and guides should be kept free from oil, otherwise they may become gummed and stick open occasionally. Does the vibrator for this cylinder operate when the skipping occurs? If not, the points may stick together or the vibrator make metallic contact with the end of the iron core of the coil and keep the points open.

2195 **Oil Leak.**

From Eugene L. Ferguson, Maine.—My Ford car leaks oil badly by the cam shaft into the timer so that it will skip. New washers stop it for only a short time. Will you please state through your paper if there is any other way of stopping the leak?

Reply. — The felts if properly installed with a metal washer in front should keep back the oil satisfactorily, and what leakage does occur should not cause any trouble as the timer ought always to have some oil in it; in fact there is an oiler provided on it for that purpose. The skipping may be due to a weak spring on the rotor or to dirt on the fiber parts that the roller runs on. The fiber should be carefully scraped clean and the spring replaced or its tension increased. The oil leak may be cut down by fastening a thin metal washer to the timing shaft just back of the timing gear cover. Oil attempting to pass through the opening of the cover will then collect on this washer and be thrown off into the case by centrifugal force.

2196 **Water for Batteries.**

From Albert F. Loebs, Michigan.—Will you please tell me if pure distilled water from an ordinary steam plant can be used in storage batteries safely? If not, why?

Reply.—We see no reason why water so distilled should not be admirable for the purpose. Rain water if not contaminated by dirt or dust is also suitable.

2197 **A Careless Inquiry.**

From H. J. Joens, Iowa.—Will you please tell me if it is a good plan to put a little lubricating oil in an automobile engine, and if so, how much?

Reply.—This question is too vague to answer intelligently. Sufficient oil should be carried in the crank case to have the end of the connecting rod dip into it slightly. Oil should not be put in the top of the cylinder, except when lack of oil on the cylinder wall is indicated by the engine turning over stiffly. Then two or three tablespoonfuls to each cylinder will answer. Putting oil in the gasoline, for the ordinary four-cycle automobile engine, is useless.

2198 **Battery Solution Level.**

From F. C. Barrios, Louisiana.—Would you be so kind as to explain to me an effective method which may be used to keep a storage battery from being damaged from the overflowing of solution in the same? This also destroys the wires, etc. Would you advise to use fluids that are sold to increase the mileage by putting same into the gasoline?

Reply.—For each battery there is a well-defined level up to which you should keep the electrolyte, and never raise it above that level. In some batteries the proper level is ½ inch above the plates; in some less and in some more. To test the level of a cell, unscrew the vent from its well, push a glass tube with both ends open straight down through the well and against the tops of the plates. Then close the top end of the tube with your thumb and remove the tube with the end still closed. The height of liquid in the tube will be equal to the height of the electrolyte level above the tops of the plates. Be sure and test the levels in all cells. As to the use of some fluid to increase the mileage of gasoline, such things have been advertised and are now on the market, but not having used any of them it would hardly be fair to endorse on condemn them.

2199 **Curiosity Inquiries.**

From G. H. Johnson, California.—1—Would it damage the magneto in any way to use a spark coil of twice the strength of the one on the Remy system, such as is used on the Buick, model 17, year 1909? If the low-tension Remy magneto described above would stand the strong coil mentioned, could the spark plug and interrupter points be run farther apart? 2—At what speed would a 4-foot propeller deliver its maximum propelling force, and about how many horsepower would be required to drive it? 3—Would a 4-foot aerial propeller drive a 2,000-pound automobile up a 35 per cent. grade if it were installed properly on the automobile?

Reply.—1—As the regular Remy coil is designed to take practically the entire output of the magneto and use it to the best advantage, it would not be possible to double the strength of the spark by the use of any other coil. 2—This would depend upon the pitch, width of blade, number of blades, and general design. The results obtained with different outfits vary so greatly that a practical test would be necessary if accurate information is desired. 3—There is none built at the present day that will do this.

2200 **His Inquiries.**

From H. P. Nichols, Connecticut.—1—I would like some information on the following points: In a recent article you speak of the fan wheel as a cooling factor. My car bothers on this line. Can you inform me at just what angle the blades should be set to give a maximum current of air on a Ford car? 2—There are on the market lamp regulators for Ford cars to prevent burning out of lamp. I have one and note that it seems to affect the running of the engine, when turned on for lamps much more than when direct running. Now can you inform me if this does not cause a loss of electric energy and what proportion? 3—Also in regard to various spark intensifiers on the Leyden jar principle. Also as a break and jump in secondary systems, do these arrangements accomplish much; and, if so, how much, and is there loss or waste of energy, and how much?

Reply.—The angle at which the fan blades should be set to give a maximum current of air, would vary as the speed of the engine varies, therefore, any angle would be best at only a certain engine speed. It is quite likely that the Ford company have determined the best angle for ordinary use, and it is doubtful if you will be able to improve upon it. However, if you desire to try it the blades may be easily bent and experimenting under actual conditions will

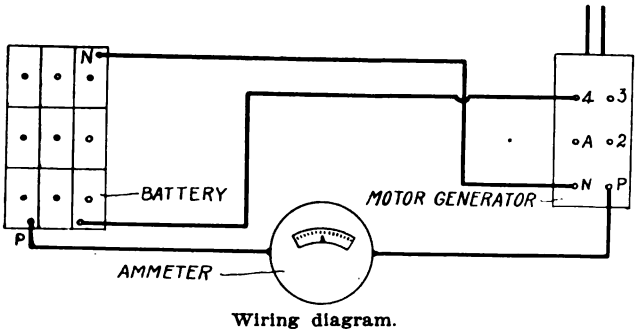
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probably give you more practical information than any theoretical figure. If the fan belt does not slip, it is more likely that the trouble lies elsewhere, and we would suggest that you fill the cooling system with a strong solution of washing soda and water, run the engine several hours, and then wash out thoroughly with fresh water. 2—Any electrical device causes the loss of some energy. It is impossible to state how much energy is lost in any one of the many makes of regulators. If the engine does not run so well when the regulator is used, it is possible that current is being diverted from the induction coil, causing weak sparks at the plug. 3—We do not know of any successful spark intensifier, operating on the Leyden jar principle. The spark gap in the secondary circuit causes a higher voltage to be built up before the spark can jump, and, therefore, the spark is intensified. This causes ignition of charges that would not be ignited without such a gap. There is no waste of energy.

2201 **Installing Ammeters.**

From Fay Brothers, Louisiana.—We have a model 1916 (built the latter part of 1915) six-cylinder Chalmers motor car, also a 1910 model G. A. D. 30 horsepower White. The Chalmers was purchased with a self-starter, but on the White we installed a starter some years later. Both these cars have no ammeters to show the rate of charge or discharge. We have been requested to install ammeters on both cars and are sorry to say we cannot do it. We wrote to the Weston Instrument Co. and they claim we can do it, but have been unable to furnish directions to do so. Our electrician claims it cannot be done and we are still knocking at doors for help, for we are anxious to put the meters on the cars if it be possible. The starter on the Chalmers was furnished with the car by the company as part of the car. The one on the White was bought from the White company and installed later.

Reply.—We will have to ask you to give us the name of the manufacturer and the model of the



Wiring diagram.

starter system installed on the White car before we can answer this question, as we cannot be sure just what system was furnished you by the White company. The following, however, may apply in both cases. An ammeter that is specially built to stand the heavy current required to operate the starting motor may be procured from the Roller-Smith Company of 203 Broadway, New York, or Monadnock Building, Chicago. In the Entz system used on the Chalmers this may be attached to either the "P" or "N" wire leading from the battery to the generator which can probably be done without lengthening the wire more than five feet. If it is necessary to add more wire than this a new wire of larger diameter should be put in as otherwise the resistance may be too great to allow sufficient current to flow to operate the motor.

2202 **Motor "Bucks."**

From Reader, New Jersey.—I have a 1916 Ford car and have continuous trouble with the motor "bucking" on low throttle. I was able to run at from 4 to 5 miles per hour on low when new but of late I cannot throttle down to less than 10 miles without bucking and jerking. I have had everything done to it and spent enough money to buy a new motor and still it will not run without bucking. It has wonderful pulling power on hills and can make almost any grade on high. Then on a straight stretch I can't get over 30 miles an hour. I have driven it about 9,000 miles. I thought of getting new Never-Leak piston rings. Perhaps that would be the cause. Or could it be a faulty magneto? Replacing the piston rings is the only thing I have not tried. Can you offer any suggestion as to what might cause this trouble?

Reply.—It is possible that the magneto is weak. Running the engine on a set of dry cells will determine this. Or a slight change in the spark plug gap, either wider or narrower, may overcome the trouble. If the machine climbs hills well, Never-Leak piston rings will probably not help much. In many cases this trouble has been traced to wear in the throttle rod or in the carburetor casting through which this rod passes. Such wear allows air to enter the inlet manifold and makes it impossible to procure a good mixture when the throttle is nearly closed. To repair this, it will be necessary to ream out the holes and install a larger pin or purchase new parts. Leaky gaskets at the ends of the inlet manifold may likewise be responsible.

2203 **Tight Fitting Rims.**

From Robert Moore, North Carolina.—My car is an Overland 85, purchased this Spring. The wheels, 32x4, are fitted with Stonweld rims, and the difficulty is that the rims fit so unduly tight that an ordinary hammer has but little effect in endeavoring to get them on or off. I have had experience with clinchers, but they are a snap in comparison with these demountable rims. I wrote the Standard Welding Co. and they put my blame on the wheel maker. I suggested to the Overland dealer here, that the lugs or studs on the rim base be filed down a trifle, but he strongly advised against this method, saying the wheels, rims, etc., were all standard and therefore just right, and that all demountable rims are necessarily fitted quite snugly which required the use of a hammer (rubber one recommended) in putting on or taking off. This has never been my idea of what a demountable rim required, and rather than undergo again the fiendish trouble I had recently in changing, I determined to file off the studs on the rims. You understand I am not referring to putting on or removing a tire from its rim, but to putting on or removing the tire carrying rim on or off its wheel. I shall be greatly obliged if you can give me any help on this matter.

Reply.—This rim is supported at the back by a complete bevel ring and at the front by the several wedges. The studs do not carry any of the weight and usually do not touch the felloe of the wheel.

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Their chief use is to keep a slight space between the rim and the felloe so that the wedges may easily be entered; except the one at the valve stem, which, of course, keeps the rim from creeping and breaking off the valve stem. Certainly, a demountable rim that must be put on or taken off with a hammer, even a rubber hammer, falls far short of its purpose, and we would, by all means, advise that you file off the studs so there will be no difficulty experienced in making the change.

2204 Can't Keep the Battery Charged.

From J. B. Belcher, Virginia.—I would be glad if you can give me some information on the following: I drive a Maxwell 1917 model touring car, equipped with the Prest-O-Lite starting and lighting system, and cannot keep the battery charged. It will go down once every month. The generator shows charging all the time when the car is making 15 miles an hour and over in high gear. Have had the wiring gone over and it seems to be in perfect condition. The battery is kept in water at the proper point, yet it runs down and will not turn the motor over after a full charge for more than two weeks. The motor is very hard to start and has most of the time to be cranked. I have a Stromberg carburetor on the car, which is in perfect condition. Any information you can give me will be appreciated.

Reply.—We are not familiar with the Prest-O-Lite starting and lighting system. The Simms-Huff system with a Prest-O battery is the regular equipment for this car. The fact that the motor starts very hard may account for the battery becoming quickly discharged. Other Maxwell owners have found that the engine may be more readily started with less drain on the battery if the starter pedal is released when the first half revolution of the engine is completed. If the starting motor is not thrown out of mesh the instant the first explosion occurs, it causes considerable drag on the engine, slowing down the speed of the crank shaft so much that the second spark is too weak to ignite the charge. The result is that the engine is cranked, one explosion occurs, the engine turns a few revolutions without an explosion, and then one more explosion occurs with the same result. Occasionally, the first explosion will develop sufficient speed to give a good spark in the cylinder following, and the engine starts. Otherwise, an excessive amount of current is used. With a little practice you will learn to anticipate the first explosion and release the starting pedal so that the motor gear will be slid out of mesh just as the explosion occurs. The engine will then turn freely and start without difficulty. Although the generator charges the battery at speeds above 15 miles an hour, it may not charge at a high enough rate. You might check this up with other Maxwell cars, and if the rate is low, clean the commutator with No. 00 sand paper, and if then necessary have the regulator adjusted.

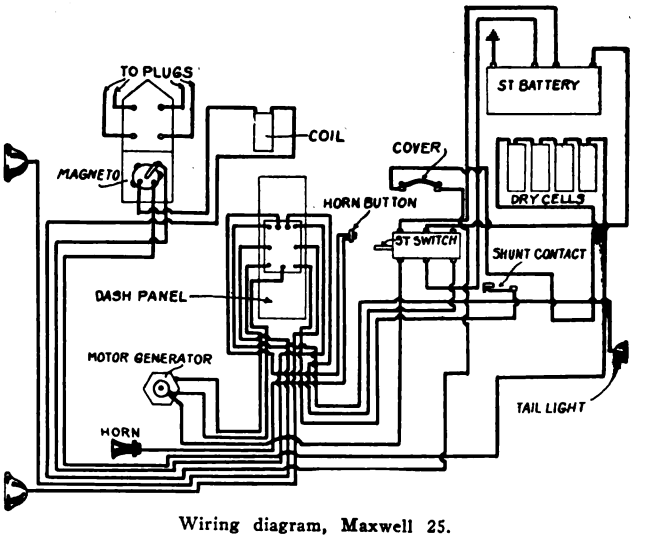
2205 Storage Battery Power.

From Barber, Johnson & Co., South Dakota.—Will you kindly tell us through your magazine why each cell of a storage battery has an energy of only 2 volts approximately? Why is it not possible or practical to build a six, eight or ten volt cell on even a sixty or one hundred ten volt cell?

Reply.—In a storage battery electricity is produced by chemical action. When two lead plates are immersed in a solution of sulphuric acid of 1,300 specific gravity, an electrical pressure of practically 2.5 volts is generated. By increasing the strength of the acid, a slightly greater pressure may be generated, but the plates would be attacked and quickly wear out. Also, the battery would rapidly discharge itself when not in use. It has been found that a battery using an electrolyte of 1,200 to 1,215 specific gravity gives the longest life, holds its charge best, and is most satisfactory in every way, except that the voltage is slightly lower and a greater quantity of acid is needed. The 1,300 specific gravity electrolyte is used in automobile batteries at the sacrifice of the life of the battery in order to decrease its bulk. Other types of batteries have been built which give a greater voltage than the lead battery, but the action of the electrolyte is so violent that they fast destroy themselves and, therefore, are not a commercial success. There are other batteries in general use that are preferable to the lead battery for some purposes because they will stand greater abuse, although the voltage generated in a single cell is only about half that of the lead cell. So far there has been discovered no combination of chemicals and metals that will give a high voltage with a reasonable length of life.

2206 Wiring of the Maxwell.

From J. Belanger, Massachusetts.—Will you please tell me how to wire a Maxwell car equipped with a Simms magneto and Simms generator?



Wiring diagram, Maxwell 25.

Model of the car is No. 25, 1916. I will greatly appreciate it.

Reply.—The accompanying wiring diagram is what you wish. This is the standard equipment for Maxwell cars. The combination cut-out and regulator is mounted on the rear of the dash panel carrying the ammeter and switch.

2207 Valve Location.

From Andrew B. Fennewald, Missouri.—Are valves in the head motors better than other kinds and in what respect? Have they any disadvantages? Are they more powerful?

Reply.—The location of the valves is a matter of choice on the part of the designer of the motor. As

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far as we know no one can tell which location is the better. If some one were possessed of this knowledge valves would be uniformly located. Some engineers prefer valves in the head and others prefer them on one side. The main consideration of valve design and location is that the gases be admitted and discharged from the cylinders as quickly as possible in order that the speed of the gas flow will not be impeded and cause back pressure.

In Descending Hills.

From Carl Goodenough, Littleton, New Hampshire.—In answer to Mr. Sears regarding high to second shift in the Overland 83. On a level road, slow down to five miles an hour and then shift smartly. On a hill, throw out the clutch and drop to a ten or twelve mile speed; then press the accelerator slightly, and simultaneously put the shifting lever into second speed. This double action is confusing at first, but it is entirely practicable. Try to imagine the right hand and right foot as one member, working together. I would say, in passing, that the steeper the hill the less one needs to accelerate, since the natural slowing of the car compensates for a lower engine speed. If the hill is very steep, don't be foolish; shift at the bottom.

Is Mr. Larkin in the Audience?

From F. H. Schultz, Kansas.—I would like to ask John B. Larkin of Pennsylvania, to give through your paper a little more information in regard to grease leaking through the Ford rear axle. He says to place a felt washer in ahead of the bearing, then put a new washer between the bearing and wheel. Is it necessary to use a metal washer in between the bearing and felt washer to keep the bearing from cutting out the felt washer, or will the felt wear all right without a metal washer? I have been a little afraid to try the felt washer for fear it might cut out or clog the bearing so it would not turn. I have had all kinds of grief with gears leaking at the axle, and would like some way to stop it.

New Place to Carry Tools.

From John C. McCandless, M. D., Illinois.—While physicians frequently find it necessary to explore cavities for foreign substances, it does not seem fair that tire and tube manufacturers should leave worn out iron tools inside of rubber tubes, and sell the job lot for new goods, as the following will explain: After running a new 36x5 tire and tube for about 800 miles, the tire went flat and on removal I found a half-inch cut in the tube, but no evidence of any injury to the tire in any way. I inserted a new tube in the tire and proceeded on my way. The following day I put a patch over the half-inch cut in tube without ascertaining the cause of the cut of the day previous. Had occasion soon to use this same tube in another tire, and after running about 200 miles, I found the tire was slowly getting slack. On removal, the patch was discovered to be leaking, and after repatching and all the handling I had given this tube, I felt a hard, rod-like substance inside of it. I then pushed the end of this antiquated iron tool through the body of the rubber tube and found it to be seven inches long, slightly bent. Lest some readers of your valuable journal suspect this long hard substance, found in the bowels of a rubber tube, be a petrified tapeworm, I am forwarding the same to editor in hopes that he may be able to classify this archaic specimen. The tube was manufactured in Ohio, and was used on the rear wheel for 1,000 miles in this pregnant condition. A question naturally arises as to whether this object kept looping the loop, regardless at what speed the wheel was revolving, or did it pursue treadmill tactics? In either case it would keep in contact with the outer side of the closed circle. Tools generally accompany automobiles and accessories for purposes of repair, but this one for purposes of destruction.

Note by the Editor.—As the doctor has complimented us by forwarding the full grown bacteria, not for publication, but as a guarantee of good faith, for our identification and classification, we hasten to report with considerable pride. To tell the truth, we always had an eye to being a physician. After having made a close analysis, we have decided it is of the strepto-pneumoccoccus order or group, somewhat flattened, elongated and water-logged. It probably gave the tire tube chronic sinusitis, but could have readily been expelled by the use of forceps having the corpus callosum curved forward. The doctor naturally seems to be of the opinion that it was carelessly left there after the operation by the tire maker, after the manner of—well, never mind—but we can assure him it is an artificial growth due to infection. One of our matter-of-fact assistants—a regular Grandgrind, in fact, who has no imagination whatever—says it is a screwdriver or some other tool carelessly left in the tube by a workman, and carried there so long that it has been flattened and bent all out of its pristine semblance. But he is not scientific and does not understand saprophyte life.

THE LINE SHAFT.

Its Connections, Operation and What It Requires For Certain Work.

From J. F. Springer, New York.—The line shaft is an important item in connection with the transmission of power from an engine or motor to various parts of the shop. Before considering where it should be located, let us look into the question of its size. We may easily buy a piece of shafting of too small a diameter and find ourselves involved in difficulties later on. On the other hand, if we get shafting too large, we become involved in a needless extra investment to say nothing of other matters. It is possible to determine in advance the diameter needed to give the necessary strength and rigidity and yet not involve us in buying steel for which we have no use. We must, however, determine the total horsepower we are going to transmit by the shaft and also the number of rotations per minute the shaft is to have when transmitting that horsepower.

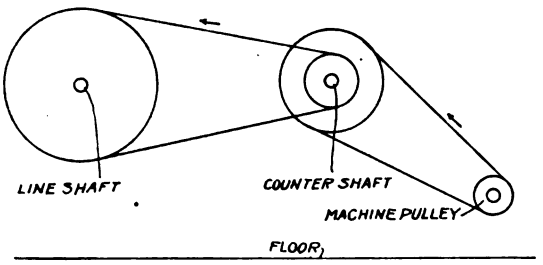
Suppose now that the horsepower is to be 8; and that we have determined that, when connected up and operating at full load, the engine will rotate the shaft at the speed of 140 rotations per minute. We want to find out just what diameter of shafting is properly required for the work. It is assumed that cold rolled steel is the material of the shafting and that the hangers are reasonably close together. What we have to do in order to get the shaft diameter is simply to multiply the horsepower by 55, then

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divide by the rotations and finally take the cube root of the result. This cube root will be the answer required.

Take the case we have supposed. The horsepower is 8. We multiply by 55 and get 440. The revolutions per minute are 140. We divide and get 3.143. Our final job is to take the cube root of this last number. We may have to look up our old arithmetic in order to find out how to take the cube root. Or, we may get some one to do it, if we feel unequal to the task. It is only a few minutes' work for one who knows how. We get for the cube root in the present case, 1.464. We learn then that our line shaft should have a diameter a trifle less than 1 29/64 inches. This will probably be an odd size; so we select something a little higher—not something a little lower—and fix upon 1 15/32 or 1½ inches. This is much better than guessing. It gives a practical certainty. If we should be compelled to guess, the only way is, of course, to guess a size too big. This wastes money, not only on the shafting itself, but on other items.

A line shaft may be driven from one end. Or, it may be driven from a central point. Other things being the same, it is undoubtedly better to effect the drive at a point midway between the ends. This may or may not be convenient, as it may require the



Line shaft along one side of the shop with machines along opposite side.

engine to be given some undesirable location in or about the shop. Better operation may be counted on, however, if the shaft can be driven at its center. The shorter a shaft, the greater its ability to resist the twisting effect of the drive. With a central drive we have in effect substituted two short shafts for one long one. All the machines will then be near the driving point.

In either case, whether the driving point is at one end or in the middle, the heavier machines should be placed closer to the drive than the lighter ones. In an ordinary repair shop, the metal turning lathe may be the machine requiring the most horsepower for its operation. If so, set it as close to the driving point on the shaft as can well be done, rather than further along the shaft. An advantage of driving the shaft from a midway point is that we double the number of positions close to the drive.

It is not at all wrong to locate the line shaft near to one side wall; but it is customary to set it nearer the half-way line between the two walls paralleling the shaft. If there are only a few machines and the shop is long enough to accommodate them all in one row, then the line shaft may be put along one side of the shop. On the other hand, if the shop is not so long, but has a good width, it may seem more desirable to locate the shaft half way between longitudinal walls and use two rows of machines—one row along one side of the shop and the other along the other side. The line shaft would thus be between the two rows.

It is a matter of very great importance that the line shaft, when suspended in the hangers, shall be absolutely straight. If it is stressed a trifle to one side, we may readily discover this fact by attempting to rotate the shaft with the hands. If right, the shaft should turn easily. There should be no places in the turn that are hard to get by. The shaft should turn easily and evenly all the way round. Do not let anything induce you to let matters go, if they are not precisely right.

The line shaft should be very rigid in its position, as there will be stresses on it from the machines or the counter shafts, these stresses tending to shift it to one side. To secure the proper rigidity there should be enough bearings along the length of the shaft. These should be well distributed. Seven feet is a good interval between bearings. On the line shaft will ordinarily be a number of pulleys, receiving and transmitting power. At the point where the shaft is driven will be a pulley connected with the engine by means of a belt. This pulley receives power on its rim and transmits it thence through its hub or a clutch to the shaft. The shaft will ordinarily transmit its power, thus obtained, through the hub of another pulley. This pulley in turn transmits the power from its hub to its rim and the rim to a belt running off to some other pulley. A moment's consideration will make it clear that the belts stress the shaft to one side. It is important, then, in order to minimize bending the shaft between bearings, to locate pulleys as close to bearings as possible. There will then be not so much leverage exerted on the shaft by the pull of the belt.

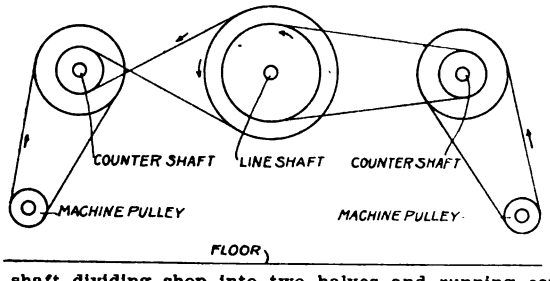
There are other ways of transmitting rotational power from one shaft to another than by using a belt; but this is the one most in use. The belt may be of leather or of other special materials. If of leather, the best belting is made from oak-tanned hides. These should, it appears, have been curried with the use of cod oil and simple tallow. A first-rate belt of high-class leather properly used will last twenty or thirty years or even longer. There are two sides to leather belting—the side on which the hair grew and the side that was next the flesh. The hair side shows more or less of a grain. This side should be put next to the pulley rim. There are several reasons for this. When a belt is bent round a pulley, the inside of the curve is shorter than the outside. That is, the material is crowded together on the inside and stretched on the outside. Investigation has made it pretty clear that the hair side is weaker than the flesh side. It is, for this reason, thought best to put the stronger (i. e., the flesh) side on the outside of the curve and thus provide strength to take care of the stretching stress. The hair side is the smoother of the two and will, when placed so as to be on the inside of the curve, cling to or hug the pulley rim with greater effectiveness.

Belts are made of a single thickness of leather, and also of double thickness. In the latter case, the two layers may be cemented together. There are thicker beltings, but they will scarcely need to be considered by us. Naturally, we shall have to use a belt of proper strength in order to get the amount of power into, say, a turning lathe that we need for proper operation. The faster a belt runs the more

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power we may transmit with a belt of given strength. It will not, perhaps, be advisable for us to go into difficult considerations. It will be sufficient for our purposes to have a good general rule. An authority on the subject states in effect that a single-thickness belt 1 inch wide may be used to transmit 1 horsepower, provided the belt is run at the speed of 1,000 feet per minute. We may use the slower speed of 600 feet per minute and still get 1 horsepower out of 1 inch width, if we use double thickness. If we have belts 1½, 2, 2½ inches broad or broader, we get the horsepower that may be transmitted by making proportionate allowances. Thus, a single-thickness belt 1½ inches wide, running at 1,000 feet per minute, will transmit 1½ horsepower; a 2-inch belt, 2 horsepower, and so on. If the belting is of double thickness and the speed is 600 feet per minute, then for 1½, 2, 2½, etc., inch belts, we calculate that we can transmit 1½, 2, 2½, etc., horsepower. That is to say, with either type of belt, we can transmit horsepower in exact proportion to the width of the belt. This is quite important, because it enables us to tell what sizes of belting to use to run the various machines.

From line-shaft pulley to counter-shaft pulley, we are apt to have a slower belt than between the pulleys on counter shaft and machine. However, the horsepower is just the same, or very nearly the same. We will, accordingly, need either a thicker or a wider belt for the former case than for the latter. The reason is this, the slower the speed the less horsepower may be transmissible with a given thickness and width of belt. And this operates proportionally. That is to say, for example, a 2-inch, single-thickness belt running at 500 feet per minute will transmit half the horsepower transmitted by the same belt running at 1,000 feet. The same 2-inch belt running at 1,600 feet would transmit 1.6 times as much horsepower.



Line shaft dividing shop into two halves and running countershafts and machines on both sides of the shop.

Suppose, now, we have a line shaft rotating at 140 turns per minute and a pulley on this shaft whose circumference is 4 feet. If there is no slippage of the belt on the pulley, we shall get a belt speed of $140 \times 4 = 560$ feet per minute. If we deduct 20 per cent. for slippage, we get 448 feet per minute as a fair determination of the actual speed. A 1-inch single-thickness belt running on this pulley can not, therefore, be expected to transmit 1 horsepower, as it would do if running at 1,000 feet. It may, in the case where the speed is 448, be depended upon to transmit 448/1000 of 1 horsepower, that is, 0.448 hp. If the machine which is to be operated is going to require, say, 2½ hp., then we will have to broaden the belt in case we stick to the single thickness. We broaden it, but how much? Every inch of width gives us 0.448 hp.; so we shall require as many inches as 0.448 is contained in 2.5. That is, 5.6 inches. This is pretty wide; so perhaps we would better consider the double-thickness belting. With it, a 1-inch width gives 1 hp. with 600 feet of speed. Consequently, with 448 feet of speed, we shall get only 448/600 hp.—that is, 0.747 hp. To get 2.5 hp., we shall need as many inches of breadth as 0.747 is contained in 2.5—that is, 3.3 inches. This, then, is the width required of double-thickness belt to transmit 2.5 hp. from the line shaft to the counter shaft. We ought to allow something over for the reason that some horsepower is really lost when slippage takes place. And for the same reason, there will be an additional loss between the counter shaft and the machine. If we want to get the full 2.5 hp. at the machine, a 4-inch belt should probably be selected.

We can reduce the belt width, and consequently the pulley width, in two ways, without adding to the thickness. First, we may operate the line shaft at a higher rate than 140 turns per minute. Second, we may increase the diameter of the line shaft pulley. If we double the pulley diameter, we double the speed of its rim, and also the rate of movement of the belt. This would result in the 4-inch belt being able to transmit double the horsepower. So, we are able to split the belt and get our 2.5 hp. by 2 inches of width instead of 4.

The joining of the ends of the belt is an important matter. It is probable that splicing and cementing, though recommended by high authority, will hardly be practicable. We turn then to other methods. There are three (1) Lacing, (2) gluing, and (3) using metal hooks or links. The importance of having a proper joint is perhaps not recognized as fully as it should be. The joint should be just as strong as the belt. Then it should be quite smooth on the pulley side. A want of smoothness seems to prevent proper adhesion between belt and pulley by breaking up the tendency to a vacuum. Then the completed joint must not be heavy, as this would create an unbalanced condition.

(To be continued.)

OVERHEATING ENGINES.

Common in Hot Weather But They May Be Avoided With Proper Care.

From H. Clifford Brokaw, New York Y. M. C. A. School.—The automobile engine will heat up too quickly in hot weather, just as an individual will. No, Percy, I did not say overeat; though if you let the engine gorge itself too long on motor fodder, it will help to overheat as well as overeat. There are a variety of reasons for the overheating, which it is well for the novice to understand.

Those who have found it necessary during the winter to cover the radiator and take off the fan belt and do other things to keep the engine hot enough to run smoothly and with the proper vaporization and firing, may find now that they are having as much or more trouble in keeping the engine cool enough to run properly.

Generally speaking, the nearer to the boiling point we can run the engine without actually having the water boil and steam away, the more efficient it will be. Some engines, in fact, develop much less than the maximum horse power because they are too well cooled, and yet this is the time that we get a great

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many complaints about the water boiling in the radiator and the engine overheating.

This would not occur if everything were working as the designer intended it should. During cold weather the man who drove with a retarded spark used up more gasoline than was necessary, but he was not bothered with overheating. When the mercury goes up he finds that his engine overheats and gives him trouble. He has not changed his manner of driving and cannot understand why there should be trouble.

Driving the engine at high speed with the spark retarded is one very good way of overheating the engine. As a matter of fact, the battery ignition systems which are now coming more into use require considerable manipulation of the spark control lever, and the tendency is, because the engine knocks at low speed, to leave the lever partly retarded, instead of advancing it, when a higher speed is reached.

With the magneto it is the general practice to advance the lever to three-fourths or seven-eighths of the full range right after the engine is started and leave it there for practically all work. except very high speeds. This may be done largely with such a system, because the nature of the spark given by the magneto changes somewhat with the speed of the engine and the equivalent of an automatic advance and retard of the spark occurs with the variation of the speed of the motor. With the battery system, however, there is very little change in the nature of the spark effected by the engine speed.

A frequent cause of chronic overheating may be traced to sediment in the radiator which cuts off free radiation of the heat. This usually may be removed by the use of a saturated solution of washing soda and water. About this time of the year it would be well to fill the cooling system with a solution of this sort and run the engine for several hours and then drain it off and refill the system with clean water. If in the system used a pump is employed, one should disconnect the upper hose from the radiator and run the engine to pump the solution out of the system. At the same time water from a hose or other source should be fed into the top of the radiator as fast as it is pumped out, and thus flush the entire system.

Where the thermosyphon system is used, which does not employ a pump, this, of course, cannot be done, but one should remove both upper and lower hose connections after running the engine with the solution and wash it out with fresh water as well as possible. A hose inserted in the upper connection probably would force all the solution out with any sediment collected, and the same process with the radiator ought to clean it out.

Fan belts are more likely to get out of order in hot weather than in cold weather; perhaps this is because the engine throws oil or grease more readily when it is warm. Belts should have grease enough to keep them soft and pliable, of course, but too much causes slipping. They should be wiped free of oil occasionally. There is always a belt adjustment and this should be adjusted so that there is sufficient tension to drive the fan at all engine speeds.

Some engines have the spokes of the fly wheel shaped to form a fan and where this is the case the oil pan and hood should be kept tight so that air will be drawn through the radiator rather than through other openings. If the radiator is not kept free from oil the outside passages will very quickly collect dust, which will prevent a free flow of air and cut off radiating surface, which also occurs when the front of the radiator is smeared too thickly with paint.

Pumps do wear out, but this is one of the last places to look for trouble. The action of the pump may be determined usually by removing the radiator filler cap when the engine is running and noting whether the water is circulating, but if a baffle plate is placed in the filler opening, it cannot be seen, and a test may be made in the same manner in which the cleaning solution is washed out, namely, by removing the top hose from the radiator and running the engine, while supplying water through the filler opening.

With the thermosyphon system there is very little pressure generated and a slight obstruction will stop the flow of water. Therefore it is more necessary to keep the system free from sediment and to see that the gaskets at the joints are made with circular openings of the right sizes so as not to obstruct the flow of water. Likewise water must be kept above the top hose of the radiator in order to have any circulation in this type of cooling system.

Another cause of overheating which it has been found very difficult to locate, comes from carelessness in stretching the hose over the pipe. In doing this sometimes the inner lining of the hose is loosened and folds back, covering the opening of the pipe, so that water does not flow freely. It looks all right from the outside, but an examination of the inside will show that it is almost entirely clogged at the end. Also the lining of the hose will often loosen up and pieces will lodge where they cut off the circulation.

Keep the engine free from carbon and keep the valve push rods adjusted close, have the mixture as lean as possible, and be sure the exhaust from the muffler is free. Taking care of these things and seeing that the other things mentioned are all right, will prevent most of the overheating which troubles the novice, if, indeed, not all of it.

They are things which should not be trusted entirely to chauffeur or garage man, but the owner should learn how to take care of each himself; then if he wants to hire it done he will know if it is being done according to his orders and will recognize the symptoms when anything goes wrong. It may take a little time and get one's hands somewhat soiled, but it pays in the long run, not alone in the saving of labor, but in the absence of annoyance when out on a trip. It is far from pleasant to have to stop along a hot roadside to make repairs which should have been done in the garage, let alone the delay and consequent upsetting of schedule. Therefore, it behooves the owner to look after these things before starting out and to learn his car so well that he will anticipate trouble and by removing causes save time and money.

It has been well said that there is one set of bearing surfaces on a car which should never be oiled—the brakes. This is not strictly true, as a squeaking brake must be oiled, but with caution. Use castor oil in moderation until the squeak is stopped.

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STARTING THE CAR.

A Few Suggestions That May Prove Useful in Case of Trouble.

If your car fails to start do not get red in the face or do anything at haphazard. There is a cause for everything and there is a remedy for everything. But if your car fails to start, you will naturally first try flooding the carburetor, make sure that the switch is in the proper position, open the petcocks and closing the eyes to guard them against any particles of dirt being thrown up, blow down each petcock, with the lips just a little removed from actual contact. The object of this is that, so far as carburetion is concerned, the failure of the engine to start up may be due either to a mixture which is much too rich or to one which is too weak. If the cylinders are charged with too rich a mixture, this action will thin it out: allow the petcocks to remain open for, say, half a minute or so.

By the end of this time it may be assumed that if the mixture were too strong it will now be quite weak, as the gas will rise up (it does not rise very high) sufficiently to leave a weakened mixture. Now put about six drops of petrol into each petcock and again allow them to remain open for a bare half-minute. Close them and have another swing. If the difficulty has been one of bad carburetion the engine will probably start now, and when once running the trouble is not likely to be very manifest.

It is rather a difficult matter to lay down any didactic instructions as to tuning up or adjusting a carburetor which is out of adjustment, as there are so many of them, and they vary considerably, not only in their complaint but also in the method of adjustment. In fact, it would require a small book for this subject alone, if one were to give a full series of instructions in the art of adjustment and the work of tuning up the various standard carburetors on the market.

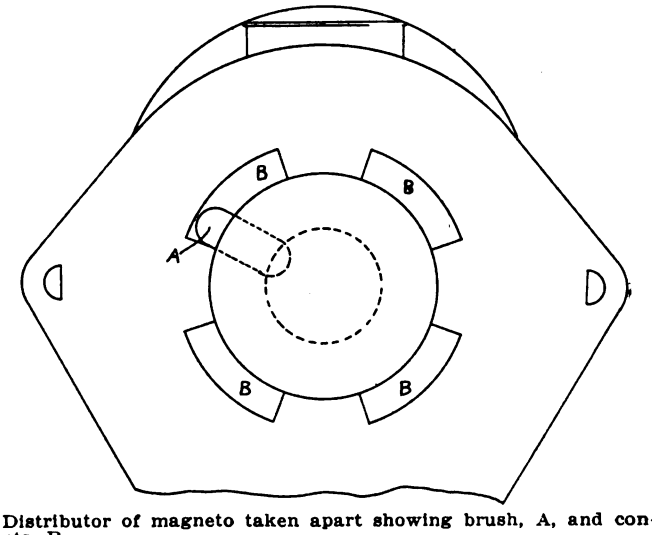
If the foregoing simple instructions have not proved successful in solving the problem, which seems to appertain to carburetion, then one may be looking round for indications of trouble further afield. Just occasionally it may be that a continual flooding takes place, and if this is so it is probable that a slight leak has occurred in the float, so that some gasoline has got inside it, and it does not rise quickly enough to actuate the little ball governors which shut off the needle valve.

Yet, again, it may be that the jet is choked with a minute particle of dirt, or partially choked, so that there is not a quick enough flow of gasoline, in which case it is, of course, necessary to remove the jet and clean it. Sometimes the jet itself may be found to be quite clear, but the passage from the float chamber to the jet may, perchance, be blocked up: there is usually a little screwed plug which can be readily removed to make sure this is not the trouble. On the other hand, the filter may be choked up, and this is a trouble which can be simply remedied. Yet, again, even the gasoline pipe itself from the tank may have got choked or the tap in some way have been turned off, either of which complaints can soon be detected.

How Trouble May Be Hidden.

One of the most extraordinary cases of trouble in locating a shortage of gasoline supply to the carburetor which has ever come under the writer's notice was due to some graphite which had found its way into the little air vent of the cap of the gasoline tank, which, of course, was a gravity-fed one. This had hardened, and as the cap was provided with a good washer the tank had thus become air-tight, so that when a certain quantity of gasoline had flowed out the partial vacuum in the tank arrested further flow. All the various defects previously alluded to had been carefully gone through by the driver, and he and his assistant were naturally sure of a ready flow of gasoline when the copper pipe itself from the tank to the carburetor had been finally proved to be free. They were greatly astonished when, on turning on the gasoline once again, it was found that the flow of spirit was still in some extraordinary way much too slow and insufficient for the needs of the engine.

As a final resource the then-unknown-to-be faulty cap of the tank was removed to make certain that



Distributor of magneto taken apart showing brush, A, and contacts, B.

the gasoline, which was known to have been in the tank, had not been stolen. All was found to be well, and on trying once more the flow of gasoline was suddenly found to be restored to its normal conditions. The coincidence set the driver and other folk thinking, and then the solution of the problem was quickly found. This fact is not mentioned as a matter in any way likely to crop up, but it serves its purpose in pointing out that, if one finds the flow of gasoline is not free, it is not always sufficient merely to cleanse the filter.

For ordinary starting-up purposes in those cars in which it is necessary to flood the carburetor, it is well to remember that slight flooding usually produces easier starting than excessive flooding; obviously, also, it is less wasteful, so that the point should be remembered. If it is found that the engine still refuses, then it is safe to assume that the trouble is due to ignition rather than to the question of carburetion.

Simple Ignition Difficulties.

If, after the carburetor has been duly doctored, the car is still obstinate, as a first step remove the main earth wire from the magneto, and—have another swing. If this proves successful it is reasonable to assume that there is something faulty with the switch itself, or that there is a shortage in the switch wiring. If so desired, the car can now be run

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just as ordinarily, except that one has not got a switch in operation, so that the engine must either be stopped by means of the throttle or the wire replaced and the engine stopped through the medium of the switch.

It is perhaps well to rule out of court a common fallacy: absolutely no harm will accrue to the magneto by using it with the main "earth" wire (it should be actually "frame" or switch wire) detached. It is just worth recording that if one finds the refusal to start up to be due to some part of the engine's electrical appurtenances, one should try the switch in the off position—in other words, in exactly the opposite position to that which is used ordinarily for starting up. It may just chance that there is some defect in the switch itself. Admittedly, it is not often that this is the case, but the writer well remembers the great consternation of a certain well-known motorist, who had spent a great time in trying to start up his engine, and after pooh-poohing the idea, reluctantly allowed a friend to swing it with the switch in the off position. At the first pull the engine started quite easily, but as the owner's only comment was far more expressive than useful, it is not advisable to record it. However, the fact itself remains that just on an odd occasion the switch may so misbehave itself as to be "on" when it is in the off position and vice versa. If these simple little first-aid remedies are not effective then one must seek a little further afield for the trouble.

Further Electrical Adjustments.

Any continued inability to start when once traced to some portion of the electrical appliances must then be sought for in other directions. First of all have a look around at all the wires to see that the terminals are right, the connections good, and the insulation not broken anywhere in a position in which a shortage could occur.

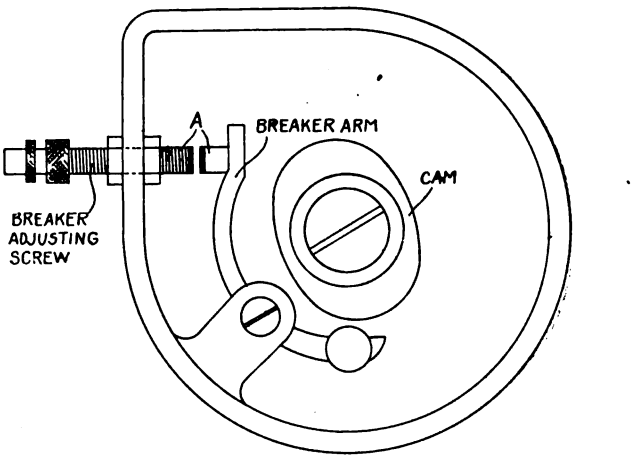
A plug may now be examined and, if found to be dirty, that is to say, internally, sooty or very oily, it is reasonable to assume that the others are in the same condition. Therefore, take them out and clean them, for which purpose a small quantity of gasoline may be employed to rinse them in, although, of course, one must be careful as to its after-disposal.

En passant, it should be mentioned that one should never throw gasoline down a water drain, and if it is necessary to throw the spirit away do not so dispose of it en masse, but sprinkle it about in small quantities over a good area, so that it will quickly evaporate. If by chance someone should throw a light down, it is only the few spots in question which will fire, and consequently no damage is done.

About the Plug Gap.

There is usually too great a tendency to have a wide gap between the electrodes of the plugs; the best working distance between the points of a plug is (very roughly) the thickness of a fairly stout visiting card. Either more or less is, generally speaking, conducive to bad running, and is also detrimental to the ignition system itself. Also note if the tips are clean, if not they may be cleaned by the use of a very fine file, if one has one, if not one can generally use the blade of a penknife and carefully push it through, which is usually a fairly satisfactory means of doing the work. If the width of the gap is found to be too great the prong of the electrode should be very gently tapped over with a good-sized key, or carefully bent, as may seem more easy to the person concerned in the adjustment. Many motorists are inclined to think that a wide gap in the plug means a big fat spark, and therefore a higher rate of flame propagation, and consequently more power. It must be remembered, however, that for other purposes it is necessary to provide a safety gap in the magneto itself, and if the width between the electrodes is too great, then, owing to the compression of the gas in the cylinder, the spark will refuse to jump the plug gap and select the one in the safety gap in the magneto itself, for preference.

Also remember, therefore, that because the spark jumps quite readily across the gap when the plug is laid on the top of the engine, it by no means follows that it will do so when screwed down in position, as the gaseous pressure is greatly increased, and the greater the pressure the greater the current



Contact breaker of a magneto—make and break, A, must be kept properly adjusted.

requisite to jump a given distance between the electrodes. This fact may be more completely grasped when it is stated that the actual safety gap in the magneto itself, where there is no air compression, is usually set 12 or 13 times as wide as the width of a plug gap.

If the plug is really badly sooted up, so that ordinary rinsing in gasoline does not appear to clean it, then the center electrode of the plug itself may easily be removed so that both portions may be cleansed separately.

Cleaning the Distributor.

In the upper little cover-case at the end of the magneto is to be found the distributor, and if the aforementioned efforts have failed, then the covering disc should be taken off and the distributor brush, A, inspected, and if necessary cleaned. Sometimes a little oil and carbon dust may have combined to make a "shorting film," which should be carefully wiped out with a piece of clean rag, and this may be just dipped in gasoline if one takes care not to use too much gasoline, and to give it time to evaporate before turning the engine again.

The Contact Breaker.

If irregular firing should occur, it is practically certain that it is due to faulty working of the contact breaker. This is the lower of two little chambers at the end of the magneto, and the cover can

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be easily removed. First of all see that the little center screw is quite tight, and also that the steel segments are rigid; also note that the two platinum contacts are in good condition—not dirty and jagged.

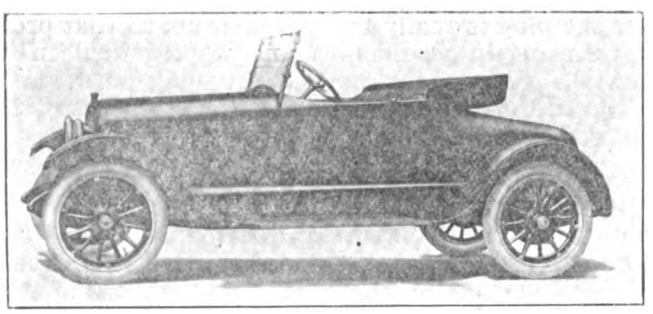
Here, again, any oil or grease should be carefully removed, and if the contact points are uneven or dirty they must be carefully cleaned or adjusted. When the small bell crank lever is at its maximum depression, then the distance between the two points should be exactly the same as in the case of the spark plug gap: roughly, the distance of a thick visiting card, if no better means of gauging the dimension is available.

If these first-aid instructions still fail to make the engine start up, then it is advisable for the average motorist to seek the aid of someone who specializes in motor work, unless by study, experience, or natural ability he feels competent to go into such questions as the correct setting of the magneto, etc. In any case, even to the fairly expert motorist, further dismantling of the magneto is not to be recommended; put more bluntly, though with more truth, it should, in fact, be avoided, as adjustments beyond the nature of those already alluded to require the return of the magneto to the manufacturers.

THE ROSS CAR.

Important Changes in the Organization of the Company and in the Motor.

Two radical changes have recently taken place in the affairs of the Ross Automobile Company, Detroit. One is a change of management, the other a change of motor. These changes will mean a new source of energy for both company and car. If the saying is true, and we believe it is, that any institution becomes as big as the man at the head of it, the Ross Automobile Company is slated for a prominent place in the automobile industry. The company has planned an aggressive campaign to put the Ross in the front rank of high grade cars. The present strong and well-rounded organization is bound to be heard from in the near future. Regarding the



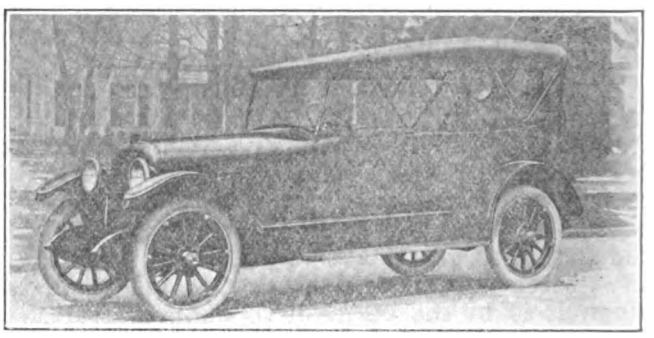
Ross 3 Passenger Roadster.

change in the motor, it has been decided to use a 6-cylinder instead of an 8, as in the past. The reasons for this change is explained as follows: The 6-cylinder is the popular motor today. It is the sifting down of all the experiments of the past. The public has learned that six cylinders are required for the necessary control and flexibility, but that the advantages derived from more than six do not compensate for the disadvantages of increased fuel cost and maintenance.

The six is the balanced motor. The Ross has always been a car of achievement, such as the recent stunt of climbing Lookout Mountain, Colorado, locked in high speed. In this event the car carried seven passengers, weighing a total of 1103 pounds, and this climb was made at an average speed of 27 miles per hour, without a single kick or complaint of the motor.

In Milwaukee recently a stock Ross car climbed the famous 19th Street Hill, a 19 per cent. grade an eighth of a mile long, from a standing start at the bottom, being thrown immediately into high and making the grade with apparent ease.

In Cincinnati a Ross stock car recently climbed the famous Fort Ancient Hill in one minute and ten seconds, locked in high. To the knowledge of the



Ross 7 Passenger Touring Car.

automobile men who witnessed the feat, no other car ever climbed that hill on high, which is so steep that farmers carefully lead their horses down the hill and never attempt to drive down.

Many other like achievements have demonstrated the Ross merits. These characteristics are due to the way the car is hooked up with the motor. In other words, it is a "balanced car." In changing to the six it has been proven that all of these characteristics will be retained, with the added advantage of fuel economy. In selecting the Continental Red Seal 3½x5¼, 6-cylinder motor, the firm believe they have the best motor obtainable for stability and latent power. Other slight changes will be made in the car to add refinement and convenience, but the motor is the only radical change made.

High ideals in manufacture and in service must be imparted to dealers and distributors, or the public will not realize on them to the fullest extent. To accomplish this all Ross dealers must be men of unquestionable standing and business ability, and a campaign for dealers is planned on this basis. The specifications are as follows:

Bodies — Seven-passenger, four-passenger suburban type, three-passenger roadster, coupe, sedan and town car. Design—Full streamline, one-man top. Unusually refined in design and finish. Upholstering—Rich, blue mottled Spanish leather. Windshield—Rain-vision; ventilating. Motor—Continental six-cylinder. Transmission—Selective sliding gears; three speeds forward and reverse; chrome nickel-steel gears and shafts. Clutch—Multiple disc. Axles—Full-floating rear; front I beam section. Starting and Lighting—Two-unit system. Lubrication—Force feed, pump driven to cylinders. Radiator—Cellular type. Ample capacity. Control—Center. Steering—Irreversible, left hand drive. Steering Wheel—Eighteen inches, corrugated, tilting type. Drive—Shaft drive; universal joints.

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Springs—Semi-elliptic front (42x2 inches); semi-elliptic rear (57⅝x2½ inches). Wheel Base—130 inches. Wheels—Extra selected second-growth hickory. (Wire wheels furnished at additional charge). Tires—35x4½ inch non-skid, rear; plain front. Rims—Quick demountable. Horn—Motor driven. Instruments on Cowl—Speedometer, ammeter, ignition switches, oil pressure gauge, cigar lighter, electric lights, with 10-foot extension cord always ready with automatic take-up. Equipment—Tire repair kit, jack, pump, tire carrier, 1 extra rim, tools, etc. Weight—(7-passenger) 3250 pounds.

AUTOMOBILE LUBRICATION.

Where Dixon's Motor Graphite May Be Used With Good Results.

The proper lubrication of a car is of vital importance. One or two kinds of grease will not answer for all the parts because the conditions are different in each part and must be treated accordingly. If the following instructions are observed they will insure the best lubrication and a long-lived car.

Engine—Use oil recommended by manufacturer of your car. If there is a splash oiling system or combination of force feed and splash, add an even teaspoonful of Dixon's Motor Graphite to each quart of oil contained in the crank case. Add another teaspoonful of Motor Graphite after each 1000 miles of running.

Mix no graphite with the oil in a force-feed oiling system, but occasionally let a little graphite be inhaled through the air intake of the carburetor.

Do not use graphite in the crank case or transmission of Ford cars. It may be introduced directly to the cylinders through the air intake of the carburetor, or by special lubricators.

Transmission—Use Dixon's Graphite Grease No. 677 in all transmissions that require grease or heavy gear oil. Use Dixon's Gear Oil No. 675 in all transmissions that are intended for light oil lubrication. Clean out thoroughly once a year and refill to under side of main shaft.

Differential—Use Dixon's Graphite Grease No. 677 in all differentials, except as noted below.

Use Dixon's Gear Oil No. 675 in two-speed rear axles, in worm-driven axles and in the differentials of chain driven cars requiring light oil lubrication.

Use Dixon's Non-Leak Grease No. 680 for noisy gears and leaky housings. Remove all old lubricant before putting in No. 680.

Clean out the housing thoroughly once a year and refill to shaft level.

Internal Drives—Use Dixon's Graphite Non-Leak Grease No. 680. Apply sparingly.

Timing Gear Case—If there is no connection with crank case, use Dixon's Graphite Grease No. 677. Ordinarily the gears are automatically lubricated by the engine oiling system and require no attention.

Universal Joints—Use Dixon's Graphite Grease No. 676. Will not throw out. Examine every 1000 miles. Cup Grease No. 5 may be used if No. 676 is not obtainable.

Pump Cups—Use Dixon's Graphite Grease No. 676. Will not melt and run into radiator.

Overhead Valve Grease Cups—Use Dixon's Graphite Grease No. 676. Is not affected by heat.

Clutch Release Collars—When grease lubrication is required, use Dixon's Graphite Grease No. 676. It is not affected by heat.

Grease Cups—Use Dixon's Graphite Cup Grease No. 3, except in warm climates, where Cup Grease No. 5 is better. All cups should be given a complete turn before starting on a day's run.

Wheel Spindles—Use Dixon's Cup Grease No. 3 or Graphitoleo. Examine every 2500 miles.

Steering Gear Housing—Use Dixon's Graphite Cup Grease No. 3 or Graphitoleo. Examine every six months. Clean out and refill every year.

Driving Chains—Clean the chain and immerse it about twenty minutes in melted Graphite Motor Chain Compound. The chain will then be properly lubricated and will not pick up grit.

Springs—Loosen spring clips, jack up chassis and work a mixture of Dixon's Motor Graphite and kerosene between the leaves. This will prevent rust and assure easy spring action.

Tires—Use Dixon's Motor Graphite in place of talc. Will not allow tube to stick to casing, thereby preventing blow-outs.

Wheel Rims—A mixture of Motor Graphite and kerosene well rubbed into surfaces of rims will prevent rusting and sticking. Tire changes can be made quickly and easily. A thin coat of shellac and graphite also gives good results.

Multiple Disc Clutch—Add a teaspoonful of Motor Graphite to the oil each time the clutch housing is cleaned, which should be at least once in six months.

Leather Faced Clutch—Nothing is better than Dixon's Traction Belt Dressing for keeping the leather soft and pliable and thus preventing slipping. Neatsfoot oil or castor oil is also good.

Spark Plugs, Gaskets, Threaded Joints, Etc.—Use Graphite Joint Compound. It makes tight joints that open easily, and prevents rusting.

Electrical Equipment—Use no graphite in lubricating magnetos, generators or starting motors.

Motor Boats—Use No. 677 in the reverse gears, No. 676 or Cup Grease No. 5 in all grease cups and Motor Graphite in the cylinders. An application of Yacht Plumbago to the hull will reduce "skin friction" and increase the speed of the boat.

Motorcycles—Pack the change-speed gears and the wheel and brake hubs with No. 677. Graphitoleo is also an excellent lubrication for the hubs. Treat chains with Motor Chain Compound. It will increase the life of chains several times. Dixon's Motorcycle Belt Dressing will prevent flat driving belts slipping.

THOSE CHASSIS KNOCKS.

How the Car Protests at Its Treatment and How It Should Be Heeded.

From H. C. Brokaw, West Side Y. M. C. A. Automobile School, New York.—Does your car chatter? Does it talk to you and protest against running over holes and bumps in the road? If it does, it is a sign that you should pay attention to, a hint that you should do away with the knocks and clicks and chattering which annoy you and everybody else within hearing as you run along. That is, if you find them, for there are some noises so obscure as to defy detection even by the expert.

Such was the car which developed a sharp click when it was started forward or backward. It ran

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quite a long time before it was possible to discover just what and where it was. It was somewhere in the back end, but so hidden as to defy detection. The rear axle was of the floating type, the construction in which the driving shaft is connected to the hub of the wheel by a number of flutings on the shaft, into which corresponding projections of the flange fitted. These had become worn and allowed sufficient play to cause a noise.

By walking alongside of the rear wheel while the car was being started and stopped, it was decided that the sound came from the hub of the wheel. The hub cap was removed and by placing the finger on the hub flange and end of shaft at the same time the play was detected by the sense of feeling, though it was hardly visible to the eye. The trouble was overcome by having the shaft welded to the flange. A few days later the owner happened to be at the agency and told what he had found.

"So glad you came," was the response, "for we have been looking for the same kind of a click a long time ourselves and the service station mechanics have not been able to locate it. They thought it was in the brake, but upon examination could see no reason for a click."

I have seen cases where the wheel was keyed on, and where the keys had acquired sufficient play to cause a continuous knocking, especially when the machine was being driven at low speed. This sort of knocking is more likely to occur with the four cylinder, slow speed engine than with the high speed, many cylindered type.

A mysterious knock sometimes may be traced to the torque rod, which is loose at the forward end, or to worn torque tube bearings, and in some cases the bolts fastening the torque rods to the rear axle become loosened, or worn, causing a knock, especially when going over bumps or dropping into holes.

The brake rods become worn and set up a continuous clattering on rough roads and this noise is accentuated if the tires are kept inflated at too high a pressure. As a matter of fact the car owner has the choice between the greatest life for his tires with accompanying rattles and discomforts, and riding at a sufficiently low pressure to subdue these noises and make life in a car worth living; of course there will be an attendant higher wear of tires.

Worn spring shackle bolts will not ordinarily cause knocking or rattling, but when going over bumps or holes the rebound of the body is sufficient to make the looseness audible. It can be overcome by having a new bolt put in, and prevented by keeping the bolts well lubricated.

Worn steering knuckle pins and tie rod bolts will be found responsible sometimes for knocks and rattles in the front end of the car. The remedy is obvious and the location of the noise is not hard to find.

In addition to these we have rattles due to tools being thrown loosely into the tool box, and sometimes the body bolts become loosened. The lamps occasionally jolt loose and the license plate bracket is sometimes so loose that it is audible as well as visible.

There are other knocks due to broken gear teeth and other broken parts and sometimes these broken teeth, loose nuts, bolts or pins, in gear or differential case, become wedged between the gear teeth and cause a knocking that is not hard to locate, albeit rather expensive to repair. And then there are the knocks and rattles from the hundred or more accessories which are attached to the chassis of many cars and which sooner or later develop defects and noise.

The up-to-date, well-designed car in perfect shape is practically noiseless and if a knock or rattle develops it indicates that something is worn or out of adjustment and needs attention. The owner who takes care to have all parts properly lubricated and kept tight need fear none of these annoyances, and proper attention means lack of annoyance when out touring; while slovenly habits will advertise themselves to everyone along the road.

The New Metz Truck.

Following more than a year of experimenting by Charles H. Metz and his engineers at the Metz plant, Waltham, Mass., the company announces that it is about to embark on the manufacture of a truck unit for converting new cars or used cars into high-duty one-ton trucks. Production is to start immediately. Different models of this truck unit will be made to meet the needs of varying transportation conditions. In connection with this announcement comes one of almost similar importance to the effect that the Metz is to turn out a tractor also. This will be a replica of the tractor that Charles H. Metz made for the committee of public safety to plow up unused land. It was designed on the spur of the moment and built in 48 hours, but has proven so successful in its nearly four months of daily service that many dealers near the factory have asked the company to market them. It will be known as the Metz Convertractor and can be attached to the front end of any make.

A car that is sure to make an appeal with the public is a taxicab with no taximeter in it.

NEW AND INTERESTING THINGS IN MOTORDOM

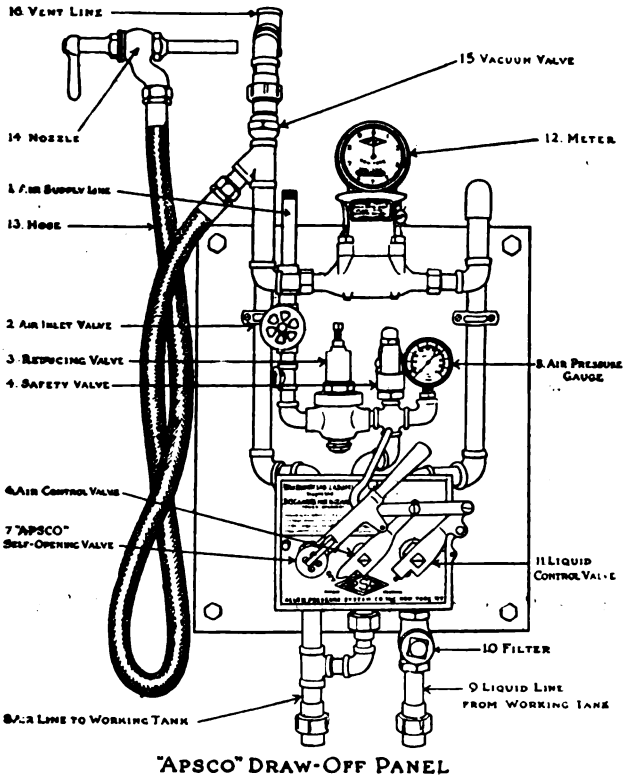
Apco Specialties For Ford Cars.

Discriminating owners of Ford cars the world over have learned to appreciate the merit of Apco specialties which are manufactured by the Apco Manufacturing Company of Providence, R. I. In this issue, a very interesting announcement appears from this company, in which the location and character of their accessories for the Ford are indicated on various cuts of the latest model Ford car. There are several diagrams devoted to this purpose, which will be studied with great interest by our readers. Dealers should especially be interested in the Apco line. Arrangements have been made to furnish Apco specialties in full assortment to dealers, packed in neat cartons, so that the packages make a very businesslike appearance, and it is true that nearly every live dealer who can make arrangements to handle the Apco line is bound to do so. Apco goods are now sold, by jobbers only, in 128 cities in the United States, but those who are looking for complete information in regard to this line should write at once to the Apco Manufacturing Co., Providence, R. I.

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New Gasoline and Oil Storage Plant.

A new distributing system for transferring either oil or gasoline by means of air presure directly from a storage tank to an automobile or other receptacle, is now on the market and judging from the detailed description it is likely to soon come into general use in garages and repair shops. The system is undoubtedly flexible and safe, and does a wide range of work. It has been approved by the National Board of Fire Underwriters and carries an absolute guaranty against defect either in material or workmanship. Briefly stated, this pressure system device consists of two working tanks, one set above the other, the lower one of which is connected with the air pressure tanks commonly used in a garage for inflating tires. Only about 20 pounds of air pressure is really necessary although any pressure can be used. The principle is that the air pressure is always on the gasoline and you simply open a valve and this air pressure forces the gasoline out of the working tank into the tank on the automobile. The working tank is usually 60 gallons, but it can be any size. In operation the gasoline flows freely and rapidly and will fill the automobile tank very quickly and the gauge showing the amount of gasoline supplied to the automobile works continuously and of course stops whenever you close the valve. The advantages are rapidity of operation and its not being necessary to use a pump. The Allen Pressure System is low in price, considering its labor serving merits. Full particulars can be learned by addressing the Allen Pressure System Co., 16 West 61st St., New York.



"APSCO" DRAW-OFF PANEL

Lewis H. Scurlock Organizes New Company.

Lewis H. Scurlock has retired from active participation in the affairs of the M. & S. Corporation, still retaining his interests and remaining vice-president of the corporation. He has organized the Krom-niK Gear Company, with general office at 1100 Karpen Bldg., Chicago, Ill., and taken over the exclusive distribution of the M. & S. Differential, which will be manufactured by the M. & S. Corporation of Detroit; as well as the exclusive distribution of Anderson Rolled Gears made by the Anderson Patent Machine Process at Cleveland, Ohio. The Krom-niK Gear Company will act as the sales organization for both of these concerns. The Krom-niK Gear Company will specialize at first on differentials and drive gears for some of the smaller and more numerous cars, including the Ford, Chevrolet and Maxwell, as well as a general line of differentials and gears for the larger makes of cars.

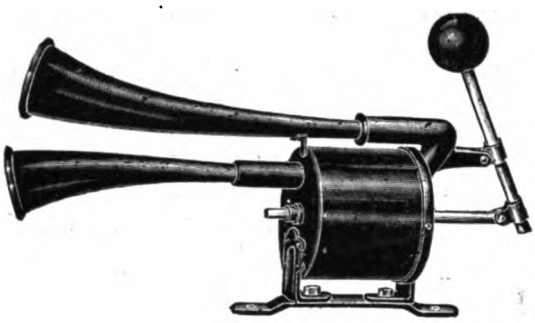
Handy Repair Tags.

Stevens & Co., 375 Broadway, New York, have recently put on the market a line of auto repair tags which are extremely handy for the use of the busy repair man or dealer. These tags are so arranged that there is a complete record of the work, and mistakes and kicks in repair bills may be largely prevented by the use of these tags. They are made of large size, tough stock; one side printed for instructions and the other for a record of time and material. These tags are also numbered serially, with detachable card and space for dealer's imprint. They are sold at $5.00 per thousand, and no doubt many of our readers will wish to order these tags, as they are a great economy and convenience in any shop.

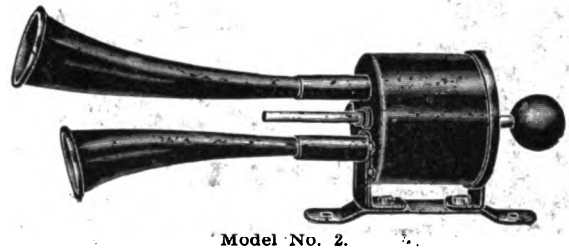


Warnola, a New Warning Signal.

It is a well known fact that in a warning signal for automobiles, it is necessary to have some sort of noise which can be readily distinguished above the roar of city traffic and that will carry for a long distance, but the manufacturers of Warnola contend that it is not necessary to have this noise of an offensive or disagreeable nature. The Warnola has a note which is insistent in its quality, yet entirely inoffensive, and will not fluster or confuse the man, woman or child who may have stepped into the path of the car. There are no diaphragms or springs employed in producing sound in the Warnola. Reeds are used, operated by a rush of air from a piston working in a double end cylinder. The piston is fitted with a felt ring held in close contact with the cylinder walls by a flexible steel band. By virtue of a special process, the felt is air-tight and indestructible. Short sharp blasts may be given by a quick movement or a long, distance-covering signal produced by a slower plunge of the piston. The illustrations herewith show two types of Warnola. Model No. 1 sells for $7.50, while Model No. 2, which is designed for small cars, sells for only $5.00. The tone is the same in the smaller horn, except that this horn is slightly different in construction and method of operation. The Warnola is likely to enjoy a large sale, as it is correct in construction, made of the best materials, with skillful workmanship and careful assembly. Readers who are interested should write for further particulars to the Warnola Manufacturing Co., 73 Wooster St., New York City.



Model No. 1.



Model No. 2.

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JOHNSON'S CARBON REMOVER

Cures 80% of Engine Trouble

A dose of Johnson's Carbon Remover—The Engine Laxative—will make your motor run like it did the first 500 miles—quietly and full of "pep"—And your gasoline consumption will drop from 12% to 25%. You will save from $3.00 to $5.00 over any other method.



You Can Take the Hills on High Without a Knock

if you will keep your motor free from carbon with

JOHNSON'S CARBON REMOVER

That knocking in your engine—difficulty you have climbing hills—poor pick-up—pre-ignition and lack of power will all be overcome.

You Can Do It Yourself

For 25c—five minutes' time—and with no labor, you, yourself, can remove all carbon deposits. Pour an ounce of Johnson's Guaranteed Carbon Remover into each cylinder—allow it to remain two to twelve hours, then drive your car 10 or 15 miles. Results will surprise you.

Use It Every 1,000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will eliminate most valve trouble and your engine will always be at its highest efficiency.

If your dealer cannot supply you with Johnson's Carbon Remover, use attached coupon.

Write for our folder "Keeping Your Car Young"—it's free.

$1.00 Special Offer $1.00

S. C. JOHNSON & SON, Dept. AD8, Racine, Wis.

I enclose $1.00 for which please send me by prepaid express enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four-cylinder motor four times.

NAME.....

ADDRESS.....

CITY & STATE.....

MY DEALER IS.....

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JOHNSON'S PREPARED WAX

Now Made in Liquid Form

We are now making Johnson's Prepared Wax in ***Liquid Form*** as well as Paste—so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is exactly the same as our Paste Wax except that it is a liquid. Apply with cloth, brush or spray.

Is Your Car Dirty, Grimy and Unsightly?

DO you know that you, yourself, can make it look almost like new and save the cost of revarnishing? All you need is Johnson's Cleaner and Johnson's Prepared Wax ***Liquid.***

JOHNSON'S CLEANER

entirely removes all stains, scum, road-oil, tar and grease from body, hood and fenders. It doesn't injure or scratch the finest varnish—simply cleans and prepares it for the Wax polish.

Absolutely Dust-Proof

Johnson's Prepared Wax Liquid gives a hard, dry, glasslike polish which does not collect or hold the dust. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches—prevents checking and cracking—sheds water and makes a "wash" last twice as long.

Johnson's Prepared Wax Liquid is very easy to use—it polishes instantly with but very little rubbing. You can go over a good sized car in half-an-hour.

Quarts.....$1.40 Pints.....$ .75
East of the Rockies

If your dealer cannot furnish you with Johnson's Automobile Products, we will pay the expressage to any point in the United States east of the Rockies.

Write for our folder "Keeping Your Car Young"—it's free.

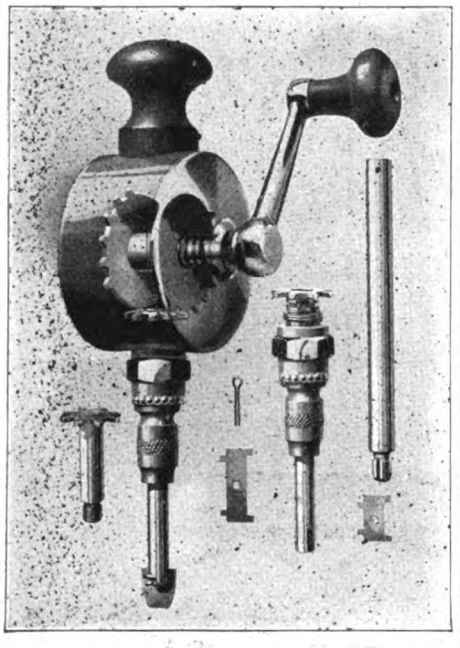
S. C. JOHNSON & SON, Dept. AD8 Racine, Wis.



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The Sioux Valve Grinder.

The Sioux valve grinder is built to be a life-long tool, and cannot wear out by ordinary use. By continuous movement of the handle in one direction, the valve is given a reciprocating motion, always traveling slightly forward in one direction then in the opposite, thereby producing the motion that is absolutely necessary for perfect valve grinding. The end thrust ball bearing makes the



A New Valve Grinder.

grinder run easily and smooth. The gears are made of pressed steel. The grinder is provided with spring take-ups; that is, the springs act as the bearings and grinder wear, putting the gears in deeper mesh and the bearings in a more rigid position. The Sioux valve grinder has a high grade finish and nickel plated, and is provided with five driving points and one long extension shank. This tool is made by Albertson & Co., Sioux City, Iowa.

The Saybrook Carbon Brush.

This is a new brush which has recently been placed on the market by the Chapman Brothers Company, Saybrook Point, Conn. The brush is novel in construction and it has many good qualities. It is really two tools in one. By the method of construction used there is a ring of bristles with outside length below the bottom of ferrule of five-sixteenths of an inch. This makes a short and very stiff bristle capable of cutting the hardest carbon deposit. Inside this ring of bristles there is a length of eleven-sixteenths of an inch below bottom of the plug. This length allows of a very considerable flexibility and permits reaching into all irregularities in the cylinder head casting and also insures covering thoroughly the rough unmachined surface. The bristles are mounted around the retaining plug, after which this plug is forced into place under a two-ton pressure. This ferrule is then crimped midway of the length of the plug, making an absolutely positive mounting. The bristles are permanently anchored and cannot work loose. The handle is mounted in the same manner. This brush will appeal to repair men, garage owners and car owners who look after their own cars. The brush is simple in construction and moderate in price, yet it exactly fulfills the purpose for which it is made. Readers who are interested should write for descriptive circulars and prices direct to the manufacturers at Saybrook Point, Conn.

Grinds Four Valves at Once.

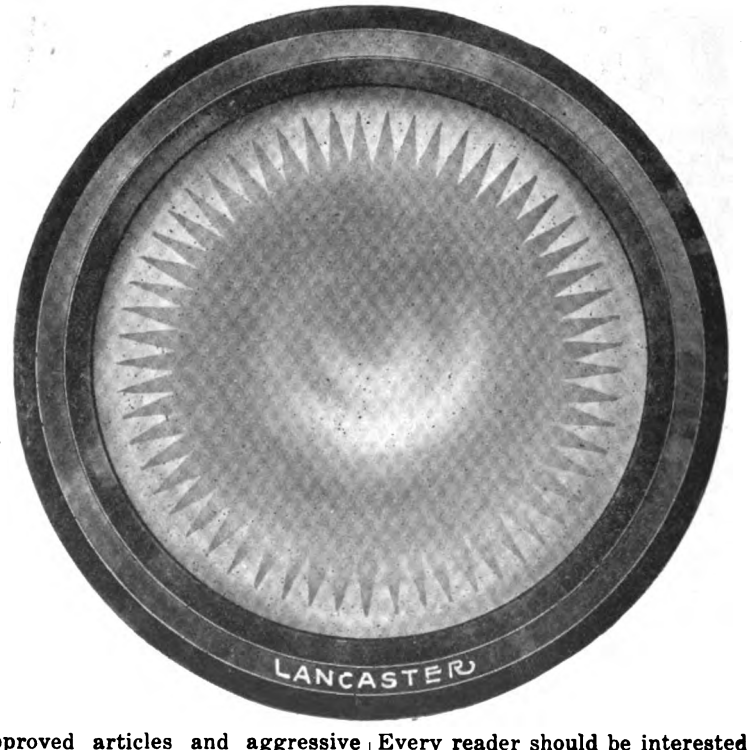
A new valve grinder which grinds four valves of the Ford motor at one time, thus saving 50 per cent. is the latest thing on the market. It works so accurate that a boy can do a perfect job with it and it ought to be in every repair shop in the country. The price is low; so low that any car owner can well afford to own one. Write for particulars, Universal Pure Air Pump Co., 1607-11 Prairie Ave., Chicago.

A New Company in the Automobile World.

A company whose officers and directors are closely affiliated with some of the largest financial interests of Pittsburgh, has entered the automobile field. The activities and developments of this organization will, undoubtedly, be of interest to the entire automobile industry. The Iron City Products Company has a broad Pennyslvania charter which grants to it the right to manufacture any article from iron or steel, but it is understood that the initial development will have to do largely with the manufacture and marketing of such parts as have previously met with the most rigid tests; and are identified with the aircraft, marine and automotive industries. The company is now testing out a number of inventions bearing upon the increased efficiency of automotion and will take up and exploit such of these as meet with their requirements and satisfy all trials in actual operations. The trademark "ICP" will be placed upon such approved articles and aggressive sales and advertising campaign will follow. The company has for several months been marketing an improved piston ring which will be produced in large quantities in their new factory. This "ICP" ring for pistons is said to incorporate a new engineering principle and has met with a remarkable showing in various tests and received the endorsement of well-known engineers. The personnel of the officers and directors of the Iron City Products Company is an assurance that it will play a large part in the development and merchandising of new and meritorious articles in these industries. It is understood from officers of the company that while they now have a number of articles of proven merit, they are continually in the market for new and practicable products in their field. Plans have been made to introduce the piston ring to the trade and public early in the fall.

The Star Lens.

Nearly every state in the country now has a law against glaring headlights, and the minds of the best inventors of the country have been busy with the important problem of how to fulfill the requirements of the law, and at the same time furnish the driver of a car with a satisfactory headlight. The Star Lancaster Diffusing Lens is the result of a careful scientific investigation and study, and it is believed that everything most desirable in a headlight lens has been accomplished in the creation of this device. With this lens all the brazen glare is toned down, so as to actually give more illumination, distributed where it is most needed. With a stream of silvery rays, a diffused light, the fog, mist or darkness can be penetrated much further than with a clear glaring light. The light is thrown sideways as well as forward, and a driver can go to the extreme edge of the road without being ditched. Corners can also be turned sharply and quickly with perfect safety. These lenses fit every car. They work equally well with gas or electric light, easily installed.



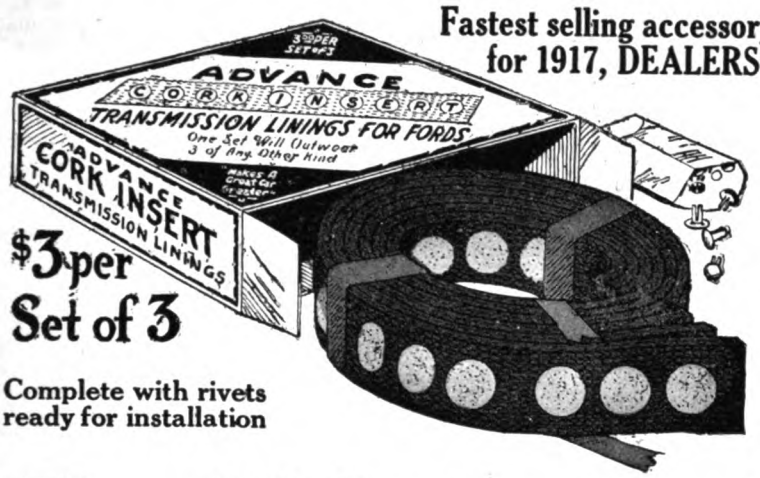
Every reader should be interested in this new lens and should write for full particulars direct to the manufacturers, the Lancaster Lens Company of Lancaster, Ohio.

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CORK INSERT

Transmission Linings for Fords

Fastest selling accessory for 1917, DEALERS!



$3 per Set of 3

Complete with rivets ready for installation

They Make the Ford Brake BRAKE

YOU know how the Ford jumps when it starts, and jerks when it stops—how it shivers and jars every time the brake goes on. Here is something that puts velvety smoothness in the Ford Transmission, so that it goes into low or reverse like a high-priced car. It starts gliding to a quiet stop at the first touch of the toe on the brake. No more chatter, no more jar—regular big car stuff.

Ordinary transmission fabric becomes glassy surfaced and hard and does not grip unless excessive pressure is brought to bear. Then it suddenly grabs and slips—causing jars and the mechanism-killing vibration. The corks in Cork Insert Linings eliminate the slipping, the jarring, the vibration, of starting and stoping. In addition Cork Inserts outlast two to three sets of ordinary linings.

Get Cork Inserts, Now, Dealers!

Cork Inserts (both Transmission Linings and Fan Belts for Fords) are being advertised to your trade in the Saturday Evening Post and leading trade papers. They are selling by the thousands. Your customers know about them and are ready to buy as soon as you are prepared to sell them. They give better service with increased economy. Use the coupon and send your order today for Cork Inserts. Your jobber will get full credit.

Car Owners! *Send the coupon for Cork Inserts. Your dealer will get full credit.*

Advance Automobile Accessories Corp.
Dept. H5-1
56 East Randolph Street
Chicago, Illinois

And Now This New Big Winner

ADVANCE CORK INSERT FAN BELT FOR FORDS

Most motor troubles are caused by overheating. Overheating would largely be avoided if the fan were kept fanning by a belt that didn't slip. The slipping of the ordinary Ford Fan Belt runs between 25% and 50%. It's bound to get slippery from the soaking in oil and water and the polishing action of service. Cork Insert Fan Belts

Keep the Motor Cool —They Don't Slip

Corks are inserted into high grade, waterproof oak leather, and backed by heavy waterproof fabric. The corks stop the slipping. They are unaffected by water or oil, grease or dirt. They *retain* their gripping qualities throughout a service several times as long as ordinary belts.

$1 for 1917 Ford

—85c for earlier models



Keeps the fan fanning —keeps the motor cool

Dealer Coupon

Advance Automobile Accessories Corp.,
Dept. H5-1 56 East Randolph St., Chicago

Send by express, subject to regular dealer discounts, the following:

( ) 1 dozen sets Cork Insert Transmission Linings.
( ) 1 dozen Cork Insert Fan Belts, 1917 size.
( ) 1 dozen Cork Insert Fan Belts, 1916 size.

Name.....

City..... State.....

Jobber's Name.....

Ford Owner Coupon

Advance Automobile Accessories Corp.,
Dept. H5-1 56 East Randolph St., Chicago

Enclosed find $.....

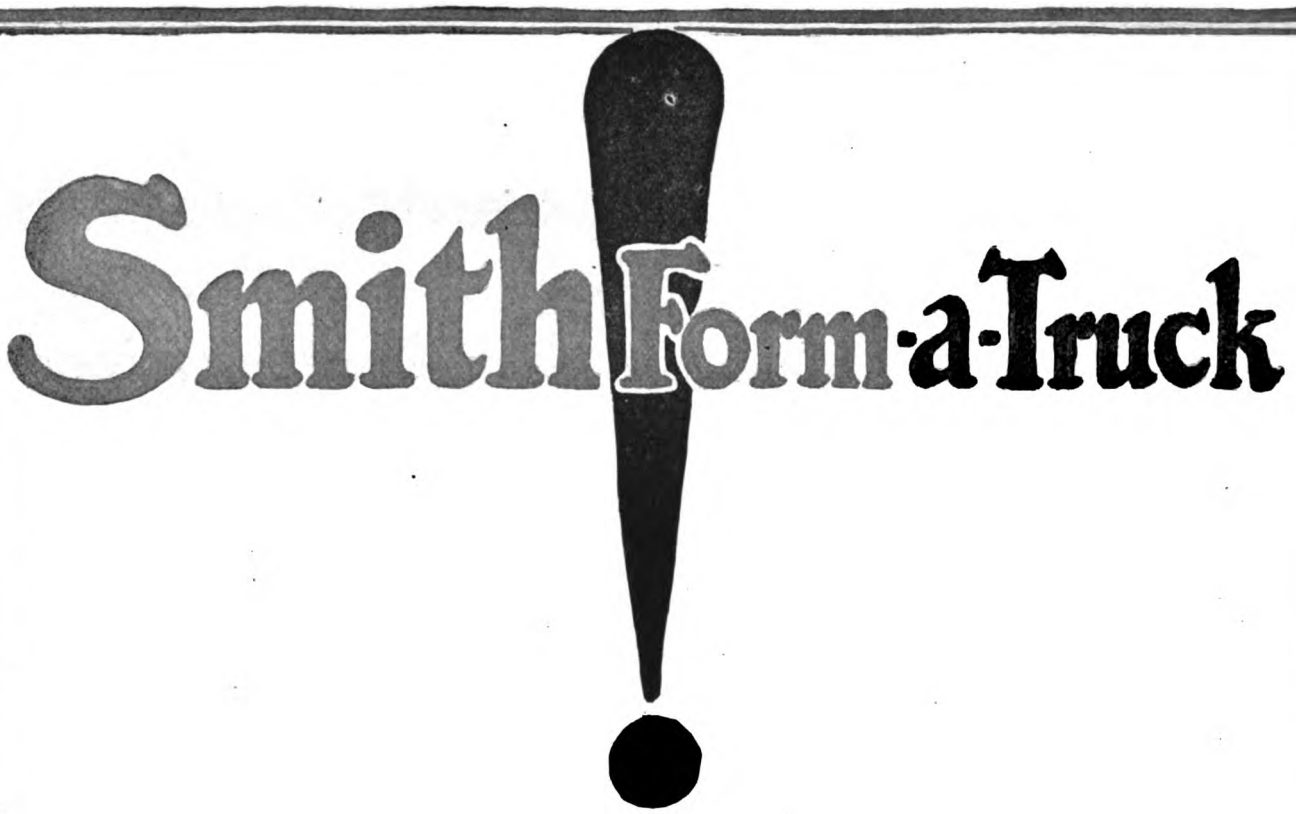
Send me ( ) 1 set Cork Insert Transmission Linings, $3.00
( ) 1 Ford Fan Belt for 1917 Ford..... 1.00
( ) 1 Ford Fan Belt for 1916 or earlier Ford models..... .85

Name.....

City..... State.....

Dealer's Name.....

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There Will Be 1000 New Smith Form-a-Truck Dealers Appointed in the Next 90 Days

To each we give a money-making proposition that CANNOT be EQUALLED in the industry

Startling as has been the success of Smith Form-a-Truck dealers in the past, it does not compare with what we have in store for the coming season.

A year ago we said Smith Form-a-Truck was the best proposition of the year — ***and we proved it.***

We say NOW the proposition for the coming season will be infinitely greater.

Smith Motor Truck Corporation

Manufacturers of Smith Form-a-Trucks

Executive Offices and Salesrooms, Smith Form-a-Truck Building

Michigan Avenue at 16th Street, Chicago

Kansas City Branch, 1808 Grand Ave. Southern Branch, 120 Mariette St., Atlanta, Ga.

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Smith Form-a-Truck?

Will You Be a Smith Form-a-Truck Dealer This Year?

You will—if you investigate—if you get the facts—if you qualify.

Get our unparalleled proposition.

RESOLVE now—today—this minute—as you read this message, that you are going to handle a proposition in which the profits are ***positive.***

The coming season will be your most profitable one—if you decide now to sell Smith Form-a-Trucks for next year.

To get territory requires action ***NOW***—today. Better wire, to make sure your reservation is in early. Do it TODAY!

Smith Motor Truck Corporation

Manufacturers of Smith Form-a-Trucks

Executive Offices and Salesroom, Smith Form-a-Truck Building

Michigan Avenue at 16th Street, Chicago

Kansas City Branch, 1808 Grand Ave. Southern Branch, 120 Mariette St., Atlanta, Ga.

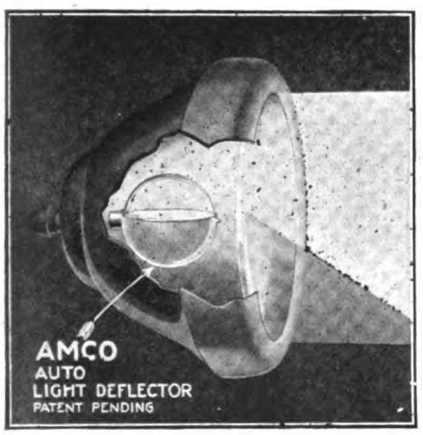
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"Buy Your Trucks Early."

Do your motor truck buying early. This is the slogan which is now being heralded across the country for the reason that the government is looking about, with the idea of ordering some 70,000 trucks. Which means that the farmer, the factory owner and the merchant of progressive tendencies ought to get his order in now, to assure him of his vehicle. For when the U. S. A. wants things, it usually manages to get them. Users of light trucks need not worry, however, with the "attachment" company on the job. Utilization of the pleasure car chassis permits the quick change from a touring car to a ton truck, as is the case with the Smith Form-a-Truck. This firm is not handicapped so long as the pleasure car makers continue to produce their machines, for an output of 40,000 this year is predicted by the production manager of the Smith Motor Truck Corporation, of Chicago.

An Auto Light Reflector.

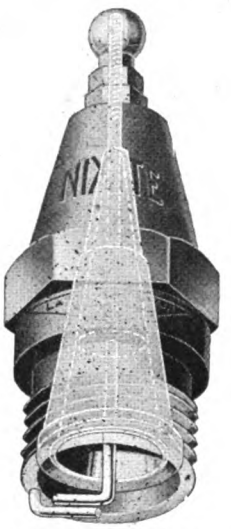
The Amco is a new auto light reflector which has been licensed by five states and has received unqualified endorsement by all who have seen it. The illustration will give a fair idea of what this device is and how it works. The price is only $1 per pair. It is easily installed and causes the rays of light to be sent in whatever direction it may be necessary. It is manufactured by the Art Metal Mfg. Co., Cleveland, Ohio.



The La French Spark Plug.

The rapid growth of the La French Spark Plug Company of Dayton, Ohio, has compelled them to seek better facilities and larger quarters. This prompted the organizing of a company with a capitalization of $100,000 with its new location at Columbus. The low grade fuel has played an important part in the designing of motors and ignition along with carburetion. The engineers are keen and alert in taking advantage of scientific research work to bring out a blue hot fat spark in the form of ignition to burn up and consume the low grade gasoline after it leaves the carburetor. This company is placing on the market a most remarkable power spark plug designed on the principle of a dynamo, so arranged to take the current with the least possible resistance, thus stealing the life or current away form ordinary spark plugs. For this reason they are sold in full sets at $1 each.

The greatest troubles of today that the motorist has to contend with, are broken porcelains and lost compression, and the La French Power Spark Plug

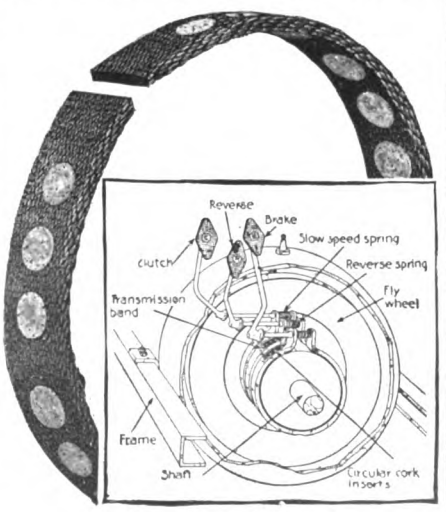


Note the Insulator.

Company has overcome both these difficulties with the use of their new Nix-ite insulator, which is inserted inside an independent steel shell.

Cork Insert Linings.

Cord insert linings were originated to make the planetary transmission easier of operation and more efficient through the elimination of slipping. In addition to doing this, it has been found that they give a wear from two to ten times longer than transmission linings of the ordinary plane surface type. The lengthened service of cork insert linings is due both to the gripping qualities and the wearing qualities of cork. Into the highest grade transmission fabric, buttons of cork are inserted at regular intervals. The corks are a bit thicker than the fabric itself, and make the first contact with the transmission drums. Because

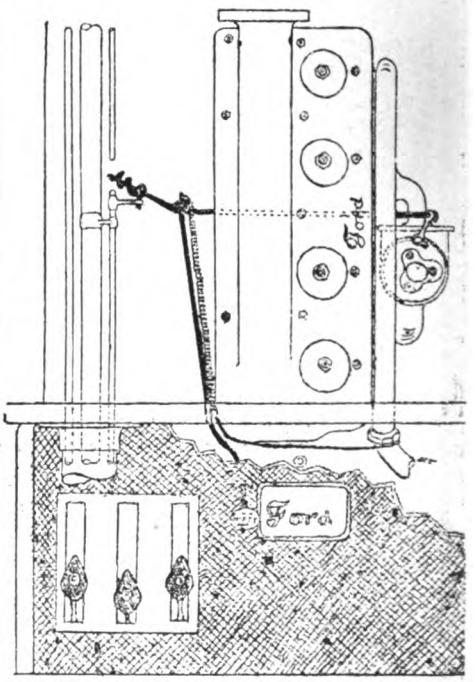


How They Work.

of the high coefficient of friction of cork and steel, the response to the pressure of the brake or speed pedal is immediate, and a smooth, velvety stop or start is made. The corks prolong the life of transmission lining because they eliminate the wear and tear of excessive pressure, of burning friction, aggravated by slipping, and because of the wearing qualities of cork itself. Cork is not affected by soaking in oil, does not harden from pressure. It wears very slowly, retains its place in the fabric, and holds is gripping qualities as long as the lining is in use. Cork insert linings are manufactured by the Advance Automobile Accessories Corporation of 56 East Randolph St., Chicago, and retail at $3 per set of three.

Accelerator for Ford Cars.

The nifty foot accelerator for Ford cars gives a quicker and more even pick up than is possible with the hand throttle; also enables you to maintain a much more even speed on the road. It leaves both hands free to handle the steering wheel which is desirable at times as when driving on muddy or sandy roads and on crowded streets. When driving in cold weather with this foot accelerator on, the hand throttles may be bent down slightly, thus enabling you to use a large pair of mittens without interfering with the throttles. It weighs less than 8 ounces complete. It can be attached in five minutes' time. It does not interfere in any way with the use of the hand throttle; either one takes effect immediately when it is touched, regardless of where the other is set. Guaranteed to give satisfaction. Price, $1.35. Manufactured by Will A. Sapp, Elgin, Nebraska.



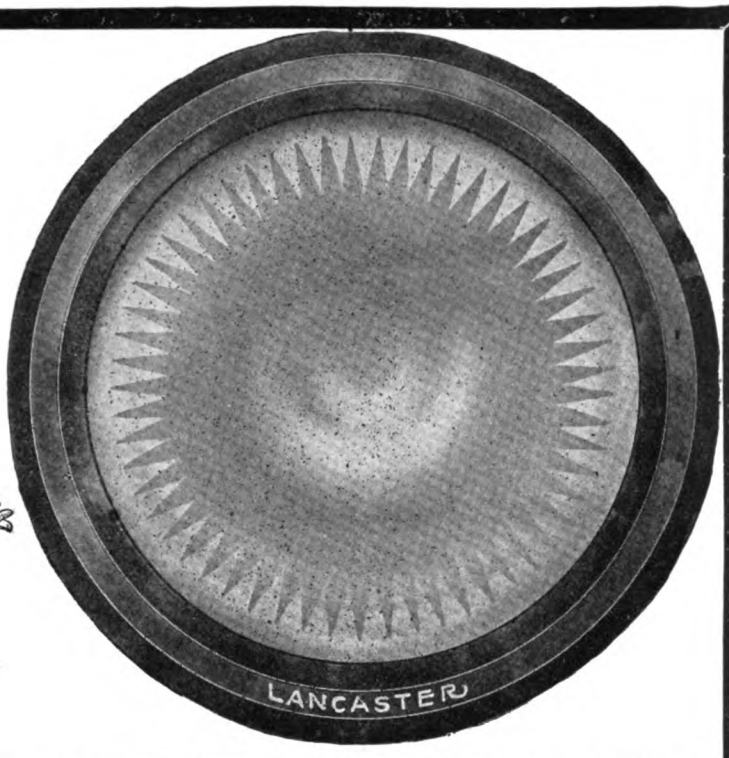
Nifty Accelerator.

Parry Mfg. Co. Donates Ambulance Bodies.

Six motor field ambulance bodies constructed by the Parry Mfg. Co. were presented recently to the Indiana National Guard for use of one of its newly motorized field ambulance companies. The offer to make and donate these ambulance bodies was made to the Governor of Indiana some time ago and it was promptly accepted with thanks from the chief executive.

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OUR LONG EXPERIENCE

THE BETTER QUALIFIES US TO MAKE THE BEST LENS—YES,
THE VERY BEST—

THE STAR LENS

All Danger is Avoided—*The Law is Obeyed*—Night Driving is Made Safe and Pleasant

Automobile Lighting is "our middle name"—we've been at it for years—now, honest, just between ourselves, if you had your mind made up to buy Lenses, either as a jobber, dealer, or car owner, isn't it a ten to one shot that the order would go to the house with the most experience at its back? Yes! Sure! Just naturally the order would drift that way —Why? Well, because buying Lenses cannot be likened unto the buying of soup greens. We all know that diffusing Lenses have been going through the experimental stage—that's why our customers flocked to us, as soon as we announced our finished product—they knew we'd have the goods.

The Star Lancaster Diffusing Lens

is the highest point ever reached in Auto Headlight Lens making. All our experience is there—and experience is good if not bought too dear. All the brazen glare is toned down so as to actually give more illumination, distributed where most needed. This is scientifically accomplished. The stream of silvery rays—the diffused light—penetrates fog much further than a clear, glaring light.

All shadows and dark spots often mistaken for ruts are eliminated. The light is thrown sidewards as well as forward. A driver can go to the extreme edge of the road without being ditched. Corners can be turned sharper and quicker with perfect safety.

LIST PRICE

SIZE	DIAMETER	PER PAIR
3¼ to 6 15-16 in.,	varying 1-16 in. in diameter,	$1.00
7 to 7 15-16 in.,	" " " "	1.50
8 to 10½ in.,	" " " "	2.00
10 9-16 to 12½ in.,	" " " "	2.50

Liberal Trade Discount

Sizes in greatest demand are 7¾, 8, 8⅛, 8¼, 8⅜, 8½, 8⅝, 8¾, 8⅞, 9, 9⅛, 9¼, 9⅜, 9½, 9⅝, 9¾, 10, 10¼, 10½, 11, 11¼ and 11½.

Those sizes underscored represent two-thirds of our entire sales of Lamp Front Glasses

They fit every car---work equally well with gas or electric light.

EASILY INSTALLED

If your jobber cannot supply you—come to us.

Better write us today.

THE LANCASTER LENS CO., LANCASTER, OHIO

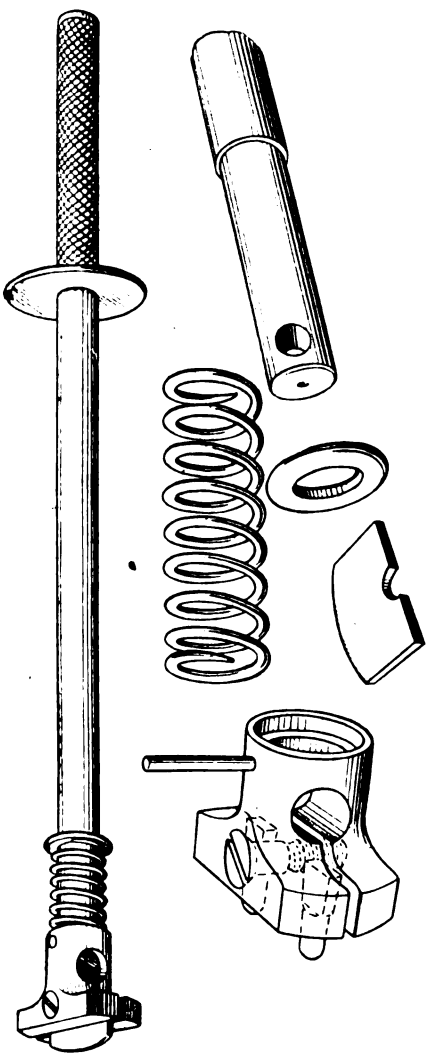
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The Bailey Ball Thrust Bearing.

This is an exact replacement bearing to replace thrust washers at the left or gear side of the Ford car and Chevrolet 490 differentials. This device is claimed by the manufacturers to be an efficient remedy for axle difficulties, noisy or broken gears. This invention is the work of a master engineer and it will fit to the thousandth part of an inch, and will positively keep gears in proper mesh and make them run quietly and last indefinitely. Dealers, garage owners and repairmen throughout the United States and Canada are stocking this bearing, which retails at only $3.75. A liberal discount is offered to dealers, and readers who are interested should send their orders and inquiries to the Ahlberg Bearing Co., 2634 Michigan Avenue, Chicago, who are the sole distributors for the United States.

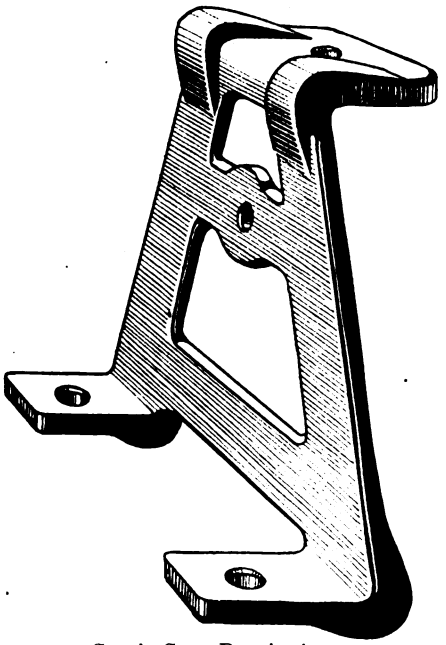
New Labor-Saving Devices.

The Hudson Motor Specialties Company, Real Estate Trust Bldg., Philadelphia, Pa., has put on the market a universal jointed valve-grinder which seems to be quite an improvement over



Valve Grinder and Parts.

the ordinary method of valve grinding. This tool is undoubtedly efficient in grinding the valves of the fourth cylinder of the Ford engine which seems to give more trouble than any of the other cylinders, and which it is difficult to reach for the purpose of grinding. It is of unusually low cost and does the work accurately and with little labor. The same firm makes a crank case repair arm which is illustrated herewith.



Crank Case Repair Arm.

With this device you can repair the engine in case the crank case breaks in a short time and at little cost.

Standard Roller Bearing.

An event of interest to New England automobile owners in general and to dealers and garage men in particular, is the opening of a Boston branch house of the service sales department of the Standard Roller Bearing Company of Philadelphia, which will be headquarters in New England territory for all their products. Attractive quarters have been secured at 163 Massachusetts Avenue in the center of Boston's "automobile accessory row" and this new store will be in charge of Joseph R. MacCollum, well known to the trade, having been for several years purchasing agent for the Packard Motor Car Company of Boston. This is the first of series of branch houses of the service sales department of the S. R. B. Company which will be opened in the near future in approximately fifteen or twenty of the leading cities of the United States. These branch houses will cater particularly to the interests of dealers, garage men and consumers covering all supplies and service pertaining to S. R. B. products.

The $295 Ford Truck.

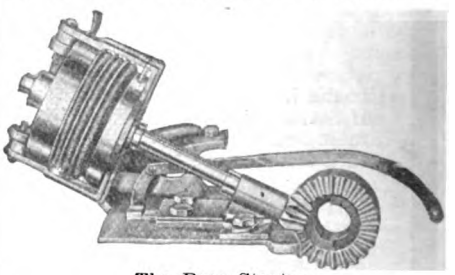
Business men are awakening to the fact that it is folly to buy a new truck or do without, when a Ford can be so easily and quickly converted into a first class 2500 pound truck, at such a surprisingly low cost. There's a good, profitable harvest in this field for live dealers. The future needs for small trucks can hardly be estimated. When trucks can be procured at so low a cost, thousands of uses will be found for them, which are as yet unthought of. Your imagination can run riot along this line without exceeding the possibilities. The low upkeep of the Ford will result in fleets of Ford trucks replacing the heavier kind, etc. Be ready for the harvest. The Andaford attachment, composed of chassis, heavy artillery rear wheels, springs, chain drive, etc., made to attach rigidly to original Ford chassis by simply removing pleasure car body and rear wheels, is designed by men associated with the auto industry ever since it was an industry. In construction, utility and quality of materials it is supreme and the price—$295, will make it a ready seller. It is made by the Andaford Truck Co., Jefferson and McDougall Aves., Detroit, Mich.

The Stanley Steam Cars.

Word comes from the Stanley Motor Carriage Company of Newton, Mass., that from this time on Stanley cars will be supplied in only one chassis size. This is the standard 130-inch wheelbase model, such as they have made for the past three years with three, five, or seven passenger bodies. For many years the Stanley manufacturers have been furnishing a special over-size chassis and power plant for heavy duty commercial service, twelve to fifteen passenger mountain wagon service, and general bus service. The power, flexibility and economy of steam power adapts itself unusually to these extreme uses and this department of the business has flourished for years. The decision to discontinue these models was induced by a growing demand for Stanley cars which the factory is having difficulty in keeping pace with. The concentration of production on a single chassis size will help the output of the Newton works and assure better deliveries on the regular line. Whether it will be a permanent policy of the Stanley Motor Carriage Company to withdraw from the bus and mountain wagon fields, is not said, but their factory capacity is being increased and the move may be only temporary.

Bear Starter Spins the Motor.

An ingenious invention for starting Ford cars from the seat is the Bear starter the big feature of which is a three-to-one gear, driven by a tapered drum, and placed under the hood independent of all working parts. The drum revolves three times with each operation, spinning the motor a complete revolution over two compressions and past two



The Bear Starter.

ignition points giving both leverage and speed. Giving the handle a pull from the seat, the pull is transmitted by flexible cable direct to the drum which immediately begins to revolve at great speed and in an instant the second compression point has been reached, the motor has drawn in a full charge of gas and generated a good hot spark. There are no corners or pulleys to work around making the pull easy and wear on the cable negligible. The starter is bolted on to the motor base. No holes need to be drilled and no parts disturbed. Manufactured by Bear Mfg. Co., Rock Island, Ill.

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Food Supply is Decreasing.

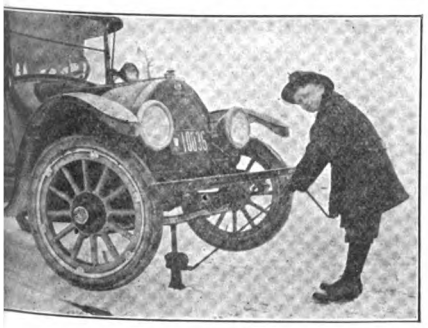
The food supply for humans is decreasing, says T. J. Hudson, sales manager, motor truck department, Chicago Pneumatic Tool Company, Little Giant Building, 1615 Michigan Ave., Chicago, Ill. Its price is increasing. Yet horses are being daily fed it. 17,000,000 work horses each consume 136 bushels of oats per year, or 2,312,000,000 bushels of what might be oat products, the most nourishing food for human beings. Again, the U. S. Department of Agriculture says it takes over three average acres to supply a human being, and more than five for a horse. So every team of horses costs more to maintain than three human beings. The expert analysis continues, "Wherever a team of horses is employed to do work that can be done more effectively and more economically by a motor-driven vehicle, the up-keep of those horses is seriously menacing the food supply of human beings even if it is not robbing three human beings of food. The great war will be won or lost by food. All the authorities are agreed upon that. Even if there be no actual pinch of hunger, the rising cost of foodstuffs is bound to crystallize into an irresistible public opinion whose object will be to compel the conservation of food. Those who employ horses to do work that motor trucks can do better may have to justify the use of horses."

It is presumed that the large cities will require all tenement automobiles to be equipped with adequate fire-escapes.



An Extraordinary Jack.

The Rees jack, recently introduced by the Service Corporation of Pittsburgh, Pa., possesses many novel features. The fact that this jack can be operated while standing erect at a sufficient distance from the car to insure perfect freedom of action, will doubtless prove a boon to many motorists. Its long crankhandle enables the operator to swing it under the car, push it into the exact position desired, raise and lower the car, and



How It Operates.

remove the jack, all without stooping under the car or actually handling the jack itself. The Rees jack has only 4 working parts, and contains no springs, pawls or ratchets. It was developed in railroad yards, lifting freight cars and passenger coaches for the replacement of bearings. It is an extremely powerful and efficient lifting device, silent, steady and safe. The 2-ton jack, for motor car use, is tested with a 5-ton load, yet it is practically no larger or heavier than other jacks. The ease and swiftness with which this jack can be handled, together with its safety and cleanliness, seems to assure it a warm reception by the trade.

Harvard Pocket Battery Meters.

The Harvard Electric Co., 525 W. Van Buren St., Chicago, Ill., are manufacturers of the Harvard Pocket Battery Meters, which are high grade instruments of the permanent magnet type. They are light, handsomely nickel-plated, and of convenient pocket size. They are accurately calibrated and guaranteed for two years. Neither the temperature nor the weather affects their accuracy. They may be read in any position, with or without the use of the flexible cable.

They also make ammeters for testing dry cells. These instruments indicate the direction of current as well as its strength. A flexible cable accompanies each instrument so that the total effect of the whole battery may also be easily determined. A new circular illustrating the above material has just been issued and those interested are requested to write for a copy.

New Accessory Manufacturers.

The Bear Manufacturing Co. of Rock Island, has just been incorporated under Illinois law with a capital stock of $200,000 and promises to be a large manufacturer and handler of Ford accessories. The company has developed a number of excellent accessories most of them being particularly adapted to Fords. A. I. Sandbo is the inventor and some of his inventions are now known the country over and are in use around the globe. Among the accessories now ready for the market are the Bear mechanical starter for Ford cars, the Bear Primer, Bear gas generator, Bear running board support for Ford cars, Bear vulcanizer, Bear draft shield, Bear oil saver, Bear radius rod and Bear crank handle release. Each of these articles are fully covered by patents and facilities are at hand for their manufacture in large quantities. The Bear primer is another of the company's products. It is a gravity primer with a self-measuring chamber which gives just the right charge every time and carries it to both ends of the manifold, right at the intake ports. It is non-leakable and operated by simply lifting a double acting needle valve.

Tire Repair Equipment.

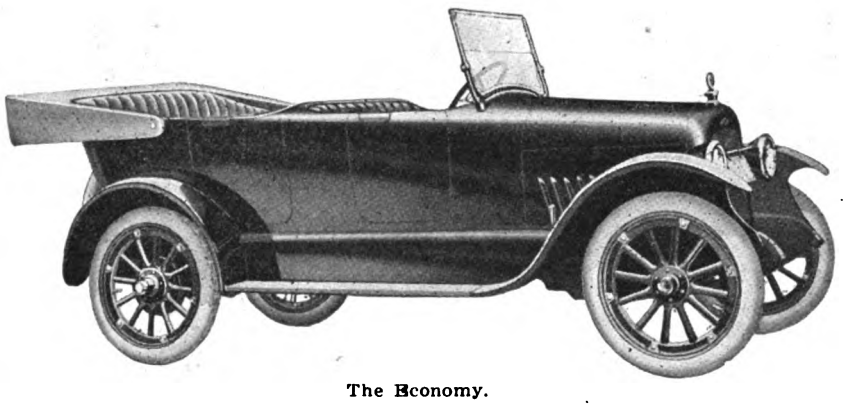
The Akron Rubber Mold & Machine Co., 917 Sweitzer Ave., Akron, Ohio, manufacturers of Tip-Top Ti-Re-Pair Equipment, after maintaining their price of $125 for their Type F Equipment, big capacity. self contained vulcanizer, for months in spite of the steadily increasing cost of raw materials, have been forced to advance the price of this equipment to $150. As a result of the price and specifications published, orders poured in from the trade in all parts of the country, taxing the factory to the utmost to keep up with them. Now with the present cost of raw materials, the manufacturers claim that their Type F Equipment, big capacity, self contained vulcanizer, with the specifications and high quality of this outfit, is better value for the money than is now offered elsewhere for anywhere near the price. Equipment consists of two cavities: 2½-3 and 4½-5, with reducing shell to take 3½-4, on which practically all sizes of inside work can be done. 2½-3, 3½-4 and 4½-5 bead molds in either quick detachable or straight side furnished with outfit.

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The Economy Motor Car.

As will be seen by the illustration, the Economy Motor Co. of Tiffin, Ohio, have designed a most graceful and attractive automobile. It is an assembled car, and that is considered by some a decided advantage rather than otherwise. The principal specifications are given herewith and it will be seen that they are all of the highest class.

Four-cylinder cast en bloc, high speed type; bore 3¾ inches, stroke 4¼ inches, 36.9 horsepower, at 2800 revolutions per minute. Crankshaft and camshaft of nickel steel specially heat treated. Carburetor—Schebler. Model "R," air adjustment from dash. Ignition—Connecticut automatic in connection with coil and distributor, current taken from the storage battery. Lubrication—Splash system supplemented by plunger pump effected by the camshaft. Cooling—Thermosyphon in connection with a honeycomb radiator. Clutch—Disc type running in bath of oil. Transmission—Center control ball bearing, nickel steel gears, three speed forward and reverse. Electric system—Two unit Dyneto, chain driven generator with timer head, ammeter on dash. Starter with Bendix drive to the fly wheel. Storage battery—Willard, 6 volt, 80 ampere. Wheelbase 115. At present the Economy Motor Company is confining its efforts to only two models—the touring car and the Thre-Dor roadster. The touring car is large and roomy and will easily accommodate five passengers. The Thre-Dor roadster as implied by its name is built with only three doors, one on the left and two on the right, and will accommodate five passengers without crowding. Prices are as follows: Touring car or Club roadster, 4 cylinder, $1040—either type, 8-cylinder, $1395, f.o.b. Tiffin. For further information, write the Economy Motor Company at Tiffin, Ohio.



The Economy.

"Care Saves Wear."

This is the title of a most attractive little pocket size booklet of 32 pages, issued by the Federal Rubber Company of Cudahy, Wisconsin, for the benefit of tire users. And it is doubtful if any other three small words could be found, which, framed into a sentence would be of greater interest and benefit to automobilists in general. In this booklet practically every trouble to which a tire is subject has been illustrated from photographic reproductions of actual specimens gathered from many of their service stations, thus representing the results of service over practically every kind of road throughout the United States. In each instance the cause of the trouble is clearly explained, and suggestions offered for its prevention. Carefully studied and practiced, the valuable knowledge contained in this booklet will enable any motorist to largely decrease his repair bills and very materially increase his tire mileage.

Guarantee Visible Gasoline and Oil Pumps.

These pumps for garages, dealers and gas filling stations will surely command a ready sale as they have many distinct advantages. The visible measuring device is extremely handy. These pumps are guaranteed to be absolutely accurate as to measurement and by their use, all hand pumping is eliminated. There are no parts to adjust or get out of order, and these pumps are easily cleaned and positively filter gasoline. One or more grades of gasoline can be handled through one pump. These pumps are not affected by temperature. They hold no gasoline in the hose and they are absolutely self-measuring. Readers who are interested should write for printed matter and full particulars direct to the manufacturers, the Guarantee Liquid Measure Co. (Hepburn Walker, Distributor, Farmers Bank Bldg., Pittsburgh, Pa.)

Prismolite Lenses.

The Prismolite Company, Columbus, Ohio, are having wonderful success in marketing the improved type of Prismolite lenses which were first offered to the trade in May of this year. Prismolite lenses are made of plate glass. They are convex, and on the inner surface of each lens are over 20,000 prismatic surfaces, 256 to the square inch. Each of these prisms collects the blinding glare from the headlight and breaks it up—diffuses the rays, making a soft mellow light which illumines the roadway and 30 feet on either side. Just below the center of the lens is a clear glass bullseye which throws a beam of light 1,000 feet ahead. Thus light is furnished wherever it is needed—on the roadway in front of the car, on the sides of the road, everywhere except in the eyes of the approaching pedestrian or driver of another car. Prismolite gives, beyond doubt, the clearest, strongest, brightest, yet softest illumination of any lens now on the market. It may not be generally known that the Prismolite Company produce more automobile glass than all other manufacturers combined. The retail list price is $3.50 and $4.00 per pair, according to size.



New Dixon Booklet.

The Joseph Dixon Crucible Company have just published a new booklet descriptive of their graphite automobile lubricants. This booklet has for its introduction a story of the Roman Emperor who covered the world with leather and the connection between this story and their graphite lubricants is very cleverly drawn. A booklet will be sent to anyone who will write the Joseph Dixon Crucible Company, Jersey City, N. J., giving the name of their car and dealer.

Ford Car Accessory Exposition.

There will be held at the Coliseum in Chicago from September 22nd to 29th, a National Exposition for Ford car accessories. This unique show has received almost universal endorsement, not only of those interested in Ford car accessories but by other big concerns and it promises to be an occasion of a good deal of interest and importance. Automobile schools have been invited to participate in the Ford accessory show and the Coliseum Annex has been set aside exclusively for their educational demonstrations. There will be no exhibits in the balcony and basement of the Coliseum; these portions of the huge exposition building being used for promenade, lounging and smoking rooms and places of entertainment. The national colors and American flags will be the feature of the show decorations, the work being in charge of the leading festival decorator in the United States.

Carries Nearly All of the Ford Load.

The Ford power plant is built to carry the ordinary equipment and body of the Ford passenger car, plus five passengers, at most. Its surplus strength is sufficient to care for ordinary overload. It does the work for which it is built. But the Ford power plant will pull many times the weight it will carry—and on this basis the Phenix truck maker is built. There is no danger of overloading the power plant of the Phenix truck maker, or of putting undue strain on the motor. At no time is the motor or car—even when hauling the maximum load—subjected to greater strain than when traveling at moderate speed as a pleasure car. With its massive construction and broad, heavy, artillery type wheels, it carries 90 per cent. of the load, safely and easily. The Ford part of the unit merely pulls it. And, besides, ball bearings in the bell housings relieve Ford axles of strain and prevent breakage. Extra heavy springs carry the load with ease, and the efficient brakes operate metal against metal. The capacity is 1½ tons and the price is but $350. When you purchase a truck extension get only the best and strongest and thus avoid trouble.

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There's a Great Call

for this popular pump

"Ninety Pounds Before You Know It"

It's so *easy* and so *sure*— requiring so little muscular effort that even a woman can easily pump up a tire to standard pressure. Power pumps may fail—foot pump disappoint you, but a

YANKEE
90 Pounds Before You Know It
PUMP

is always on the job. It's not an up-and-down, back-breaking, "push-and-pull" motion, but an easy swing of the arm, standing erect, with a pump so perfectly made and adjusted that it answers every thrust with full volume of air. Make a Yankee Pump part of your necessary equipment. Ask your dealer about them.

$5

Apex Electric Mfg. Company
1411 West 59th Street, Chicago, Illinois

Big Sales through big advertising and big demand

Send us your order today with name of your jobber



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Training a five-inch gun aboard one of our Dreadnaught Battleships

DREADNAUGHT TIRES

have set a new mark in the tire world because of their toughness, durability, resiliency, and smooth-riding qualities. They deliver mileage far in excess of their guarantee.

5000 MILES GUARANTEED

DREADNAUGHT Red "Silent" Vacuum Tread is a positive anti-skid—the bar through the centre of cups prevents clogging, avoids "drag," minimizes noise and road friction, and "holds" the road. DREADNAUGHT Red Ribbed Tread is easy to steer and successfully supplants the old time plain tread. The color scheme—the *red* rubber treads contrasted with the soft-toned ivory side-walls—adds smartness and distinction to the car.

Use SUPER-DREADNAUGHT RED INNER TUBES in Dreadnaught Tires—they are thicker and stronger than ordinary tubes. Dealers find them excellent leaders for their accessories stocks.

We have an exceptional proposition and assure excellent service and territorial protection with intensive co-operation from our organization. Write or wire, Department "Y"

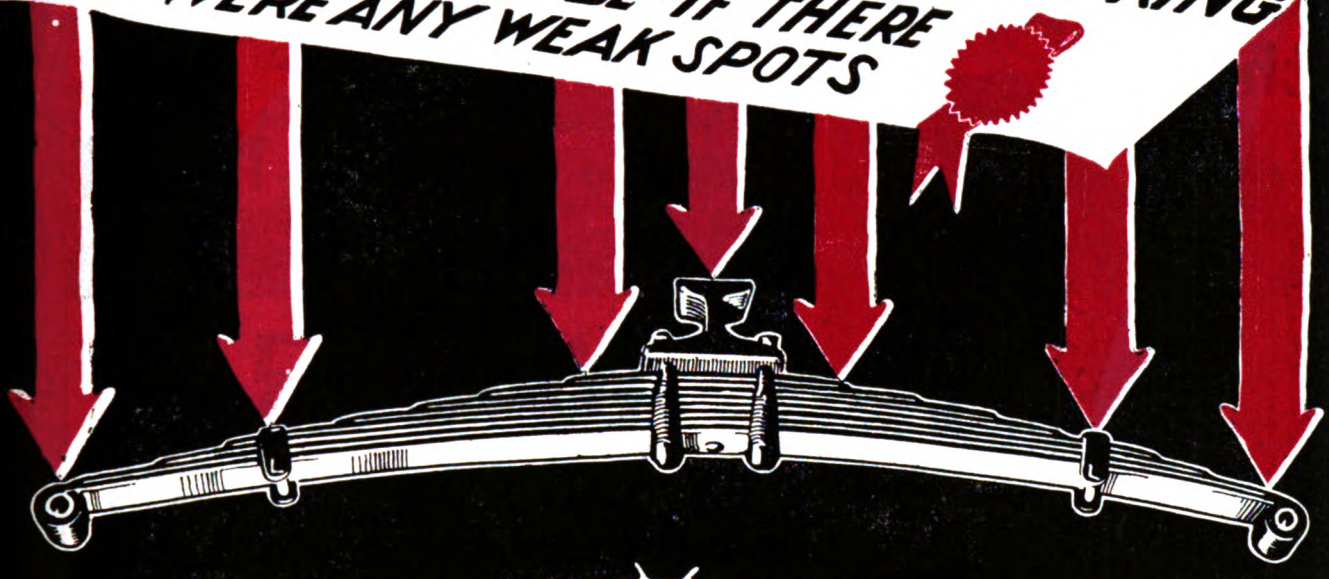
Beautifully illustrated Booklet "The Evolution of the Battleship" by Henry McDonald Spencer, sent free on request.

CHARLES F. U. KELLY, Inc.
Sales Department
1834 Broadway, New York

Manufactured by
The Dreadnaught Tire & Rubber Co.
Baltimore, Maryland

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Our Guarantee
THE SAME AT ANY POINT ON SPRING
IT WOULDN'T BE—IF THERE WERE ANY WEAK SPOTS



The manufacturer of a spring knows more about his product than any outsider does. His guarantee is going to be just as liberal as quality will allow. So it follows that the broadest guarantee covers greatest spring value. Providing, of course, the guarantee is given by a *responsible* maker.

Higgins Quality Springs
FOR REPLACEMENT

are guaranteed alike at *all* points. There isn't a weak clause to leave a loophole for weakness of construction. Our guarantee is strongest because years of the most rigid usage have proved Higgins Quality Springs equal in every *section* to all demands.

This Alone Should Show You Where To Obtain Greatest Value

We *know* Higgins Springs will stand up and render satisfactory service in the center where 90% of all spring breakage occurs, for under our scientific form of center building all weakness has been done away with. Instead of a bolt and a hole which rob the spring of just so much support—instead of a hump, which stiffens the center and causes equally great breakage outside malleable that holds leaves together—we employ the *nib* form of retaining leaves securely in place.

This improved design grips centers safely in position—it possesses strength which bears the brunt of heaviest loads and hardest bumps, and *allows* the "give" essential to real riding comfort. We employ only best grade of motor car spring steel of special analysis—tempered in furnaces and quenching baths constructed especially for us. Subjected to most exacting tests for defects in elacticity, tensile strength and anti-fatigue properties before shipping. They are *proved* perfect.

Higgins Quality Springs are equipped with rebound clips. Leaves properly lubricated with special high grade spring leaf lubricant. They never squeak. They never rust. They never leave you in doubt as to their dependability. Safe springs to buy—to use. Immediate shipments.

Ask Your Supply House and be sure to send for prices and Catalog C-1917, showing 500 different styles—also proposition which is certain to stimulate spring sales.

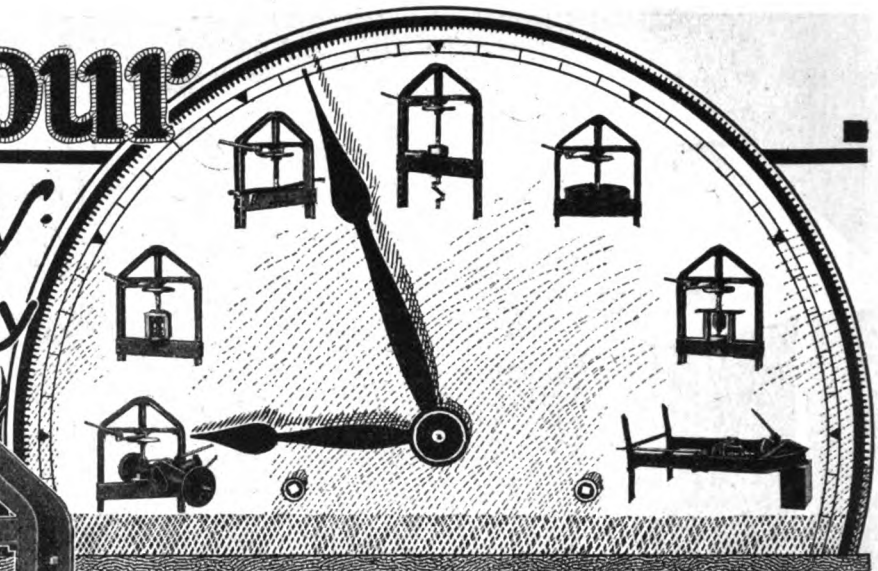
Higgins Spring & Axle Co.
Dept. 314, Racine, Wis.

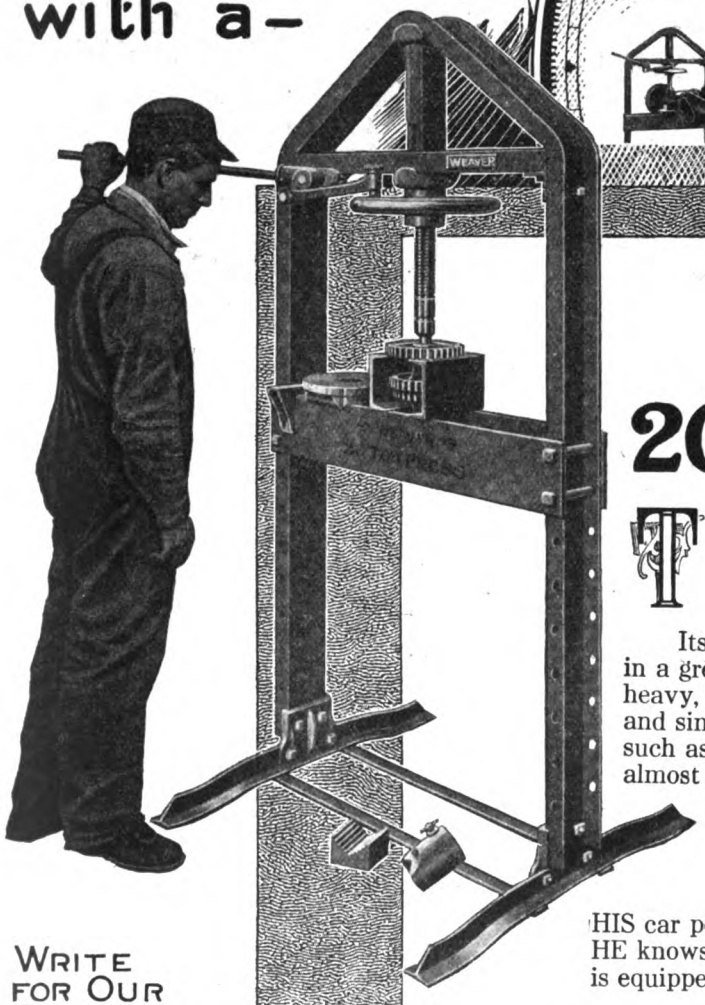
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Every Hour

of the day

will save money with a—





WEAVER 20-TON PRESS

THIS PRESS—specially designed for Garage work—can be used to great advantage to perform dozens of operations in your shop other than simply pressing off gears, straightening axles, etc.

Its wide, clean, open construction permits it to be used in a great many ways which are impossible with the ordinary, heavy, bulky type of press. From straightening frames, axles, and similar heavy work down to the most delicate operations such as pressing the pinions off of generators, etc.—there is almost constant opportunity to save money and labor and to perform your work more efficiently.

It Will Attract Trade

Every car owner would prefer to have the work on HIS car performed with a Press instead of with a sledge hammer. HE knows what it means and he will patronize the shop which is equipped to handle work in a mechanical manner.

Enormous Strength and Leverage

Notice that the frame of the Weaver Press is made of ONE PIECE of NINE pound, five inch channel steel—no bolted joints or corners to weaken its construction.

This Press is listed at 20-Ton capacity, but we know of cases where OVER THIRTY TONS PRESSURE have been developed on it, and without any injury whatsoever to the Press.

THE LEVERAGE adjustment for ordinary service is 1500 to 1, but a convenient adjustment is provided which will DOUBLE this leverage when necessary.

Width of frame, 32 inches; perpendicular capacity, 48 inches; BALL BEARING WHEEL for quick adjustment; bronze thrust bearings; 2 inch mill cut screw.

Furnished complete with vise attachment, face plate and special blocking.

WRITE FOR OUR COMPLETE CATALOG



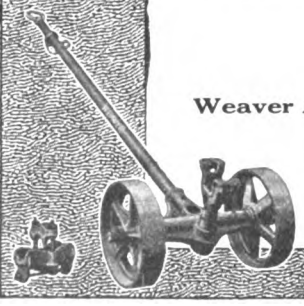
WEAVER MFG. CO.

2175-79 SOUTH NINTH STREET

SPRINGFIELD, ILLINOIS

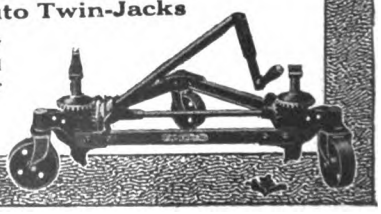
Weaver Auto Ambulance

for towing disabled cars. TELESCOPING steel tongue; roller bearing steel wheels; will attach to either axle of the car.



Weaver Auto Twin-Jacks

A combination of screw hoist lifting jacks and turn table. Ball and roller bearing throughout.



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A LAMP TEST.

Results Will Be a Guide to New York Motorists.

Tests to determine those lenses and other devices on the market that will bring an automobile's headlamps within the legal requirements of New York State have been conducted by the New York State Motor Federation. Of 38 different articles tested 25 were found to come within the restrictions set, and further tests are to be held on others not passed on. In making the tests, a sheet was placed directly in front of the car at a distance of 75 feet in such a way that a horizontal mark on it was exactly 42 inches above the ground. In the judgment of the committee, the direct beam of light from the lamp was required to fall below this line. Another object placed 250 feet from the lamp and directly in front of it had to be clearly disclosed, these two tests reproducing conditions of the New York law. At a distance ten feet in front of the car and ten feet to the side of the lamp the ground was required to be illuminated by scattered rays from the lens.

The 25 devices which received the approval of the Federation's technical committee follow, with the names of their respective manufacturers:

Warner, Warner-Lenz Co., Chicago.
Letts, Manifold Heater Co., Cortland, N. Y.
Rand, Rand Mfg. Co., Haverhill, Mass.
Glare screen, Palmer Glare Screen Co., Cleveland, O.
Offset, G. T. Sutterley & Co., Philadelphia, Pa.
Stryker, C. L. Stryker, Buffalo.
Ames, Heinze Electrical Co., Lowell, Mass.
Pennock, Specialty Mfg. Co., Minerva, O.
Tilting reflectors, Cadillac Motor Car Co., Detroit.
Star, Lancaster Lens Co., Lancaster, O.
No-glare, No-Glare-On Co., Watertown, N. Y.
More-Lite (clear and amber), L. E. Smith Glass Co., Mt. Pleasant, Pa.
Da Lite, Jeannette Toy & Novelty Co., Jeannette, Pa.
Saferlite, Saferlite Lens Co., New York.
Primolite, Standard Glass Specialty Co., Morgantown, W. Va.
Conaphore (clear and Novial), Corning Glass Works, Corning, N. Y.
Legalite, Legalite Corp., Boston.
Fracto, Crew-Levick Co., Philadelphia.
Mac No-Glare, F. F. MacLean & Co., Syracuse.
Perrin No-Glare, Perrin Mfg. Co., Detroit.
Osgood, Osgood Lens & Supply Co., Chicago.
Omolite, Omolite Co., Jamestown, N. Y.
Holophane, Holophane Glass Co., Corning, N. Y.
Crockett, C. W. & C. H. Crockett, Troy, N. Y.
Rite Ray, Reflex Co., Newark, N. Y.

It will be noted that the list contains the names not only of many well-known lenses, but of devices for controlling the elevation of lamps while using the original lenses with which they may have been fitted by the manufacturer, and devices for breaking up the beams that would offend before they pass through the lens.

If you use an enamel cover for your tires, be sure you put it on right side up. Sometimes we find one put on upside down, which will cause it to hold the rain instead of shedding it.

STOP
WORRYING

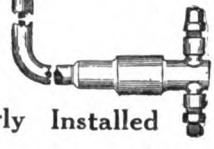


Lock your car with a
WALKER KE-LES



Cuts Off
Battery
Magneto
Starter
Circuits
Also
Gasoline

$10



No Key to Lose
—No Keyhole
to Find

$15 Properly Installed

Saves Gasoline Waste
Reduces Insurance

Ask Your Dealer

Over Three Thousand Five Hundred Walker Ke-Les Auto Locks in use for three years—and not one car stolen. Unqualifiedly endorsed by leading Automobile Engineers, Master Mechanics and Electrical Engineers—condemned by all Auto Thieves.

No more gasoline waste by leakage from the carburetor when the car is standing still, and no more repair bills. Walker Locked Cars get a MUCH LOWER Theft Insurance Rate.

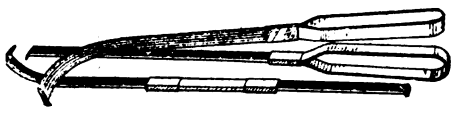
See your Dealer, Garage or Repair Man. If he does not happen to have Walker Locks on hand, send us his name, right now.

WALKER KE-LES LOCK CO.
Dept. G
Factory: Aurora, Ill. Sales Dept.: Chicago, U. S. A.

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A New Carbon Scraper.

The Flexible Carbon Scraper Co., 1421 West Washington St., Los Angeles, Cal., has put on the market a novel device for removing carbon. It is claimed these



Flexible Carbon Scraper.

carbon scrapers will do the job as well as it can be done without taking the motor apart. The price is low, and the illustration gives an idea of the character of the device.

A Pleasing Warning Signal.

The old harsh and frightful warning signal for automobiles seems rather on the wane; possibly it is because such a signal is annoying to a good many nervous people. With this in view, the Cathedral Bell Mfg. Co., Baltimore, Md., have designed a signal that is unusually pleasing, although forcible and loud. It is claimed that it attracts attention and does not offend. This bell is unusually simple in construction, the price is very low and it uses only a small amount of electricity.

New Bodies for Chevrolet Cars.

The Parry Mfg. Co., well-known vehicle builders in Indianapolis, Ind., have brought out a new type of panel body for the benefit of Chevrolet dealers and others who wish something for commercial use. The fact that this well-known firm has produced it is a sufficient guarantee without further words as to its merit.

A New Spark Plug Tester.

There has long been a demand for a dependable auto lamp tester and a spark tester. These are now supplied by the Jefferson Electric Mfg. Co., 426 South Green St., Chicago, Ill. It need hardly be stated that these devices are unusually essential and desirable in an automobile repair shop. With ordinary care they will last a long time and the price of them is so low that car owners will feel that it would be a matter of economy to have them in stock.

A Big Truck Attachment.

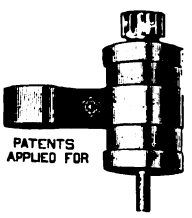
The Commercial Truckmobile Company, 400 Truckmobile Building, Chicago, Ill., are making a truck attachment adaptable to four different sized chasses which is wider, longer and has a greater loading capacity, so it is guaranteed, than anything thus far on the market. It has few parts and is guaranteed for a one and one-half ton load. Strong claims are made for its cheap operation and upkeep. It ought to be a good attachment for dealers to sell not only because it gives a good deal for the money, but likewise because it is simple, unusually strong, and adapted to a wide range of work.

This Is Really a Gasoline Economizer.

A gasoline economizer will soon be placed upon the market which the manufacturers claim is based upon an entirely new principle. It has an unusually desirable feature for commercial vehicles as it does away entirely, so it is claimed, with the necessity of removing carbon from engine cylinders. Strong claims are made for it as to increased mileage for gasoline and also for increased horsepower. The carburetor mantle has been designed and developed along scientific lines and has met with wonderful success in Greater New York, where it was first introduced. There has been developed a mantle for each particular make of car. The devices heretofore submitted to the motoring public have been either those of the screen type or those which permit of a stream of air that is usually admitted through the manifold and requires boring and tapping work. All that is required with the mantle is that the carburetor be dropped down or extended out sufficiently to permit of the attaching of the mantle which is in the form of a gasket, and then the bolts are drawn up and the mantle has been permanently installed. Those who desire further particulars will address Murray-McIntyre Co., 50 Church St., New York.

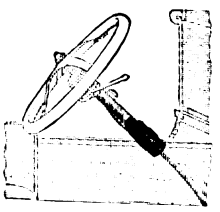
New Ford Car Light.

One trouble in the use of a magneto for lighting Ford cars is that you do not get a good light at low speed. A new electrical invention secures this advantage and it will give a Ford car practically all the lighting advantages of a high-priced equipment and at a cost of



New Lighting Device.

only $2.50. The illustrations give in some measure an idea of the device and how it is mounted. There is no glare and it is a perfect dimmer. The lamps are wired independently and if one naturally goes out for any reason the other

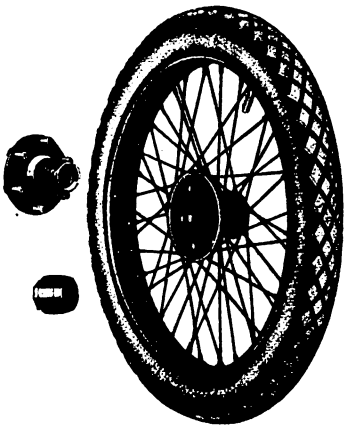


Mounted on the Steering Column.

will continue with the current regulated so there is no danger of burning it out. Those who wish further particulars of this unique lighting system should address the Hastings Mfg. Co., Hastings, Michigan.

New Dayton Wire Wheels.

The Dayton quick detachable wire wheel is a new high grade product, manufactured in Dayton, Ohio. The Dayton Wire Wheel Company is making this wheel under license and they specialize on wire wheels for Ford cars. They have excellent manufacturing facilities, a factory well equipped and an organization of experienced wire wheel men. More tire mileage, easy riding qualities, convenience of changing wheels in case of puncture, the remarkable strength, and the stylish appearance are some of the outstanding advantages claimed for the Dayton wheels. Although this organization only began manufacturing in January, it has been fortunate by having at its head men who are familiar with the wire wheel field and who, by reason of their close association with



Dayton Wheel.

the raw material market, are enabled to secure materials and thereby make immediate and prompt deliveries of the Dayton wire wheels.

To anyone interested, the Dayton Wire Wheel Company will cheerfully and promptly mail literature and any other information desired.

The Bour-Davis Car.

Things are beginning at the Shadburne Bros. plant at Frankfort, Ind. Production on the Bour-Davis car is being transferred from the Detroit plant. Shipments will begin from the Frankfort plant this week. Moving the plant from Detroit to Frankfort was a huge undertaking. Dealers were calling for cars so production could not be interrupted. A small army of men, twenty-two motor trucks and horse trucks were mobilized. Parts, materials and machinery were loaded on trains that were given an express running schedule through to Frankfort. Shipments of cars will begin at Frankfort twenty-four hours after the last cars are shipped from the Detroit plant. Bour-Davis cars are now on exhibition at the salesroom of the Shadburne Bros. Co., 2700 Michigan Ave., Chicago.

A Self-Adjusting Belt.

This belt supplies what may accurately be termed "a long felt want." It is something that has long been needed for automobiles, tractors and machinery generally. It is made of piano wire springs and is absolutely self-adjusting. As a proof of its durability, it is guaranteed for a year, and as guarantees go this is an unusually strong one. This belt is made for about all the different automobiles, and when ordering it it is well to specify the car that it is to be used upon. It is made by the Self Adjusting Belt Co., Watertown, South Dakota.

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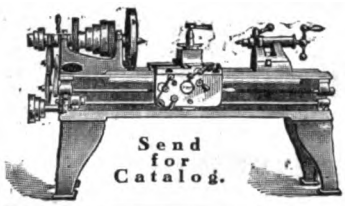
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The Bacon Service, Inc., has issued a booklet for accessory dealers which is designed to show them how to increase their sales. The writer of it knows how to solve the every-day problems of that business and the book is free to any one who asks for it. Write for Booklet D. 7, addressing the Bacon Service, Inc., 151 Grand St., New York.



The Sebastian Lathe Co.
108 Culvert St.
CINCINNATI, OHIO.



HAND-I-WASH
COMBINATION
Water-Soap-Towel
All in one, ready for use. Every motorist should have one. At your dealers or direct, $1.00 prepaid. Refillers 50c., (tube of liquid and roll of paper towels,) 2c. a wash. Weight 29 oz. Size, 11x3½".
TAY-MILLER MFG. CO., Inc.
1714 Cherry Street PHILADELPHIA, PA.

A Great Spot Lamp.

The new law in this and other States involves rather severe requirements for lighting. The Victor Spot Lamp is most satisfactory for these new laws, and the price itself is very low. It is not only beautiful but strong and ought to last a good many years. An advertisement on another page of this issue gives full particulars of its construction and it is guaranteed to give the utmost satisfaction. The firm claims that a better lamp cannot be purchased for twice the price asked for this one. It is very powerful and unsually economical in electric current. If further particulars are required they can be had by addressing the Corcoran Victor Company, Reading Road, Cincinnati, Ohio.

The Despair of Automobile Thieves.

Automobile thieves, of whom there seems to be almost a legion, will find that the new Walker Ke-les Auto Lock will surely put them out of business. There is no keyhole or key and there are over 87,000 changes to the combination. It is easy and quick to operate, cannot get out of order, can be installed quickly and complies with all insurance, fire and police requirements. It has sold like wildfire since it was placed on the market and dealers have found it something that car owners immediately desire when they have once seen it. The profit on these locks is liberal and it is guaranteed in the strongest kind of way. For full particulars, address the Walker Ke-les Auto Lock Co., Chicago, Ill.

Acetylene Welding.

The Imperial Brass Manufacturing Co., Chicago, Ill., have published a new catalogue which treats of welding, cutting, decarbonizing and lead burning. Those interested in these important branches of auto repair work should send to this company and get a copy. Quite likely it will cost nothing provided those making the request do so on their own business letterhead.

Labor-Saving Motor Stand.

The Continental Motor Stand is designed to speed up the assembling and repair of automobile motors. It is guaranteed in every way to save time, meet every requirement of quick assembling, to fit any make of motor and to be easily moved from place to place. It seems to us that it would be a desirable device for every repair shop. It is made by the Continental Auto Parts Co., Knightstown, Indiana.

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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

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HORNS AND SPEEDOMETERS

Official Klaxon Horn Station

Send for price list

GENERAL SPEEDOMETER REPAIR COMPANY

51 West 63d Street **NEW YORK CITY**

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Inner Tubes, any size, $1.75 Each

INTER STATE RUBBER CO.

259 N. 15th Street **Philadelphia, Pa.**

AFFA SPECIALTIES

For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

AFFA SPECIALTY COMPANY

34 SOUTHBRIDGE ST. **WORCESTER, MASS.**

We Still Have a Few 100-lb. Box Assortments

Bolts, Nuts, Set Screws, Rivets, Filister Head Screws, Key Stock, Etc., Etc.

$5.00 per 100 lbs.

Westchester Accessories Co., Inc., 1777 B'way, New York

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Hecht's Magneto Exchange

Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.

Expert Repairing of All Makes.

Express your Magneto, Starter and Generator to us. Same will be repaired and returned same day as received.

Distributors and Service Station for

BERLING SWISS, NATIONAL and MICHIGAN MAGNETOS

— Also —

Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos

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USED MAGNETOS

Bosch High Tension, $15 up

Save 50% to 75%

Herbert Aucock, 222 Columbus Ave., Boston, Mass

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CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

Tires

DOUBLE TREAD TIRES

—GUARANTEED—

Size	Plain	Tubes	Size	Plain	Tubes
28x3	$5.00	$1.75	35x4	$9.00	$3.00
30x3	5.00	1.85	36x4	9.00	3.00
30x3½	6.50	2.15	34x4½	9.50	3.15
32x3½	7.00	2.25	35x4½	9.50	3.25
34x3½	7.50	2.50	36x4½	10.00	3.60
30x4	7.00	2.75	37x4½	10.50	3.60
32x4	8.00	2.75	35x5	11.00	4.50
33x4	8.50	2.90	36x5	11.50	4.25
34x4	8.50	2.90	37x5	12.00	4.75

For (Non-Skid sizes) up to 30x4, 50c Extra.

All other sizes $1.00 Extra.

Examine your worn tires when taking them off, and if the bead is not cut, ship them to us. We will remake them into a GOOD Double Tread Tire at 60% of the above prices.

When ordering, be sure to state what bead tire is required. Whether Q. D. Clincher or Straight Side.

10% Deposit required on C. O. D. orders.

SPECIAL Offer to Agents

Write for Catalogue

Get our special price on new tires.

M. Liben & Co.

205-A West 48th St. New York City

FORD SIZE TIRES

New 30x3½ Non-Skid

$7.50

Jandorf Automobile Co.

1763 Broadway New York

INDIAN HEAD TIRE CO.

FRED J. EBLING WOLFORT

All Makes of the Better Grade

157 WEST 51st STREET

Telephone, Circle 679 NEW YORK

Tires

PRICE WRECKERS

All goods bought before the January increase in price sold at 1916 prices.

Blemished New Tires		Double Tread	
30x3	$6.50	30x3	$5.00
30x3½	8.00	30x3½	6.00
34x4	13.00	34x4	8.00
Guaranteed		$1 00 Less for Re-covering	

Give Us a Trial, We'll Both Benefit By It

ROYAL TIRE EXCHANGE

282 Halsey Street **Newark, N. J.**

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$4.50	35x4	$8 50
30x3½	5 00	36x4	9 00
32x3½	6.00	36x4½	9 50
32x4	6.50	36x5	9 50
33x4	7.00	37x4½	9 50
34x4	7 50	37x5	10 00
34x4½	8 00		

For Non-Skid, 50 cents more on all sizes

We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.

236 WEST 48th STREET, NEW YORK

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
37x5	5.00	9.00	12.00

Ship Your Old Tires by Prepaid Express

McDANIEL RUBBER CO.

613 Ohio Street **Cairo, Ill.**

DOUBLE TREAD TIRES AND TUBES

Write for prices, stating sizes.

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1319 FIFTH AVENUE **NEW YORK**

Branch Store: 241 W. 54th St. (near Broadway), New York

5,000 MILES GUARANTEED. 40% OFF.

Standard Make Tires

Send for Complete List

STAR RUBBER COMPANY

1781 Broadway, N. Y. City Tel., 123 Columbus

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Tires

SPRING REDUCTION ON

DOUBLE TREAD TIRES AND TUBES

GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90
30x3	5.00	1.75	32x4½	9.00	2.75
30x3½	6.00	2.10	34x4½	9.00	3.00
32x3½	6.50	2.15	35x4½	9.00	3.00
34x3½	7.50	2.25	36x4½	9.00	3.10
30x4	7.00	2.50	37x4½	9.00	3.10
32x4	8.00	2.75	34x5	9.50	3.25
33x4	8.00	2.75	35x5	10.00	3.25
34x4	8.00	2.75	36x5	11.00	4.00
35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street NEW YORK CITY 112-A East 100 Street

THE HOME OF DOUBLE TREAD TIRES

TIRES Fresh Stock ALL NON-SKID

Our Guarantee—4,000 Miles

30x3½	$11.00	34x4½	$23.65
32x3½	12.50	35x4½	24.75
33x4	17.18	36x4½	25.25
34x4	19.00	37x5	29.75

All Standard make Firsts at fair prices.

10% deposit required, 2% off if cash accompanies order.

Proposition to Dealers

LEON JAFFESS, Inc.

252 West 55th St., New York City — 6106 Euclid Ave., Cleveland, O.

We make liberal allowances for old tires

—— TO APPLY ——

On Purchasing Tyrian Tires

Guaranteed 4000 Miles.

Any 3 in. tire, regardless of condition, we allow $3.50
Any 3½ in., $4.00 4 in., $6.00
" 4½ in., 7.50 5 in., 10.00

Write us for price and full particulars

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INSYDE TYRES,

inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.

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CHEAP DOUBLE TREAD

NEW AND SECOND HAND

Tires and Tubes

Write for Prices

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ADVANCE TIRES

Most Mileage Per Dollar

FULLY GUARANTEED HONEST ADJUSTMENTS

Write for Prices. Wonderful Opportunity for Dealers. Just what you have been looking for.

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1902 BROADWAY NEW YORK

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SO-LUMINUM

This new welding compound for aluminum is stronger than aluminum—perfect substitute for acetylene. One-half time and cost.

Use Gasoline torch.

Trial Bar, 50 Cents $3.00 per pound

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ACETYLENE WELDING

New Process—Brazing of Aluminum Crank and Gear Cases

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WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.

HUDSON AUTO LAMP WORKS
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RADIATORS REPAIRED

We also make and repair FENDERS, HOODS and TANKS of all kinds.

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STODDARD DAYTON PARTS and GEARS FOR ALL MAKES OF CARS SEND IN YOUR OLD ONES

These parts are new parts.

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COIL AND MAGNETO PARTS

Platinum - Tungsten

H. & L. MFG. CO., 33-35 Liberty St., NEW YORK

Parts for All Make of Cars

Bosch Magnetos, Any Type
Stromberg Carburetors
Slightly Used Tires
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PARTS MARION PULLMAN ELCAR ABBOTT-DETROIT

All kinds of Repairing, such as Motor Work, Overhauling, Painting, Trimming, Body Fitting, Slip Covers, etc.

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SAVE 50% TO 75% ON PARTS—Parts for Pope-Hartford, Columbia, Reo, Buick, Overland, Chalmers, Mitchell, Thomas, Oldsmobile, Maxwell, Stoddard-Dayton, Stevens-Duryea, Corbin, Cadillac and all others. Eiseman, Splitdorf and Remy magnetos, $5.00 to $10.00. Bosch high tension magnetos, $15.00 to $25.00. Also the Mea, Connecticut National, U. & H. and K. & W. magnetos in stock. Springs, wheels, axles, etc., for all cars. Connecticut Auto Parts Co., Inc., 1070 Main St., Hartford, Conn.

For Sale

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

FOR SALE—Gasoline tank and pump, 2" retreading moulds and cash register. Vanderpool Co., Springfield, O.

FOR SALE—Make money easy. While business is good. Vulcanize tires. Our book tells you how. $1.00. Vanderpool Co., Springfield, Ohio.

235 DOLLARS will buy my vulcanizing and tire accessory business that averages 33 dollars weekly. Right man can double this amount easily. Moline Shaler Repair Co., 5215 Fifth Avenue, Moline, Ill.

FOR SALE—Auto business and machine shops, best in state; $8,000 net income; stock, $4,500; machinery, $3,250; real estate, $9,500. G. H. Rogers, York, Nebr.

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RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

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BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

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Bearings

CUPS

(Ball, for Wheels and Spindles)

TO FIT

BUICK

	Each Net
M/10 F. W. Inner	.40
M/10 F. W. Outer	.20
M/17 F. W. Outer	.40
M/17 F. W. Inner	.70

COLE

1910 F. W. Inner	.40
1910 F. W. Outer	.20
1911 F. W. Outer	.40
1911 F. W. Inner	.70

HUDSON

M/20 F. W. Inner	.40
M/20 F. W. Outer	.20
M/33 F. W. Outer	.20
M/33 F. W. Inner	.40

HAVERS

1913 F. W. Outer	.50
1913 F. W. Inner	.80

In conjunction with the above, we carry all the cones to fit these cups together with the retainers, and if in doubt as to the size you require, send us sample, as our stock of caps and cones covers about 100 different types. NO SECOND HAND REJECTED STOCK. BUT BRAND NEW PARTS.

CRANKSHAFTS

To Fit	Net
BERGDOLL 30 H.P.	$30.00
CHALMERS 30 H.P.	30.00
CHALMERS 36 H.P.	35.00
CHALMERS 40 H.P.	40.00
CHALMERS Big Six	50.00
HERRESHOFF M/20	20.00

CAM SHAFTS

To Fit	
BERGDOLL 30 H.P.	$10.00
CHALMERS 30 H.P.	10.00
CHALMERS 36 H.P.	15.00
CHALMERS 40 H.P.	20.00
CHALMERS Big Six	24.00

Are you getting our Bulletin Sheets? If not, drop us a line as it covers what material we are selling and states explicitly what you are getting for your car by year, type, etc. (Not on junk or some worn out part, but absolutely brand new material.) DO NOT LOSE SIGHT OF THIS VERY IMPORTANT FACT, NEW! NEW! NEW!

We also maintain a complete line of parts to fit these cars at discount: Abbott, Atlas, Bergdoll, Buick, Ewing, Chalmers, Hudson, Everitt, Grabowsky, Maxwell, Herreshoff, R.C.H. Elmore, Selden, and many others.

Bulletin No. 8

J. C. Gorey & Co.

Pioneer Parts Experts

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Telephone 9489 Columbus

USED TIMKEN BEARINGS

For Sale. 1-in. to 2½-in. bore. A-1 condition.

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Automobile Initials

DECALCOMANIA TRANSFER INITIALS in gold and colors. You apply them on automobiles while they wait, making $1.38 profit on $1.50 job; free particulars. Auto Monogram Supply Co., Initial Dept., Niagara Bldg., Newark, N. J.

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CYLINDER GRINDING PISTONS — AND — RINGS

Largest Because Best.

Send for Price List.

Houpert Machine Co.

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Cylinders Reground

CYLINDER GRINDING

GREATER EFFICIENCY
QUICKER WORK
LOWER PRICES

are the result of specializing in a single line By taking advantage of our service, you can have cylinders reground or rebored and fitted with new cast iron pistons and individually cast rings, at the finest equipped plant, *specializing exclusively* in this line. We guarantee absolutely every piece against poor workmanship. 20 years' practical experience is back of us. Write for prices.

BRIDGEPORT PISTON RING CO.

Connecticut Ave. and 3rd Street

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Thousands of Satisfied Customers

SCORED CYLINDERS

Repaired With a Silver-Nickel Alloy

"Fused Electrically by Patented Process"

NO WARPING or ENLARGING OF BORE

Same Piston and Rings Used

Also Do a Large Grinding and Welding Business

ALL WORK GUARANTEED

L. LAWRENCE & COMPANY

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CYLINDER REGRINDING PISTONS, RINGS and PINS

Quality work. Get our prices.

BUTLER MANUFACTURING CO.

ESTABLISHED 1897.

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CYLINDERS REBORED AND REGROUND. Fitted with light grey iron pistons and leakless rings. High grade quality. McCadden Machine Works, Inc., St. Cloud, Minn.

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IMPROVEMENTS WANTED—Send for free bulletins and advice. Book "INVENTIONS—PATENTING and PROMOTING" Free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C.

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PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

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TIRE SPECIALTY CO.

EXPERT TIRE REPAIRING

Guaranteed Work Moderate Price

757 Seventh Ave. 'Phone, 528 Circle. New York City

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SHIP THAT TROUBLESOME CARBURETOR

By Parcel Post. We rebuild and install new parts. Largest and most fully equipped carburetor testing plant in the East. Factory appointed service station for all the leading companies. Also a stock of used rebuilt carburetors, $5.00 up. All work guaranteed.

JOHN WILLS, Carburetor Specialist, 284 Halsey St., Newark, N. J.

Wanted

AGENTS WANTED—Patriotic flags. Set of five with holders, including American, French, British, Belgian, Italian, with multiple flag holder. Can be sold to every car owner. Agents wanted in every county. Send $1.00 for salesman's sample or ask for particulars. Reference: Automobile Dealer & Repairer. Asch & Company, Inc., 16 West 61st Street, New York City.

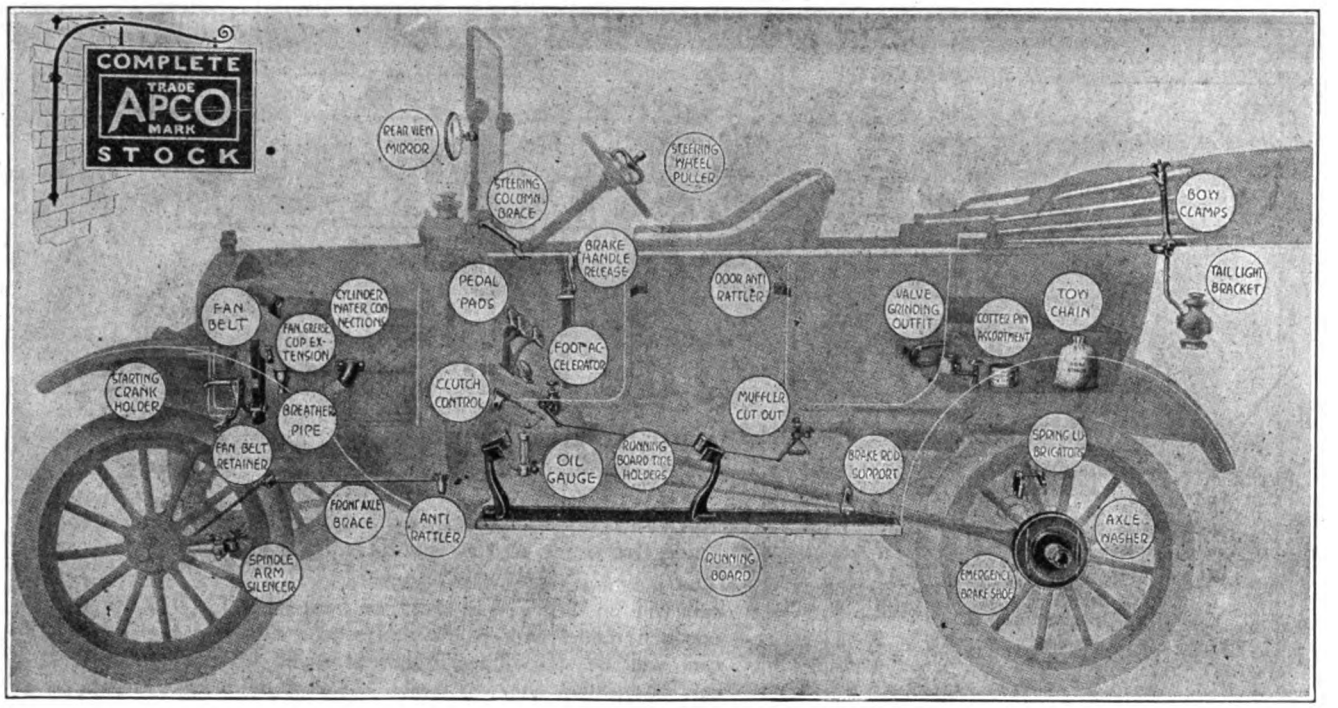
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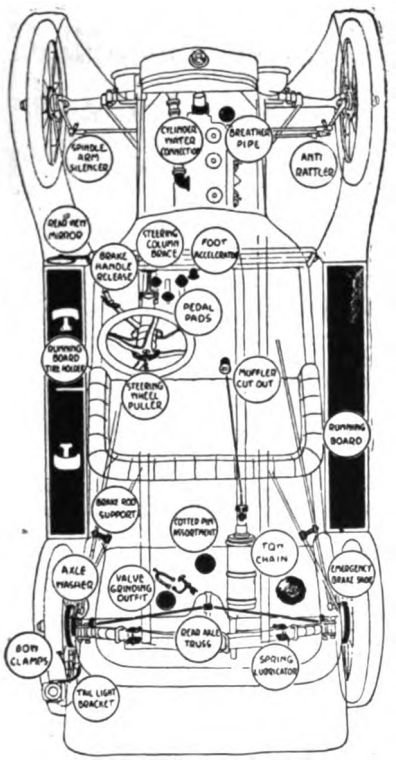
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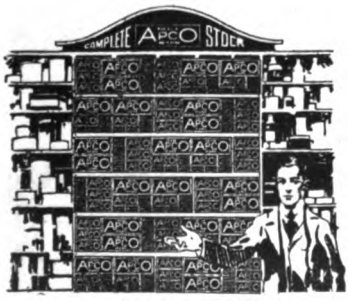
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—means "Quality Specialties for Ford Cars" and it is the "buy word" for thousands of *discriminating* Ford owners the world over.

From Front to Back, Back to Front, Inside and Out, the Ford car is a better car when equipped with the Apco "better goods."

As originators and exclusive manufacturers of "Needs for Fords" we are in a position to, and do make products that we are proud to put our name on, and when you see Apco on the outside of a box you can gamble on finding quality on the inside.

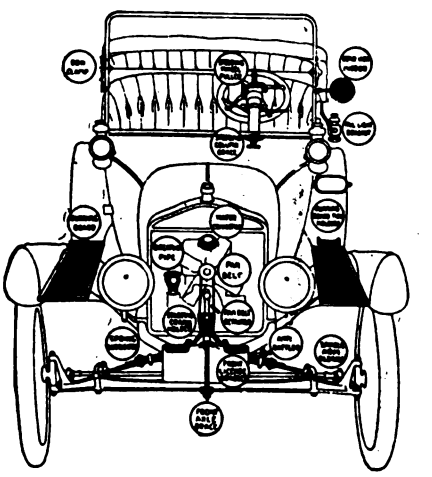
Our prices are lower in most cases than the inferior goods, and the reason we can combine high quality and low prices, is because we produce more of this material than any other five concerns in the country.

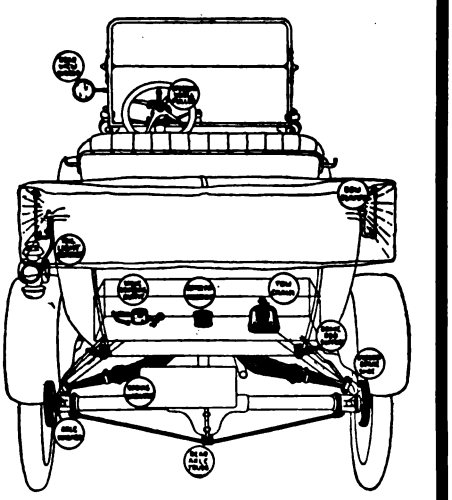
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There is nothing that shows better profit than the Apco line, especially to those dealers who value the satisfied customer as an asset.

Every Apco product is packed in an individual box and when they are on your shelves they look like real merchandise.

Get busy now, and when a customer asks for an Anti-Rattler, reach up on the shelf for an Apco, instead of down into a nail keg for a nameless, often useless, imitation. Our Catalog and Discount Sheet should be on your desk now, and remember Apco goods are sold by Jobbers only in one hundred and twenty-eight cities in the United States.





APCO MANUFACTURING COMPANY, Providence, R. I.

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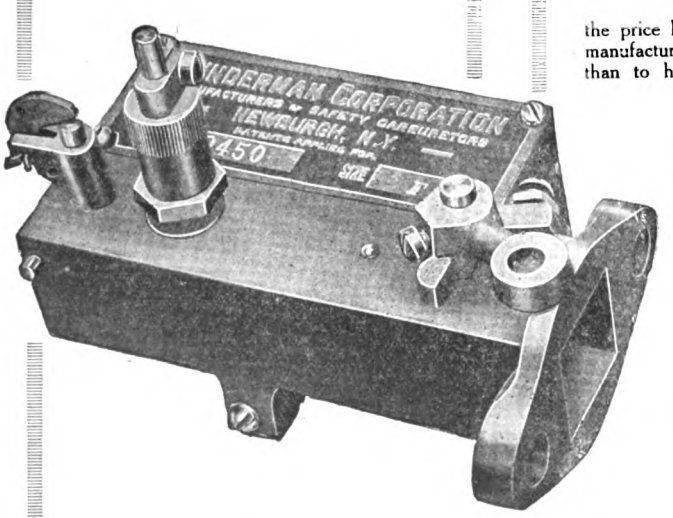
SUNDERMAN
Vacuum Carburetor

$5

F. O. B.
Newburgh

$6.50
other than
Ford or Metz

On September 1st this carburetor will cost you more. Why not send your order in at once? You'll save money and increase the available supply of gasoline—by saving from 30 to 50% with a Sunderman. ACT!



The Price Advances September 1st

Advancing material and labor costs compel us to raise the price of the Sunderman Carburetor.

The one-inch model, ready for installation on Ford and Metz cars will be $6, instead of $5, on September 1, 1917. The one-inch model with elbow and regular fittings for standard cars will be $8. Special jobs at slight advances to cover cost of manufacture.

This announcement gives dealers and car owners an opportunity of getting their orders in at the old prices. In this way we give them the benefit of the Sunderman policy of fair treatment to all customers.

The advance is slight—scarcely enough to cover the raw costs of production. We have consistently refrained from capitalizing the exceptional qualities of the Sunderman Carburetor by putting a high price on it.

We held off as long as possible—until a stubborn material market and persistently increasing labor costs compelled us to advance the price.

The **economy** of the Sunderman—and its marvelous efficiency on every test of a carburetor long ago justified us in charging a price commensurate with its worth. We have never done it.

When a carburetor saves from 30 per cent to 50 per cent of gasoline on any car, its worth is usually reflected in a high price.

The Worth of a Sunderman Is Shown in Service—

the price has always been, and the new price will be, simply the cost of manufacture plus a small profit. We look to the volume of sales, rather than to how much each sale can make for us.

In these days of conservation of resources, it is the patriotic duty of every car owner to save gasoline. The Sunderman Carburetor does it without laying up the car—it gives many more miles per gallon—sometimes **double.** Every motorist owes it to himself, to national economy and to his fellow owners to let us prove our economy claims.

Therefore, send in your orders NOW
Before the advanced price becomes effective.

Sunderman Corporation

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Like Sugar in a Grocery Store

BUMPERS have come to be as staple to the Dealer in Automobile Accessories as is Sugar to the Grocer. Bumpers are as necessary to the safety of an Automobile as sugar is to the table.

Bumpers, besides being in great demand by ALL CLASSES of Automobile Owners, bear a GENEROUS MARGIN of PROFIT for the Dealer.

HALLADAY Bumpers are at the very top of the Bumper field, peerless in their gigantic strength, their scientific lines of refinement and in their beautiful finish.

There is a HALLADAY Bumper made to fit every make of automobile on the road and the dealer handling the HALLADAY Line is in a position to command all the Bumper trade in his territory.

Add to this that HALLADAY Bumpers are nationally advertised in the leading automobile publications of the country and you have the ideal Bumper Line.

Live wire dealers looking for a live wire line of Bumpers and other automobile accessories, just pin this advertisement to your letter-head, send it along to us, and we'll give you full particulars about the "Profit Bearing Line," made by the House of Halladay.

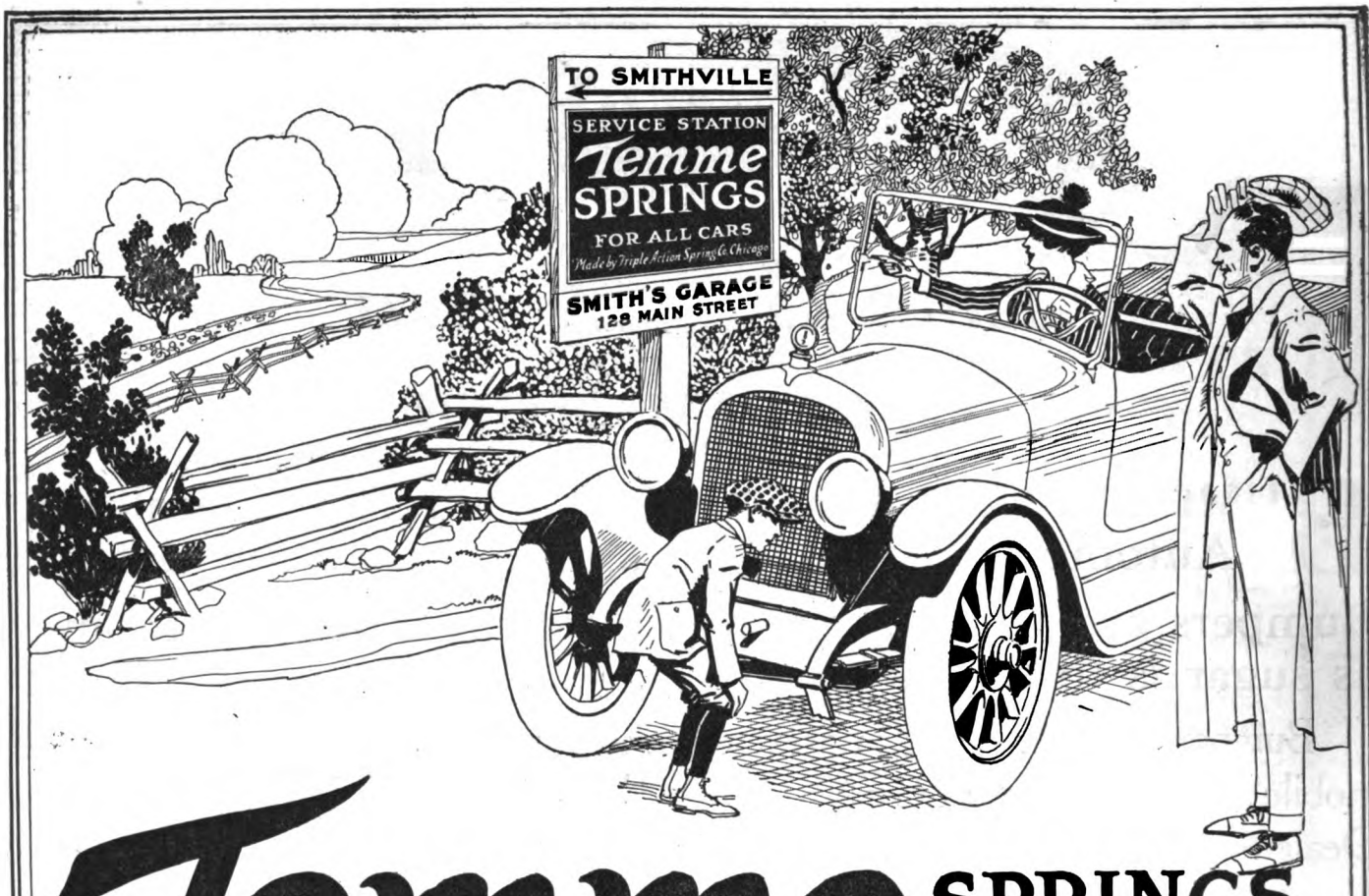
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L. P. HALLADAY Company.

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E. L. THOMPSON CO., 817 Boylston Street, Boston, Mass.
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SANFORD BROTHERS, Chattanooga, Tenn., Southern Distributors.
HUGHSON & MERTON Inc., San Francisco. Los Angeles Portland and Seattle. Pacific Coast Distributors.

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Temme SPRINGS FOR ALL CARS



THE picture tells the story. Are *you* the Mr. Smith of Smithville? Are *your* highway signs on all your roads?

Do all the lame cars drive to *your* door for Temme Springs and other things?

If *you* are not Smith, who is? Or who will be? That's the question.

And in most good towns it will be answered soon. For Temme Springs and Temme's Triple Action Service are known to be *as good as gold.*

Hundreds of repairers, who have "banked" on Temme and never lost, are putting up these Temme highway signs today.

These signs *will* bring in business. Temme has tried them, so he *knows.* And now he offers *you* what won for *him.*

Temme Springs *"for all cars"* means just what it says—for all cars *since 1902.* Test us by naming the spring you need. Temme Triple Action Service will have it on the way to you the same day.

"For all cars" means *designed* for all cars to factory specifications. And so good are Temme Springs—so prompt the service—so fair the prices—that dealers in *all* cars now buy from Temme *in preference* to the car maker.

You need these springs, this service, these signs. They will make you money, bring new business, help you build the good reputation you are after.

If you delay you may lose this exclusive proposition. Write or wire us now, saying: "Send Temme Spring Service Station proposition at once."

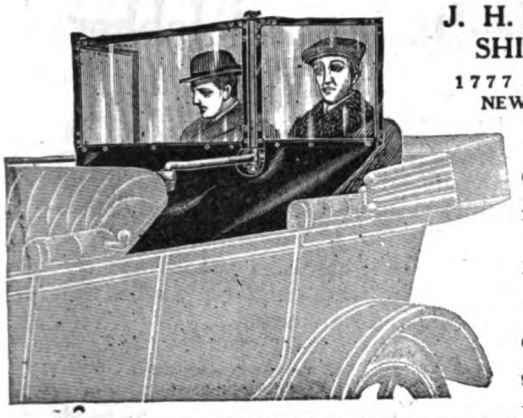
JOHNSON
Shock Absorber

This is to remind you of the new model of the famous Johnson Shock Absorber—made by us. The only cure for a hard riding car is a pair of Johnsons. Temme Spring Service Stations make good money on them. Write now for our new proposition.

TRIPLE ACTION SPRING COMPANY
79 East 28th Street, Chicago

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REAR SEAT SHIELD



J. H. TONNEAU SHIELD CO.
1777 BROADWAY
NEW YORK CITY

Representatives

Chicago Coach & Carriage Co., 1223 Michigan Ave. Chicago, Ill.

R. C. Wall Mfg. Co., 228 N. 15th Street, Philadelphia, Pa.

Columbia Tire & Top Co., 922 Commonwealth Ave., Boston, Mass.



2718

HARDENED SPINDLE CONNECTING BOLT FOR FORD CARS

IMMEDIATE DELIVERY.

OSBORNE & STEPHENSON MFG. CO.,
Plainville, Conn.

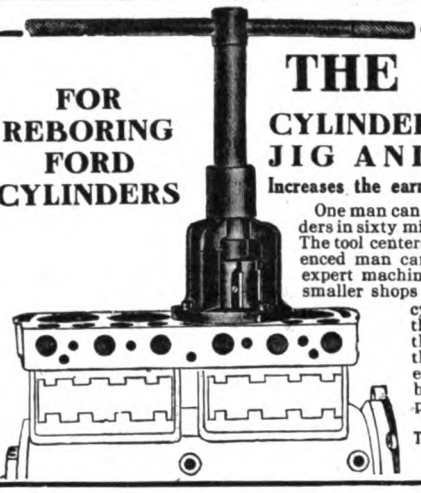
$1 Uniformly For All Sizes $1



"The One Piston Ring You Can Conscientiously Recommend"

20 E. Jackson Blvd. Chicago **Detroit Piston Ring Co.** Factory Detroit, Mich.

FOR REBORING FORD CYLINDERS



THE DAVIS

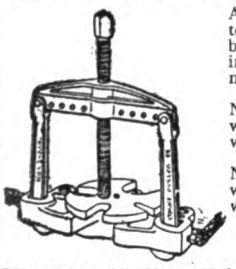
CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

A CRANE PULLER MAKES A GOOD ARBOR PRESS



All that is necessary is to bolt the base to a bench, insert the legs into it, the 2 set screws make a fine Arbor Press.

No. 2—2 arm Base takes work 9 in. in diam., weighs 18 lbs. $5.50.

No. 3—2 arm Base takes work 11½ in. in diam., weighs 30 lbs. $7.50.

Write us today about it

THE CRANE PULLER CO., 54 Lake St., Arlington, Mass.



New DOVER Two-In-One Offset Funnel

For all cars with Rear Tanks.

New Braced Spout.

Spout removable, forming a regular Funnel.

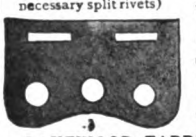
(6) *Send for 1916 Catalogue.*

Dover Stamping & Mfg. Co., Cambridge, Mass.

"LAKEWOOD" QUICK ATTACHABLE FAN BELT FASTENERS



(Actual size 1 inch Fastener. We supply necessary split rivets)



Take the "jinx" off Fan Belt Repair troubles.

On or off in a jiffy—makes Fan Belt Repair profitable to you and enables you to quickly handle "special" fan belts to order. Outlast belts.

Car Drivers will buy them separate also.

Write us direct or ask your Jobber to get them for you.

LAKEWOOD FABRIC BELTING & MFG. CO.
1516 Highland Ave. Lakewood, Ohio, U. S. A.

PHENIX TRUCK MAKER

3000 Lb. Capacity—$350

The Ford power plant will *pull* many times the weight it will carry—and on this basis the Phenix Truck Maker is built. Get the particulars—write.

PHENIX TRUCK MAKERS, Inc.,
2337-39 South Michigan Ave., Chicago

IMPERIAL WELDING CUTTING EQUIPMENT
OXY-ACETYLENE PROCESS

Catalog and prices on request.

IMPERIAL BRASS MFG. COMPANY
520 So. Racine Avenue Chicago

America's Tested Tires

GOODRICH

BLACK SAFETY TREADS

THE B. F. GOODRICH COMPANY
Akron, Ohio

G. A. C. ACCELERATOR FOOT REST

Pays for itself many times in gasoline saved. Eliminates leg strain on long trips. $1.25

GENERAL APPLIANCE CO.,
129 Federal Street, BOSTON

Any Gear, Wheel, Pulley, Off Quick as a Wink, When You Use the "LITTLE GIANT" GEAR and WHEEL PULLER



Terrific pulling power. No "struggle"—no slipping. "Harder the pull, the tighter the grip." Sure, speedy action. Adjustable to 13 in. Tough Drop Forge Steel construction. Price $10. Big Dealer Discount. Send NOW. Money back if not satisfied.

Premier Electric Co., 4033 Ravenswood Ave., Chicago

THINK

of being able to offer your customers a delivery car with 130 inch wheel base, 90 to 100 inches of loading space and a superb paneled body for less than $700.

WRITE FOR ALL THE FACTS.

HAYES-DIEFENDERFER
1872 Broadway New York City



BAY STATE SOCKET WRENCH SETS are high grade tools made for real mechanics whether professional or amateur. Four sizes, $3.00 to $10.00

Send for circulars.

GEO. A. CUTTER, Sales Agent Taunton, Mass.

"NATIONAL" PRODUCTS
ALL GOOD

Air Compressor, Garage Vulcanizer, "Surecure" Vulcanizer, Spring Oiler, Gas Saver and Gasoline Gauge for Fords.

THE NATIONAL MOTOR SUPPLY CO.
PAINESVILLE, OHIO

DAY AND NIGHT SIGNS

Flexlume signs have raised white letters standing out from a dark background which makes them not only strong when illuminated, but perfect day signs as well.

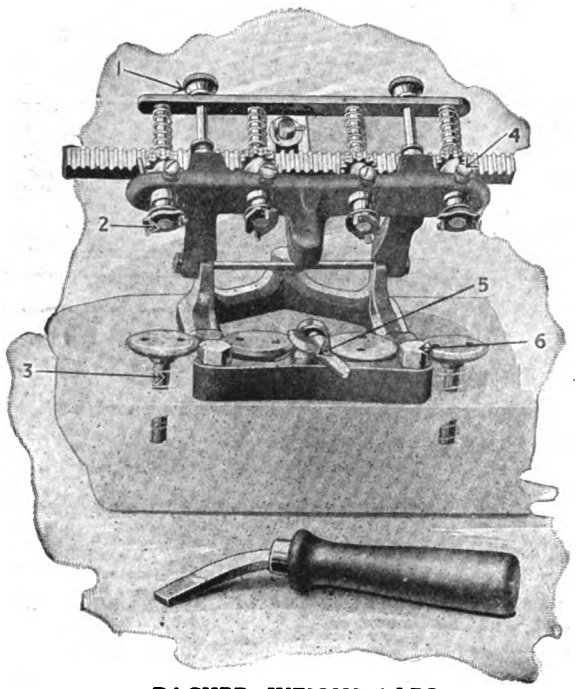
Write for sketch.

THE FLEXLUME SIGN CO.
1445-1451 Niagara Street Buffalo, N. Y.
Flexlume Sign Co., Ltd., St. Catharines, Ont.
Electric Products Corporation, Los Angeles, Cal.

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Mr. Garage and Repair Man—LISTEN—Dealer and Jobber

IT MAY SOUND TOO GOOD—BUT! NEVERTHELESS IT'S TRUE.



PACKED, WEIGHS 5 LBS.

Think of it: A "Multiple" valve grinder—grinding **Four (4) Valves** of a Ford motor at **One Time** by a single back and forth movement, **Saving** 50% in time. Satisfying your customer more at less expense and **More Profit** to yourself.

Yes sirie it's wonderful—so it has been proclaimed by thousands of satisfied users, who claim it to be the greatest labor saving device on the market.

1. **Because it will grind—Two (2) intake and two (2) exhaust valves at one time.**
2. **A boy can grind in a set of valves more perfectly with our "Multiple" than it is possible for a skilled mechanic by hand with the best of tools.**
3. **Insures a more perfect seat than hand grinding—account of being bolted down with cap screws and held central and in alignment by a single back and forth movement of handle the valves are rotated 1¼ revolutions and automatically lifted from their seats and reversed 1¼ revolutions, thereby adding greater efficiency to the motor and more satisfaction to the customer.**
4. **Saves disputes of customers account of too much time spent on job beyond your control—due to the ancient method of hand grinding.**

No mechanic necessary to do valve grinding with the "Multiple." A boy can do this in ½ the time, better and more perfectly, than is possible for a skilled mechanic by present day method.

No drilling or tapping necessary—One minute and grinder is fastened ready for operation. Being held central and in alignment it will insure a better and more perfect seat, adding greater efficiency to the motor and more satisfaction to customer. *WRITE FOR PARTICULARS.* AGENCIES OPEN.

UNIVERSAL PURE AIR PUMP CO.
1607-11 Prairie Avenue CHICAGO

900 Pages instead of 824 **1918—SIXTH EDITION** 3362 Illustrations instead of 2000

Still $3.00 **Dyke's Auto Encyclopedia.** Still $3.00

Entirely re-written, hundreds of illustrations and many new subjects added. Practically a new book. A non-technical treatise with simplified illustrations on Construction, Operation, Repairs and Adjustments, Cares and Troubles of the Automobile.

There are 50 **Instructions**—Simplified and practical.
3362 **Illustrations**—the kind you understand at a glance.
2 **Supplements**, part printed in two colors, treating on the construction, operation, repairing and adjusting of the **FORD and PACKARD**—tells how to make a Ford do 60 miles per hour; how to get more mileage per gallon; how to convert into a truck, racer, fine point adjustments, etc.
775 illustrations and 279 pages on **Electric Ignition, Electric Starters** and **Generators**, etc.
51 pages and 79 illustrations on the **Delco** system alone.
60 pages and 254 illustrations on **Adjustments, Tests**, etc., of leading **Electric Systems.**
154 pages and 1189 illustrations on **Repairing.**
27 pages and 180 illustrations on **Tires** and **Tire Repairing.**
44 pages and 119 illustrations on **Carburetion.**
89 pages and 291 illustrations on **Engine** and **Parts.**
16 pages on **Digest of Troubles.**
6000 lines to the **Index.** This is a feature worth noticing, as it means a ready reference on everything pertaining to motoring. **Index** begins on **colored** paper, easy to refer to.
Dictionary is also included, which gives the meaning of motoring terms.
Inserts: There are five—printed in colors. New features you never before saw or heard of in one of the inserts.

You must see this SIXTH Edition in order to appreciate just how complete a book it really is—Order N-O-W.

Price—Although a much larger and better book the price for the present remains **$3.00** (or **$3.32** prepaid).

How to Become an Expert Automobile Mechanician

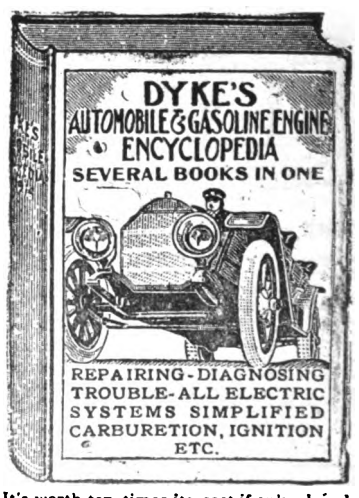
The quickest and cheapest, but BEST way, is by studying Dyke's Automobile and Gasoline Engine Encyclopedia.

It is a practical, simplified instruction on everything you want to know and OUGHT to know about motoring.

First you learn the principle of construction of each and every part of a car and engine—then the variance of construction—then the adjustments and repairs.

You learn how to diagnose troubles in a scientific manner. Step by step you advance until you are a *real expert* on timing the valves and ignition, repairing and adjusting. You learn the carburetion subject so thoroughly, you can adjust any make.

You will like this book, in fact we will guarantee you would not sell it for three times its cost if you could not get another.



It's worth ten times its cost if only placed on the shelf and used as a reference.

You will also understand Aviation, Truck and Tractor Engines as well as Auto Engines when you complete this book.

Beware of Imitators—this is the *original, simplified* book on REPAIRING, ELECTRICAL SYSTEMS, TROUBLES, Etc. It is the only book in the world combining all these subjects under one cover. Why get three—or four books?

Mr. Dyke published the first practical Automobile Book in America.

Address all Orders to

AUTOMOBILE DEALER & REPAIRER
73 MURRAY STREET, NEW YORK

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Here's Profit You Never Had Before

Cash in on the Demand We Are Creating for

KOR-KER Puncture Cure

It's a Time-Tested Proven Success.

Kor-Ker *seals punctures* instantly and permanently.

It ferrets out and *stops slow leaks.*

Kor-Ker *prevents under inflation*—you dealers know what that means to the life of a tire.

Kor-Ker is a *preservative of rubber.* Not a filler.

We *guarantee* it *will not injure,* but, on the contrary, *give them longer life.*

Motorists have tried Kor-Ker out and found it's *made good* under the *most severe test.*

We have distributors in U. S., Canada, England, France, Russia, Norway, Sweden, Holland, Spain, Portugal, India, Egypt, S. Africa, S. America, Australia, New Zealand, Java, Philippines and Trinidad.

ALCEMO MFG. CO.,
97 Bridge St., Newark, N. J.

Please mail me your book and your dealer proposition.

.....

.....



Driving Nail into Tire Treated with Kor-Ker Puncture Cure. This is the strongest proof anyone can ask and will convince the most skeptical.

Write for Free Test. Try it yourself.

We are advertising KOR-KER for you in 25 leading magazines

There's a big, liberal profit in it for you. ***But first make us prove to your own satisfaction that we've got the goods.*** Then let us tell you what other dealers are doing with Kor-Ker.

ALCEMO MFG. COMPANY, 97 Bridge St., Newark, N. J.

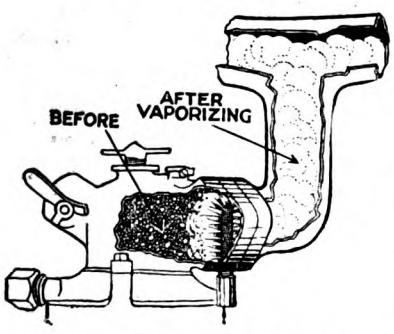
STRANSKY'S FUEL VAPORIZER

Price, $3.00. Sold on a Strictly Money-Back Guarantee.

Dealers Wanted Everywhere

Several agents wanted for all open territory, best agency proposition on earth today. We furnish proof of state agents making over $500.00 per month above expenses.

Reference, First National Bank, Pukwana, S. Dak.



Twenty Thousand Sold!

Twenty Thousand Satisfied Customers

Sample $3.00, send bank draft, money order, or your check will do if you add 10c for exchange. Money plus postage returned, if not satisfactory.

YOU are to be the judge and jury; if not satisfactory, return it and get your $3.00 plus postage by return mail.

There is absolutely no power to gasoline unless it is vaporized.

The average carburetor will only vaporize from 50% to 75% of the fuel.

The Stransky Vaporizer Will Vaporize Close to 100%

If the Stransky Vaporizer vaporizes from 25% to 50% more fuel, you will get 25% to 50% more mileage—more power—more speed —and no carbon.

The Stransky Vaporizer works automatically, no spring, diaphragm or shutters, only one working part, the steel ball valve. It is made entirely of brass and steel, and guaranteed to last a lifetime.

No holes to drill or tap—no special tools needed — any farmer with an ordinary wrench can attach one in five minutes time.

STRANSKY MFG. CO.
Stransky Block, Pukwana, S. Dak.

United States Post Office, Pukwana, S. Dak.

I have been carrying the rural mail out of Pukwana, S. D., for over one year, using a Ford car. I have averaged 3 gallons on the two routes each trip. Since putting on one of the Stransky Vaporizers, I made the two trips on 2 gallons, or the saving of 33⅓ per cent. I can now make hills on high that I could not make before. I have paid for the Vaporizer several times in the saving of fuel. My motor never overheats, which feature alone is worth many times the price of the Vaporizer. I would not take $100 for it, if I could not get another.

J. C. CROOKER.

Richmond, Va., June 27, 1917.

J. A. STRANSKY, Pukwana, S. Dak.

Vaporizer received, installed in jitney service last week, splendid results, absolute saving one-third gasoline, increased power and speed one-third, does all and more than you claim for it. ship one hundred at once, writing you fully today.

R. C. SOUTHERN.

The Whitbeck National Bank, Chamberlain, S. Dak.

To Whom it May Concern:

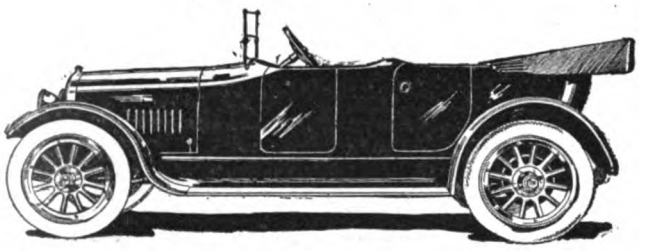
This will introduce Hon. J. A. Stransky, an ex-member of our State Legislature and the Democratic candidate for Governor of South Dakota, four years ago; whom we have known for nearly 30 years, from a young man up, and who resides at Pukwana, S. D. He started with nothing but his fists and now is in good, comfortable circumstances and is known for his square and honest dealings in live stock and telephone lines. What John Stransky says can be depended on and I take pleasure in giving him this letter.

A. C. WHITBECK, President.

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$1295.00 Pilot $1295.00

"THE CAR AHEAD"



Results

IF WE WERE ASKED to give the average motor car buyer **one** bit of advice, it would be "DON'T GO INTO TECHNICALITIES."

HIGH PRICED ENGINEERS are paid to solve problems of mechanical construction for you. The man who exhibits a **little** motor car knowledge is the sort of buyer that the clever automobile salesman is looking for.

GET DOWN TO ESSENTIALS at once. Results are what **you** want. They are the **only** things that count.

CERTAIN THINGS THERE ARE, however, which you **only** can judge.

PERFORMANCE: Make the car show you that it has power - easy, smooth, flexible power. Take any ordinary hill on high—but **don't** put it to unreasonable tests just because some "stunt" demonstrator down the street does so with his. Try out the car where **you** will drive it—not where you won't.

COMFORT: Demonstrate the riding qualities over rough roads. Naturally in your usual driving you won't look for them, but unfortunately they can't always be escaped. **Is there plenty** of leg room in the front seat? Can three ride comfortably in the rear seat of the touring car, or two in the "Get-chummy" seat of the roadster?

DURABILITY: Assuming that the performance and comfort meet your requirements, find out how long they will last. Here, you will have to take somebody's word for it. Ask your friends who own cars of the same make. Secure lists of owners from the dealer and make your own investigations. Hire yourself as your own purchasing agent temporarily and make that purchasing agent understand that he is spending upwards of $1200.00 of **your** money.

APPEARANCE: The general lines, the upholstery, the painting and finish, the refinement of details must appeal to you if you are to enjoy a happy purchase. As much so as in buying a new gown or suit of clothes. Insist that insofar as it does not interfere with mechanical construction that **your** motor car reflect your personality. Just because the manufacturer likes to paint cars green is no reason **you** shouldn't have one in a light tan with gold trimmings if you want it.

We could go on indefinitely; enumerating price, service, stability of the manufacturer, etc. We could **tell** you how dollars that you will never see but only later realize have been built into the Pilot Six Forty-five. But we would rather **show** you.

THIS IS WHAT WE ASK: **In a practical dollar-and-cents way compare Pilot Performance, Comfort, Durability, Appearance and Individuality with any motor car that sells for within two hundred dollars more.**

The Car that Produces Results for the Owner Produces Profit for the Dealer

PILOT MOTOR CAR COMPANY

RICHMOND, INDIANA, U. S. A.

To Manufacturers of Ford Accessories and Attachments.

The Accessory Jobbers have endorsed the great National Exposition for Ford Accessories which will take place at the Chicago Coliseum, September 22nd to 29th, expressing their approval in hundreds of letters.

The National Exposition of Ford Accessories is staged at a period that will afford the individual jobber ample time to determine and list the articles for his next season's catalog. This advantage has created the feeling of enthusiasm and interest with which the jobbers view this coming show.

The Exposition is to be run on a manufacturers' co-operative plan. It will stimulate a healthy trade through the educational means afforded only by a National Exposition of this character. Already one-third of the floor space has been sold.

Manufacturers of Ford Accessories and Attachments are advised to secure space for the exhibition of their products NOW.

Write for Further Information to

H. V. BUELOW, Mgr.

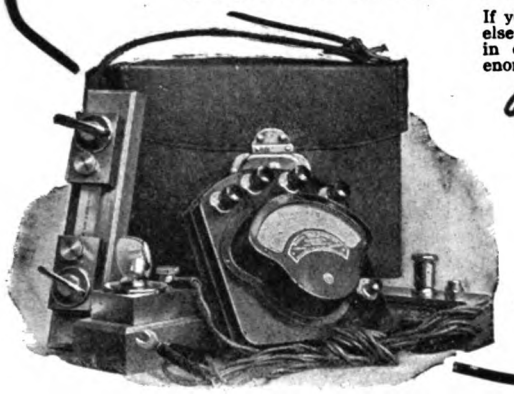
National Exposition for Ford Accessories, Inc.

New Southern Hotel

Michigan at 13th St. Chicago, Ill.

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Electrical Repairs Bring the Big Profits!



If you cannot repair electric starting and lighting equipment intelligently, your customer will go elsewhere for this service. He will take the rest of his trade with him. There is more money in electrical repairs than in any other department of the garage business. The demand is enormously increasing.

Weston Model 280 GARAGE TESTING INSTRUMENT

is the best, the most reliable and therefore the cheapest electrical equipment for you. It enables you to determine promptly and accurately the condition of the electrical equipment of any automobile, just where the trouble is and just how to remedy it.

Write for our *Special Proposition.*

Weston Electrical Instrument Co., 2 Weston Ave., Newark, N. J.

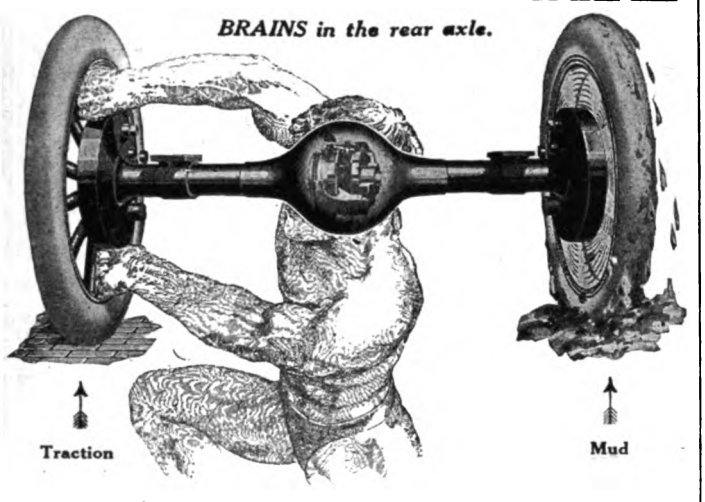
23 Branch Offices in the Larger Cities.

BAILEY

NON-STALL

DIFFERENTIAL

BRAINS in the rear axle.



POWER to the wheel that can use it.

A Fundamental Necessity For Every Car

The Bailey Non-Stall Differential *corrects a basic weakness.*
Old style differentials let the power go to waste by sending it to the wheel that does not have traction.
This causes practically all skidding, slipping, stalling, spinning and side-swaying. It is an enormous unnecessary waste of power and tires, and often causes accident troubles and expense.
The Bailey avoids all of this.
With the Bailey no power goes to waste, but *all* of it is used *properly.*
It makes you master of all road conditions.
Anybody can install it quickly. It can be fitted to any rear axle.

Owners and dealers should write us for complete information.

Bailey Non-Stall Differential Corporation, Chicago, Illinois, 1124 Michigan Ave.

Leave Your Tube in the Vulcanizer
AND WAIT ON YOUR CUSTOMERS
Why Not?

AMERICAN AKRON

Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

IF YOUR VULCANIZER IS YOUR BOSS, DECLARE YOUR INDEPENDENCE TODAY

Write for Prices

The American Rubber & Tire Co.
AKRON, - - - - - OHIO

ELIMINATE DANGER
WHEN CRANKING YOUR FORD

Every time you crank your Ford Car you are courting disaster in the form of a broken, sprained or badly bruised arm or wrist, on account of pre-ignition, either thru forgetting to retard the spark or intentionally advancing it beyond the safety point to insure continued running.

THE BILL AUTOMATIC SPARK RETARDER

is an absolutely automatic device, which can be installed by anyone, and which once installed requires no attention whatever. BILL then retards the spark to a point of absolute safety upon engagement of the crank and then upon the first power stroke of the motor advances the spark to the running point.

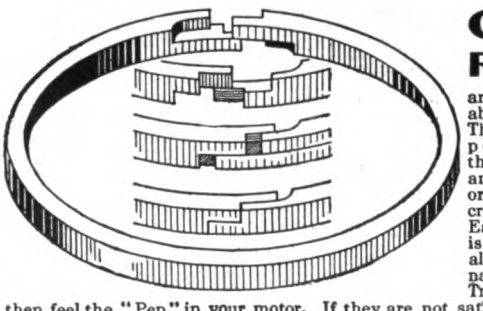
This is a fine Dealer Proposition as they sell on sight. Retail price is $3.50.

Write to-day for details and dealer prices.

BILL Mfg. Co., La Porte, Ind.

Chicago Distributors: GRAY-HEATH CO., 1440 Michigan Avenue, Chicago, Ill.
New York Distributors: ASCH & CO., 16 to 24 West 61st St., New York, N. Y.

"SEE THAT JOINT"



GILL RINGS are one-piece and absolutely tight. They increase power because they do not allow any leakage of gas or oil, and decrease expense. Each GILL RING is cast individually and has natural elasticity. Try a set and then feel the "Pep" in your motor. If they are not satisfactory we will return you your money. ***Dealers Everywhere.***

THE CHALSMITH COMPANY, 351 West 59th Street, CHICAGO, ILL.

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Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

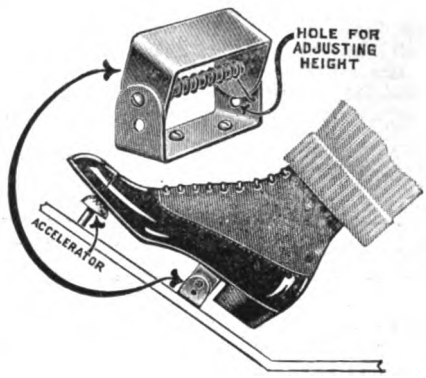
R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri



THE NEW YORK FOOT SUPPORTER

FOR OPERATING ACCELERATOR

Price 75 Cents



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The aim in the production of this work is simplicity. Too many automobile route publications attempt so much, that in their efforts to be "complete" they become "confusing." The publishers of this work say that many years of motor travel and the observations of others lead them to the opinion that once out of the confusion of a city's streets, on the broad highway, the need is less for the detailed, must-be-closely followed printed words, comments and instructions of the path itself, but rather the need is for the accurate knowledge that the road to town A and thence to town B is of "automobile goodness." and that it proceeds via this and that village, this or that side of a lake or a mountain, with crossing railroads, or paralleling trolley lines, as a check on location.

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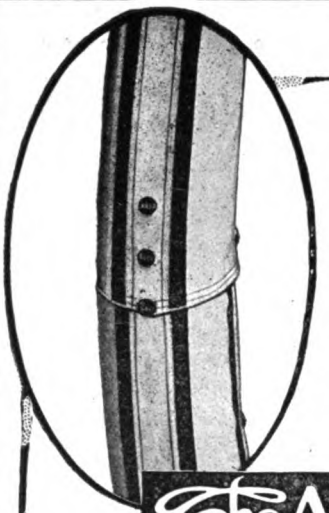
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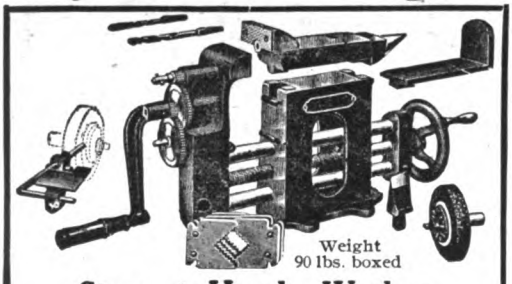
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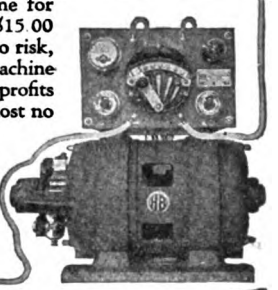
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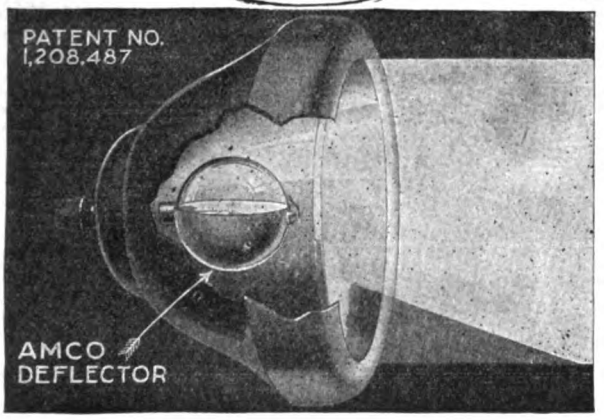


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Is the trade name of the most PRACTICAL, EFFICIENT and LOW PRICED device on the market for the elimination of the "GLARE" of Automobile Headlights.

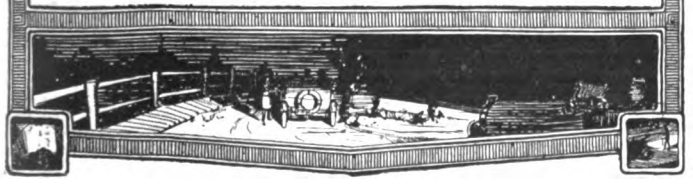
The "AMCO" is a small WHITE ENAMELED metal cup that snaps firmly on the underside of the lamp bulb, the WHITE surface of the cup deflecting the rays of light to the upper part of the silvered reflector, causing them to be projected Outward and Downward on the road ahead of the car.

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But racing service is abnormal. It proves the quality of any material, if there's quality in it.

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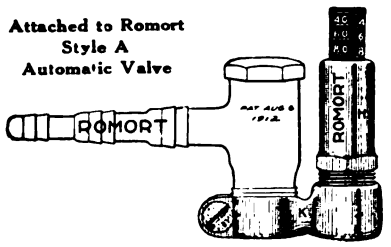
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ROMORT TIRE TESTER ATTACHMENT

PRICE, $1.50

This is a device for attaching your gauge to Romort Automatic Air Valve, and gives the service station a permanent holder for its gauge, ready for instant use by the public, eliminating the necessity of loaning gauge to operator, who three times out of five will drive off with your gauge in his pocket.

Attached to Romort Style A Automatic Valve



Simply screw your gauge into this holder and you have a tire tester and tire inflator combined in one, and the old trouble of losing gauge is forever over.

Every garage with free air should be equipped with the Romort Automatic Air Valve and Tire Tester Attachment.

The above price includes the Attachment only.

CAUTION—When ordering, state whether for Style A or B Valve.

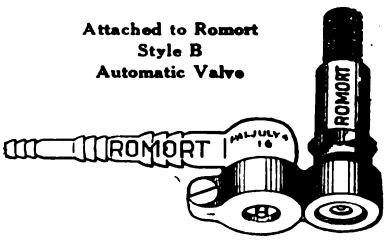
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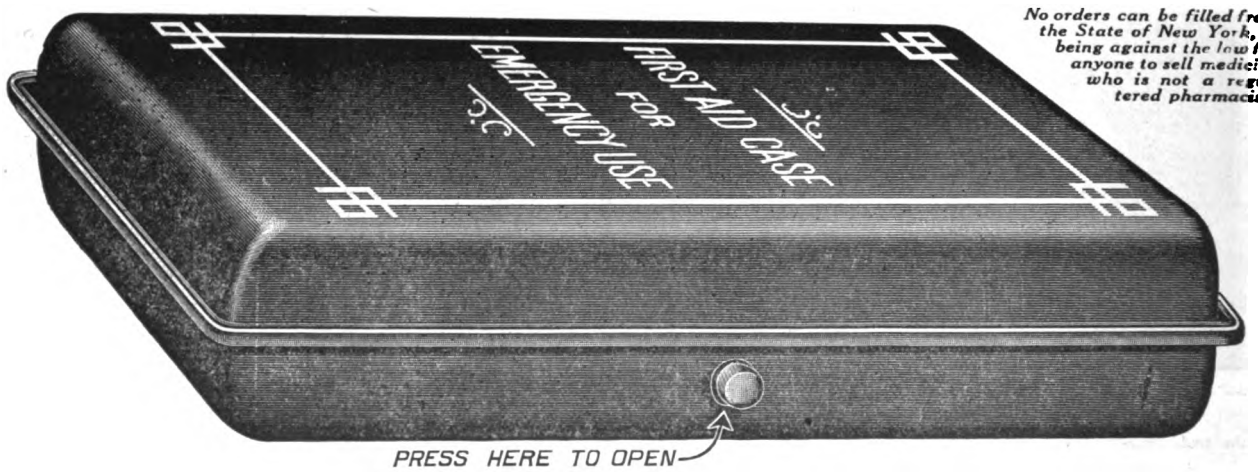
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TO MEET WITH AN ACCIDENT ON THE ROAD.

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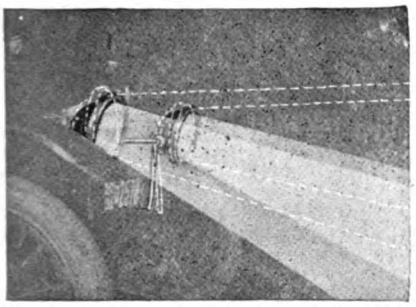
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Gives 100 per cent easier riding

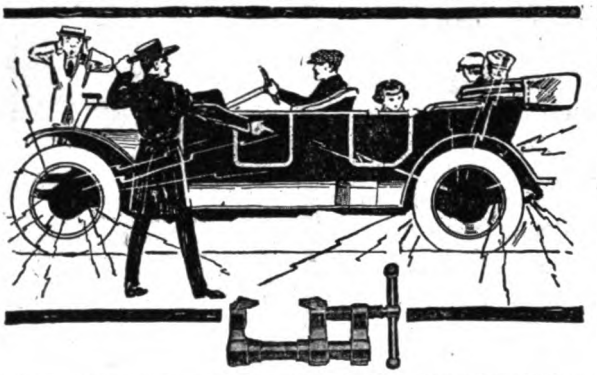
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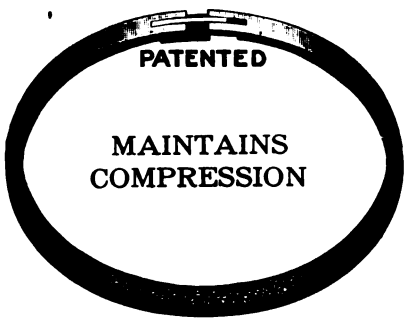
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20th Century's No. 6



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GUARANTEED SATISFACTION or Money REFUNDED

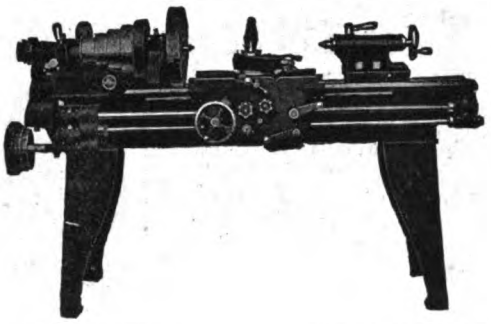
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If you want a Patch, call for "20th CENTURY"
We make all kinds of Patches, all Sizes and Prices.

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20th CENTURY TIRE PROTECTOR CO.
MIDLOTHIAN, TEXAS.

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14"x6' Monarch Lathe

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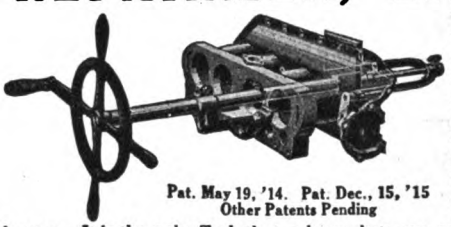


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Pat. May 19, '14. Pat. Dec., 15, '15
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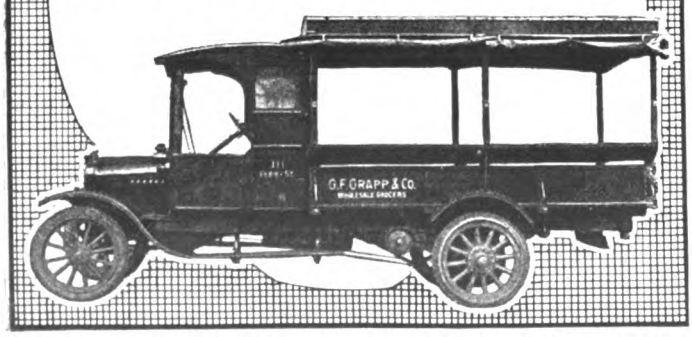
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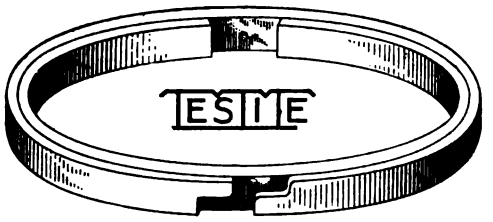
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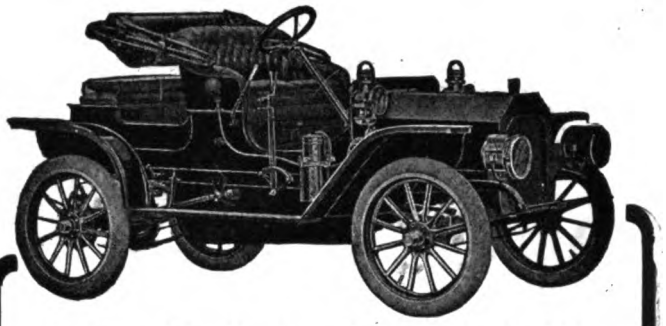
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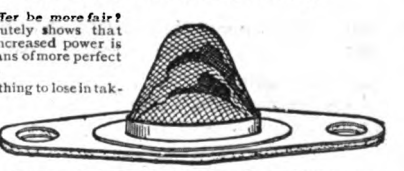
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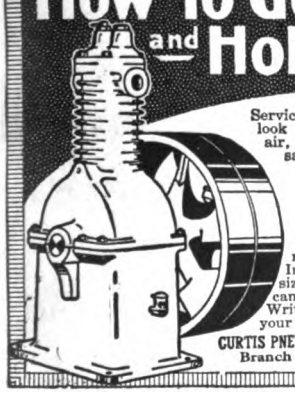
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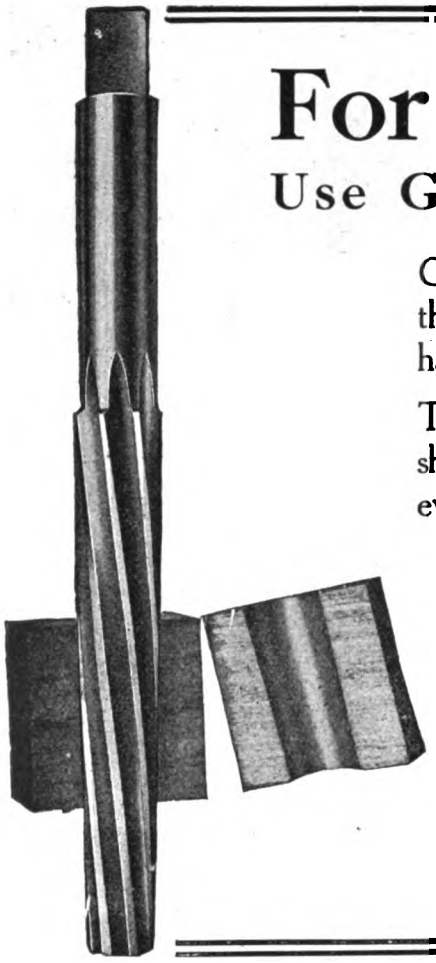
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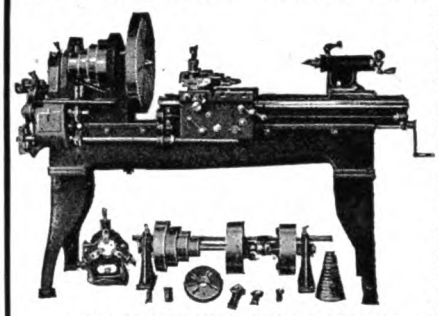
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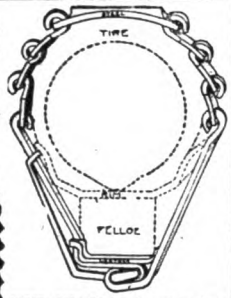
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Hang on to your old tires. They will last as long as you live if covered with steel. **The Kimball Steel Protector** makes **Blowouts, Punctures** and **Rim Cuts** impossible. A few sections will hold any old blowout. Tires as flexible as ever.

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LISTEN!

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Don't rebore cylinders.

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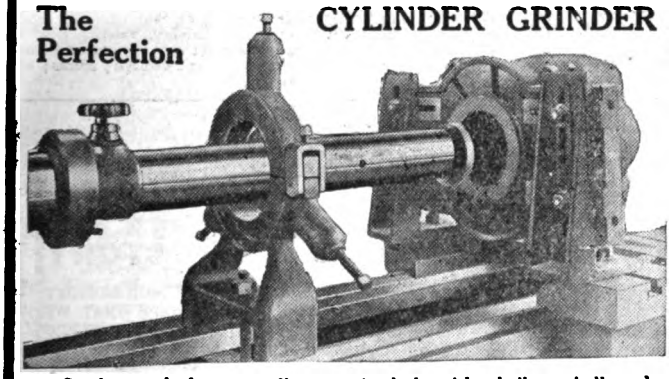
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Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. Descriptive literature on request.

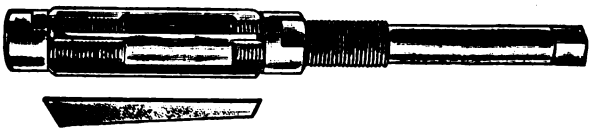
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MORE MILES PER TIRE
LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

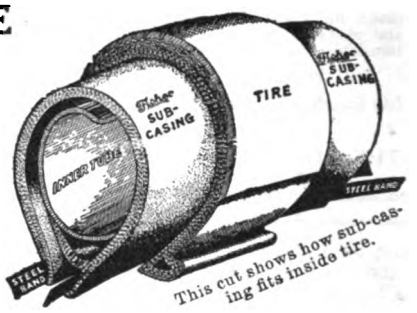
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These weakened places are hard to detect now, but will result in blow-outs later.

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FISHER MANUFACTURING CO.

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This cut shows how sub-casing fits inside tire.



"Kant Slip"
Inner Liner
For Automobile Tires.

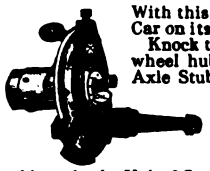
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SAVE MONEY. BE INDEPENDENT.
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EVERY CAR OWNER AND GARAGE NEEDS ONE.
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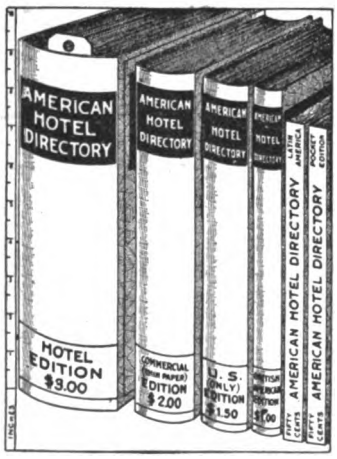
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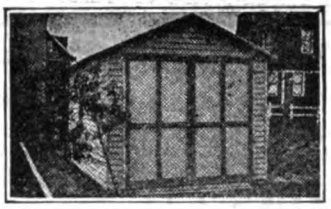
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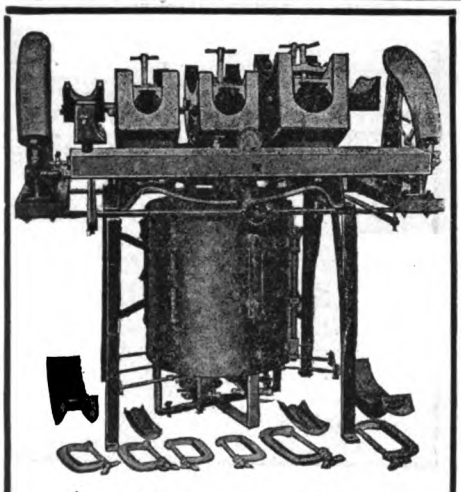
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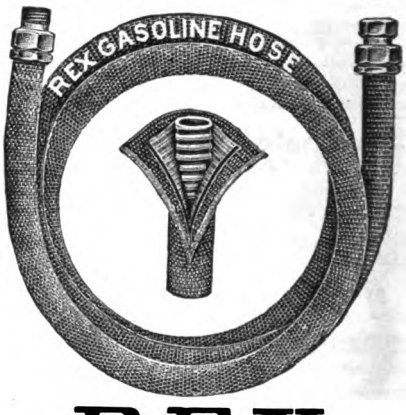
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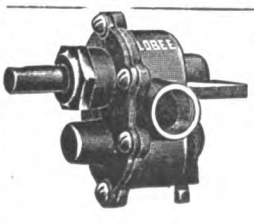
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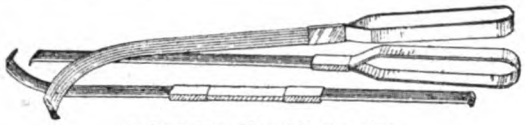
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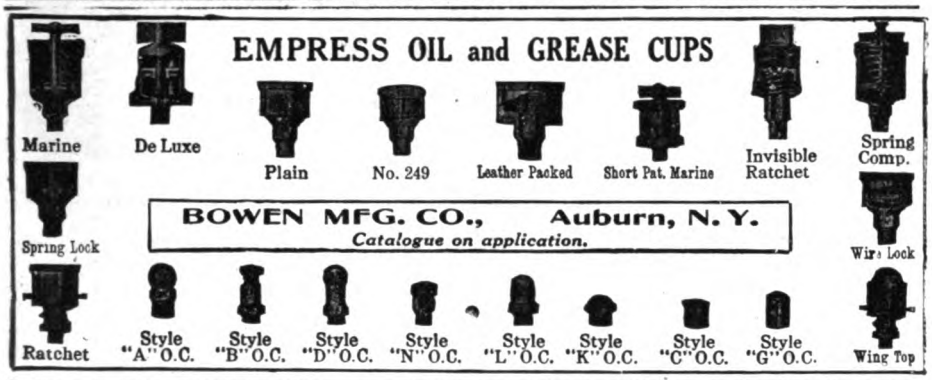
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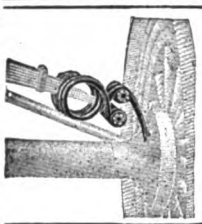
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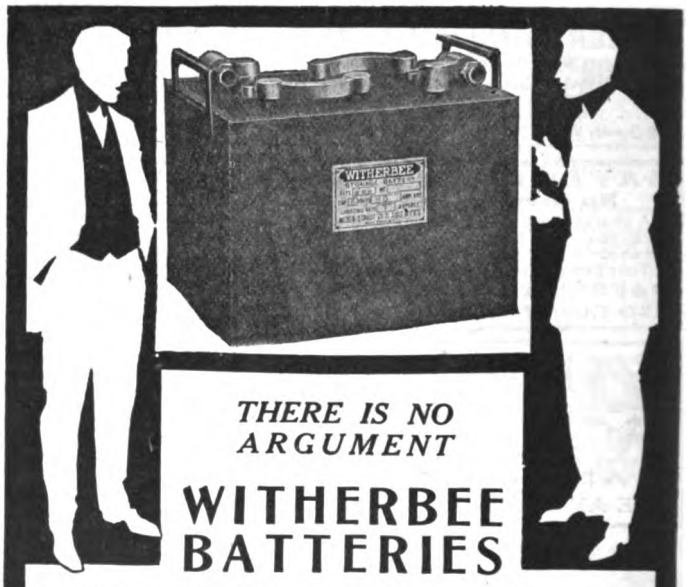
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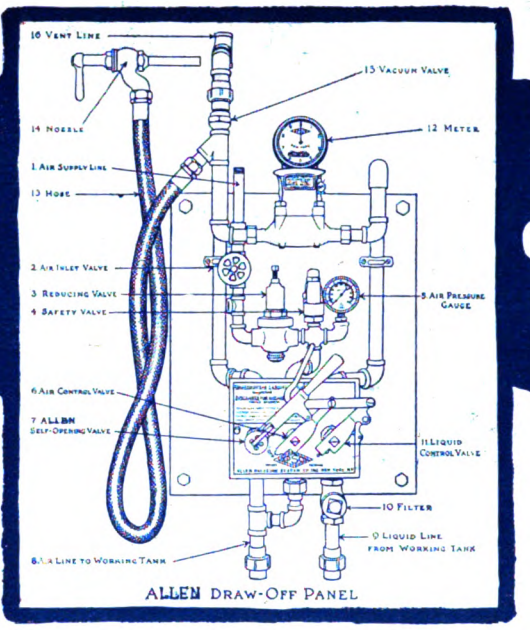
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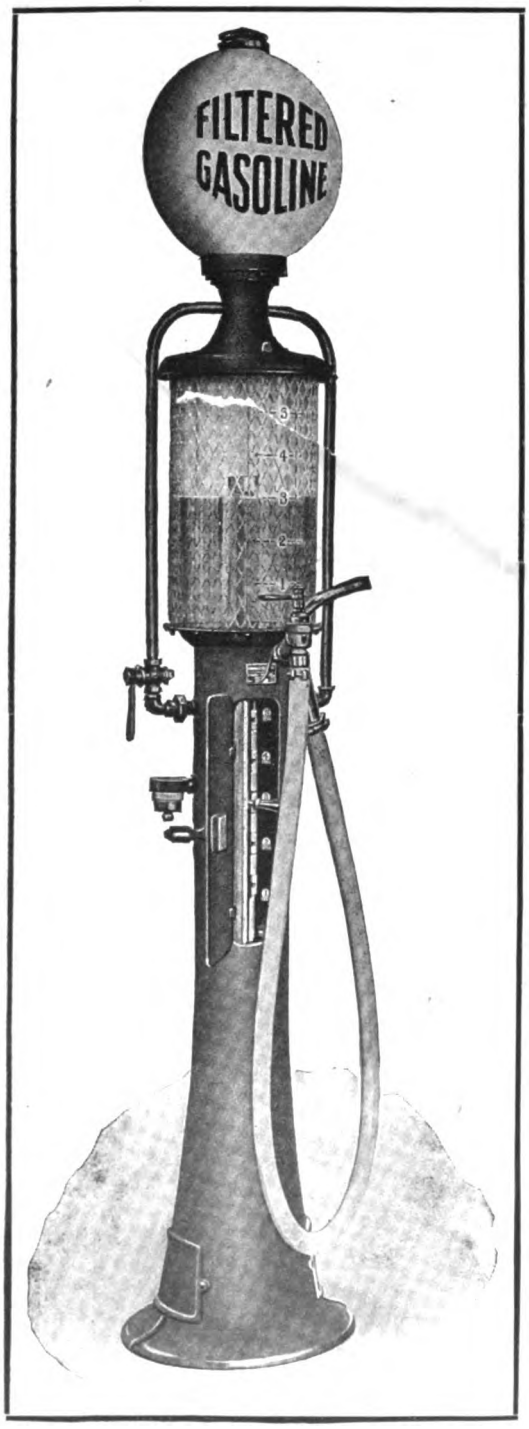
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GUARANTEE VISIBLE PUMPS CANNOT BE MANIPULATED



What Does This Mean to You?

Well, if you are a dealer, it means your use of Guarantee Visible Pumps establishes your reputation for fair dealing—giving your customers full measure always—and that record makes your garage headquarters for gasoline and oil sales.

If YOU are a car owner it means that when you buy from Guarantee Visible Pumps you ***see what you are getting and you get all you pay for.***

A Visible Measure

It eliminates all doubt, removes all suspicion of short measuring.

The fact that the car owner sees gasoline, or oil, draining from a glass measure right into his tank puts the touch of finality on the transaction. He goes away satisfied and he returns again, for he has become a steady customer.

Blind pumps do not encourage business.

The Guarantee Visible is a sure puller of trade.

Write us for particulars.

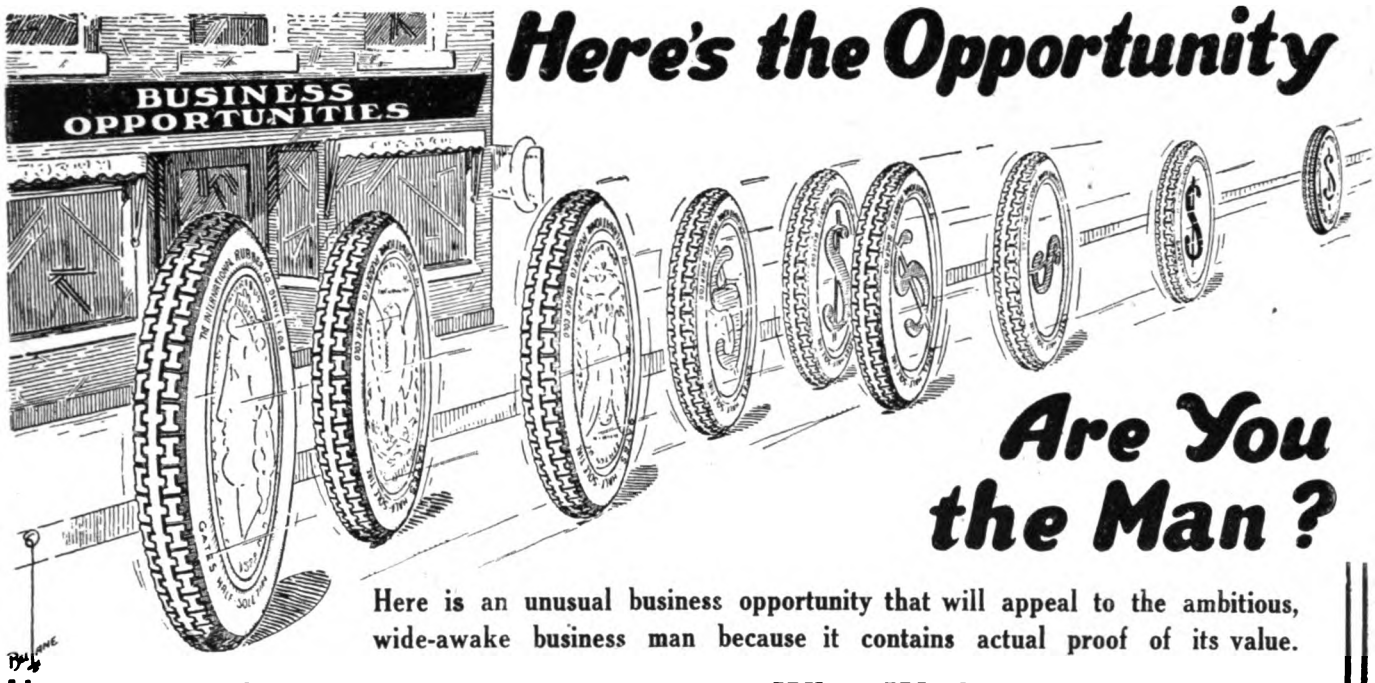
Address Dept. 9

HEPBURN WALKER, Distributor

Guarantee Liquid Measure Co.

FARMERS BANK BLDG., PITTSBURGH, PA.

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Here's the Opportunity

Are You the Man?

Here is an unusual business opportunity that will appeal to the ambitious, wide-awake business man because it contains actual proof of its value.

Our Proposition

Within the next thirty days, we will appoint about twenty men or firms in both Eastern and Western territory, to represent us as exclusive factory dealers in the sale and distribution of Gates Half-Sole Tires.

These appointments are worth from $500.00 to $1,500.00 per month to the men who are fortunate enough to get them, and for this reason, in the selection of these representatives we will consider only men who are energetic, wide-awake business-getters, with experience in handling men as well as in selling.

The Record of Our Other Dealers

About eight months ago, we ran an advertisement similar to this one. A large number of applications were received and from these we selected the men who were to be given the dealerships.

The exclusive selling rights that were given out at that time have become very valuable to those who hold them. Over thirty of these men have earned better than $1,000.00 per month in discounts and bonuses and have built up a well organized and permanently profitable business in their protected territories.

For over six months our entire output of seven hundred Half-Sole Tires per day has been taken by these established dealers, but within the next two weeks we will have our two new factory units, numbers 4 and 5, in operation and this will increase our daily production of Gates Half-Sole Tires from seven hundred to one thousand finished tires per day.

Here's your opportunity if you are the right man. What others are doing you can do.

What We Will Do For You

Every man who secures an exclusive dealership from us is immediately given the benefit of all inquiries and sales in his territory. An advertising campaign, using large size space in the local newspapers is carried on entirely at our expense. A Service Man and Tire Expert is sent out from the factory to assist in the installation of shop equipment and to properly instruct the dealer and his shop men in regard to the sale and application of the Half-Sole Tires. This service is rendered entirely at our expense and without any cost whatever to the dealer. We give it because our experience in the opening of new territory has taught us exactly what is necessary in order to insure the success of every man that we appoint.

What is Necessary to Qualify

Our first consideration is given to the type of man. He must be ambitious, wide-awake and capable of managing a business. A capital of only $250.00 to $1,500.00 (depending upon the size of the territory) is necessary at the beginning in order to carry a small stock of Gates Half-Sole Tires on hand ready for prompt delivery.

This is the kind of an opportunity that rarely presents itself—less than $500.00 in capital backed up by a live man with a desire to build and possess a business of his own will within a few months earn in discounts and bonuses each month more than the initial investment. Our proof of this statement is the fact that scores of other dealers are doing it.

Here is the Reason

Gates Half-Sole Tires sell for only one-half as much as the ordinary standard tires, still they are **guaranteed 3,500 miles without puncture** and this guarantee is backed with a million dollar capital. It is not strange after all that a hundred thousand motorists are using Gates Half-Soles and that more of them are going into service every day - just as fast as five hundred men working night and day in our three factories can turn them out.

Don't Delay—Act Promptly

A great many men will read this page. If you can qualify for one of these exclusive territories and are prepared to handle it, don't delay in writing us at once.

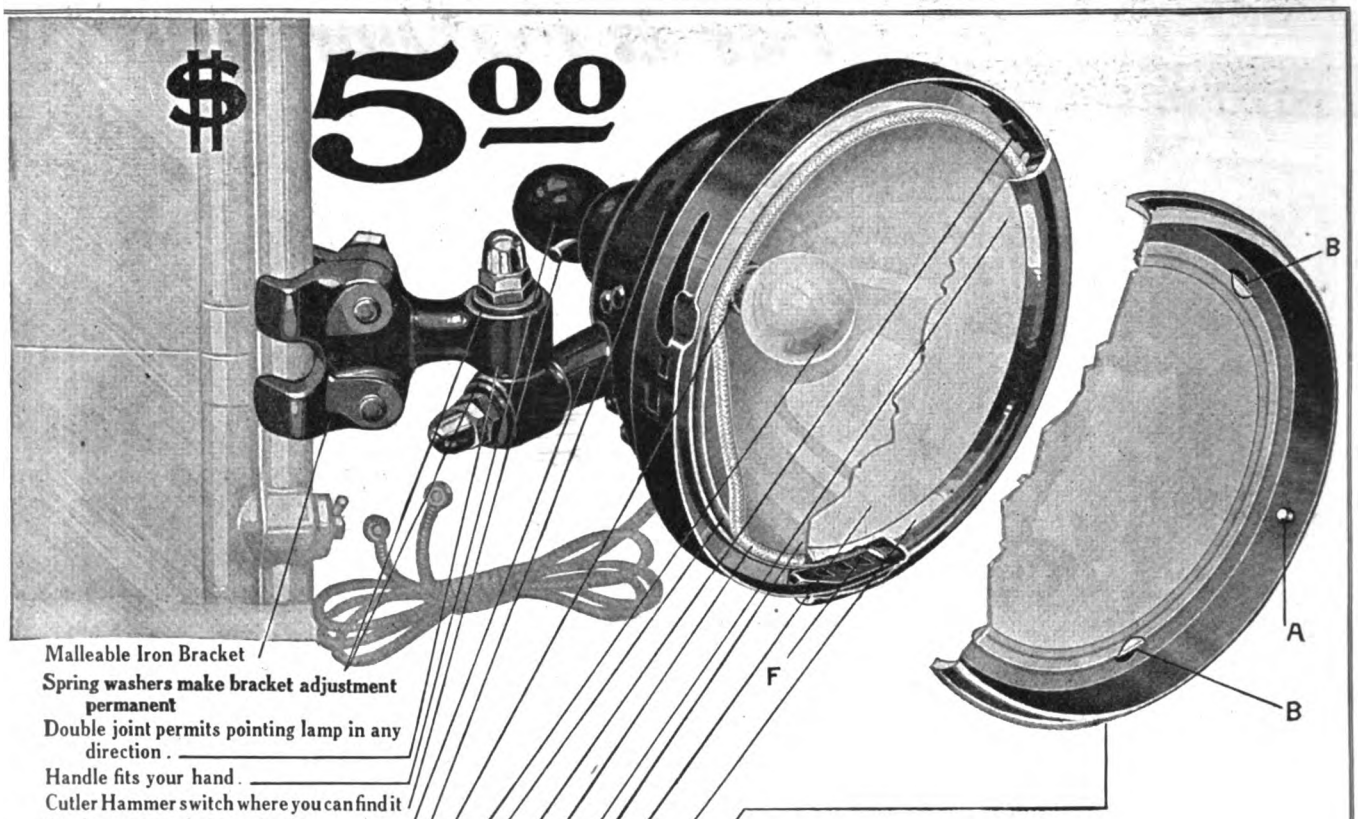
This is a Live Opportunity for the Right Man. Don't Pass It!

The International Rubber Company

98 West Tennessee Street **Denver, Colorado**

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$5.00



Malleable Iron Bracket
Spring washers make bracket adjustment permanent
Double joint permits pointing lamp in any direction.
Handle fits your hand.
Cutler Hammer switch where you can find it
Machine tapered short shank.
Streamline body of cold drawn steel finished in black japan.
Lamp socket designed with focusing device
Nitrogen filled Mazda bulb.
Groove for sealing cord.
Clip holding reflector in place—abolishes screws—prevents vibration
Sealing cord compressed between glass and reflector making lamp dust-proof
Offset flat edge on reflector which concentrates the light.
Silver plated reflector.
Glass which can never rattle.
Handsome copper plated nickel finished door frame..
Half section of door showing locking lugs "A", and clips "B" which always hold glass in place.

MAKE night driving safe and day driving a greater pleasure with the best spot lamp and mirror you can get.

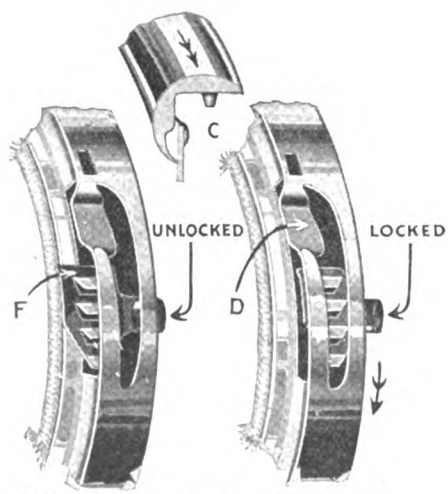
Choose the handsome lamp with the beautiful door, the streamline body, the silver reflector.

Choose the silent lamp with the rigid reflector, the anchored glass, the silence cord and the hingeless door.

Choose the powerful lamp with the Mazda nitrogen bulb, the instant focus, the concentrating searchlight reflector.

Choose the lamp of unequalled convenience that opens with a push button, carries any sized bulb, can't get out of focus, can't shake out of position, can't take in dust and that lights with an easily found Cutler Hammer switch in the handiest of handles.

Read the specifications at the left and choose the



The lug "C" on door rim shown above passes thru "D" and the turning of the door in the direction of the double arrow carries it over the ratchet "F". Pushing button releases it.

Victor
TRADE MARK

A spot lamp of beauty and convenience made for high class cars by

The Corcoran Victor Company

703 Reading Court Cincinnati, Ohio

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What Car Do You Drive?

IS its name among those mentioned here? If it is, the chances are ninety-nine out of a hundred that you feel the same as these owners do when you use Texaco Motor Oil.

The expressions of opinion printed under the name of each car are quoted from unsolicited letters written about Texaco Motor Oil by different owners.*

So many thousands of motorists regularly use

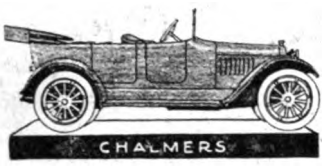
TEXACO MOTOR OIL

that those quoted are only a few from many hundreds which we have received. Innumerable drivers of Fords have written us. We have several letters from Pierce-Arrow owners, and so on.

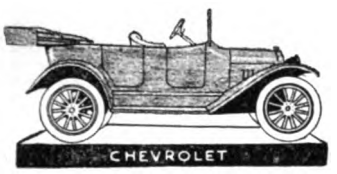
If the name of your car is not mentioned ask some friend, who drives the same make and uses Texaco, what results he gets. Perhaps you are a Texaco enthusiast yourself. If you are, we should be glad to hear from you and add the name of your car to our list. If you are not, it is easy to become one. Buy a one or five gallon can of Texaco Motor Oil and try it.

*Entire letter of any owner, with the name and address, will be sent you upon request.

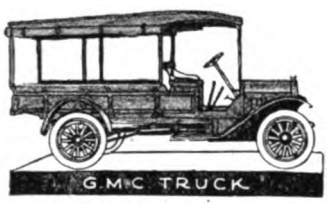
THE TEXAS COMPANY
New York Chicago Houston
Distributing Offices in Most Cities



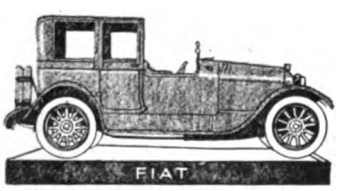
"I am glad to say that after a thorough test of your Texaco Motor Oil, it has proven to be exactly what you claim for it."



"My Chevrolet has been driven 8,500 miles. The valves have never been ground, and the motor has more power than when I bought it. I can truthfully say that there is none better than Texaco."



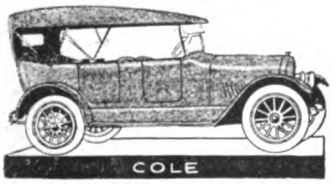
"We have a G. M. C. Truck in which we have used your lubricating oil for two years with very good results, finding it a good lubricant and free from carbon."



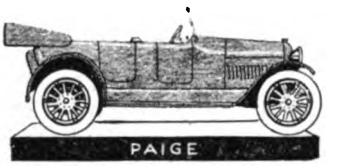
"I can with every confidence recommend Texaco Motor Oil to all motorists. Both from an economical and efficient point of view. I have used nothing that has given me such good results."



"I have run my Ford car on Texaco Motor Oil 7,500 miles without cleaning my spark plugs and get very best of compression today."



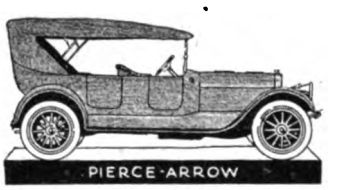
"It gives me better satisfaction than any other I have ever used."



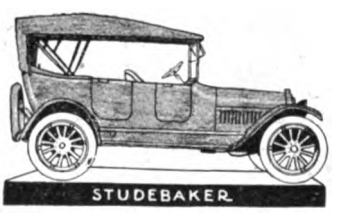
"Your oil has given the best of satisfaction on Paige cars, in fact I have had no troubles myself nor have had any but favorable reports from my sub-agents and customers."



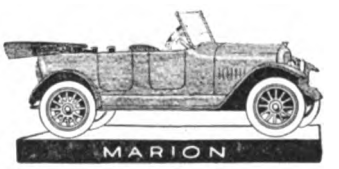
"I have no carbon troubles whatever and both the oil and gasoline are entirely satisfactory. In fact, I think that your motor oil is the best that I have ever tried for an Overland car."



"My car is a Pierce-Arrow, seven passenger, and it runs better today than it has since I have had it, due no doubt, to the use of Texaco Motor Oil."



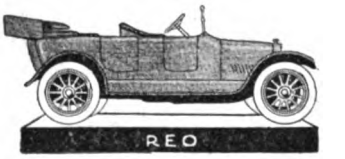
"We expect to get over 12,000 miles out of 15 gallons of your oil. Can't ask for better service than your oil gives."



"It gives perfect lubrication, with a minimum amount of carbon in the cylinders, in fact there is hardly any carbon noticeable."



"It has given perfect satisfaction in every respect."



"On five gallons of this oil the car made a few miles in excess of 5,200, and during this time I have had absolutely no lubrication troubles of any character."

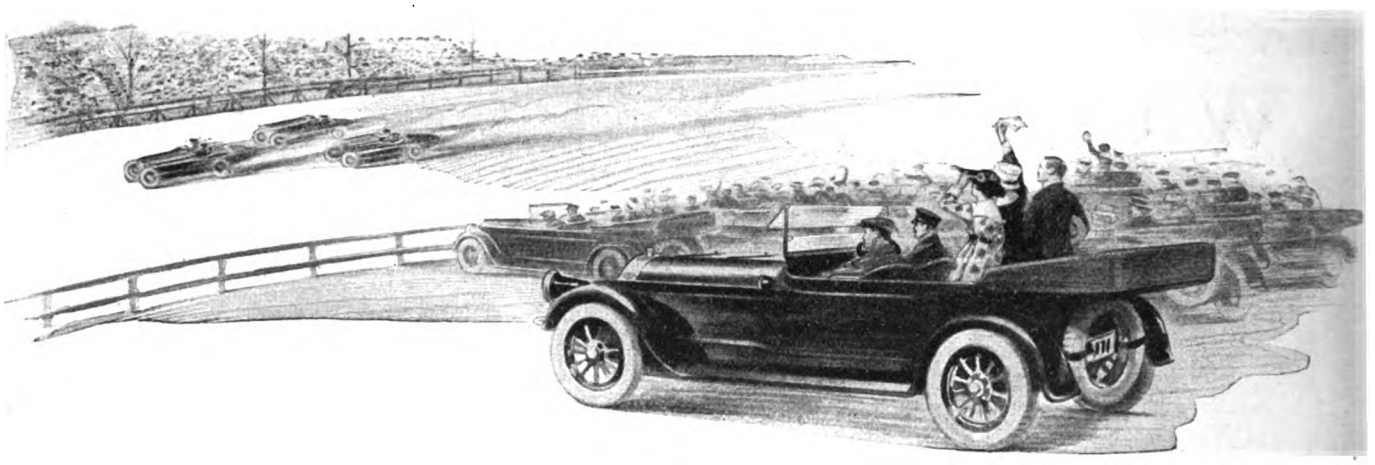


"It increases my power and speed and decreases my fuel consumption greatly. It has reduced my running expenses fully 15%."



"I would say that it is the best I have used yet."

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Rajah Repeats

Last year more than half of *all* spark plugs used by *all* drivers in *all* racing events were Rajah Spark Plugs.

Including Metropolitan Trophy, Indianapolis Sweepstakes, Chicago Sweepstakes, Chicago Grand Prix, Cincinnati Sweepstakes, Astor Cup Race and the Vanderbilt Cup and Gold Cup Races at Santa Monica.

So far this year 54% of *all* spark plugs used by *all* drivers in *all* big racing events were Rajah Spark Plugs.

Including Uniontown Universal Trophy, Cincinnati Speedway and Chicago Speedway Races.

Rajah repeats in sales for the same reason Rajah repeats in races. The plug that is good enough to stand up under the relentless test of racing is good enough to give quick sales to dealers and satisfactory service to owners. That's why Rajah repeats.

Address RAJAH, *Bloomfield, N. J.*

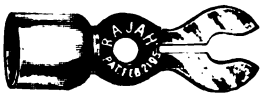
HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland, Seattle
JOHN MILLEN & SON, Ltd., Montreal, Toronto, Winnipeg, Vancouver

RAJAH
SPARK PLUGS





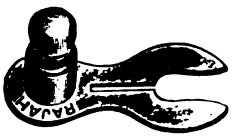
Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.



Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.



Rajah Thumb Nut Terminal
Adapter for Dodge, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



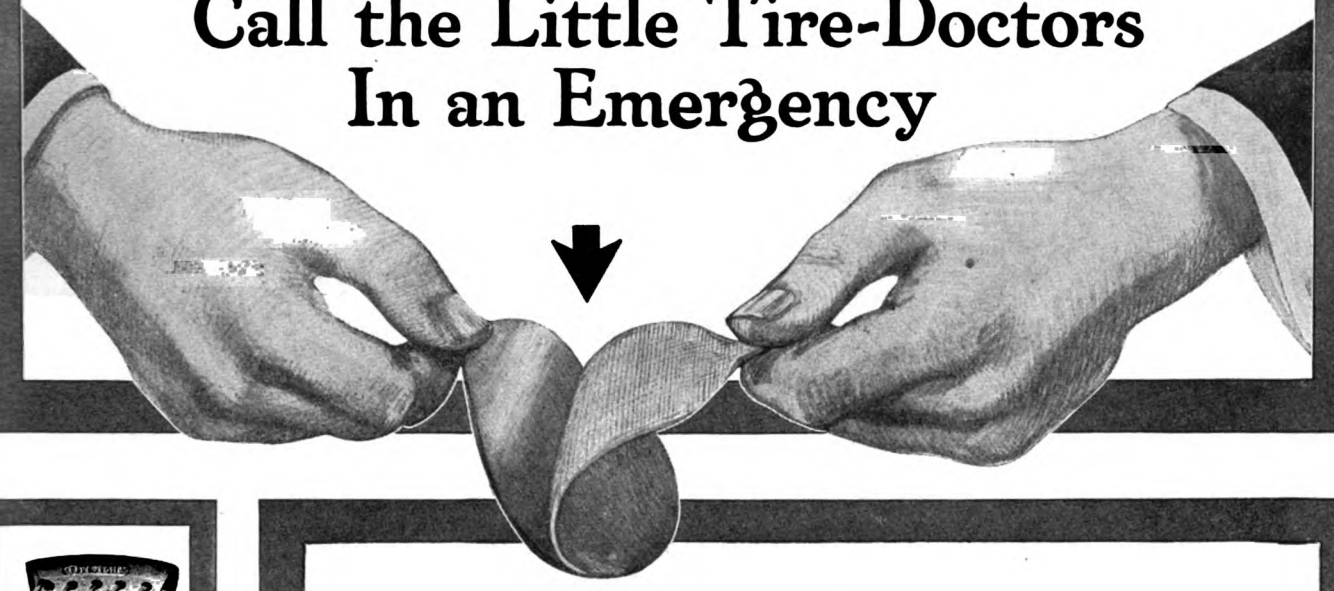
Rajah Stud Terminal
Adapter for Buick, Chevrolet, Oldsmobile.

Rajah Terminals and Adapters are furnished so that Rajah Plugs can be used on any car not equipped with the Rajah type of Clip Terminal. Any size exchanged if desired

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Call the Little Tire-Doctors In an Emergency





FIRESTONE LACE-ON BOOT

Fits any style or type of tire. Furnished with extra long lace. Hook-On style also.



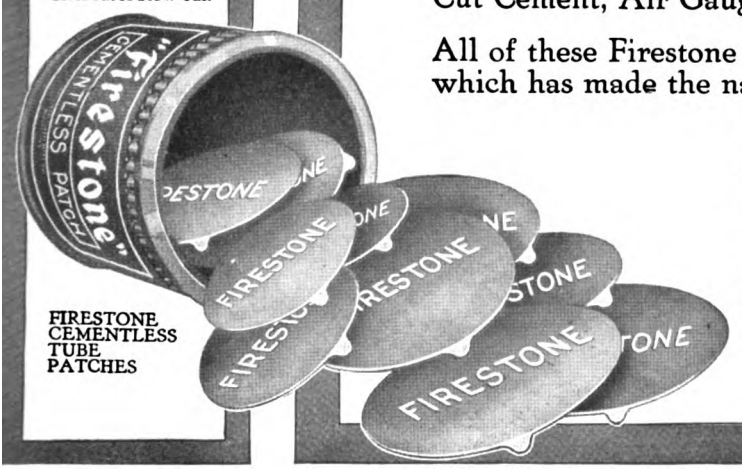
FIRESTONE "CURE-CUT"

A soft, strong rubber gum for filling in tread cuts and snags.



FIRESTONE INSIDE BLOW-OUT PATCH

Strong and reliable, holds tire securely after cut or blow-out.



FIRESTONE CEMENTLESS TUBE PATCHES

WITH the Firestone Cementless Tube Patches in your kit, the big helps for little troubles, you can ride with assurance that when trouble comes you can call them into service and be off again in a jiffy.

Firestone Tire Accessories perform big things. Cementless Tube Patches are representative of the Firestone know-how and care in manufacturing. They are easily applied, will not pucker or creep, and they stay put. Note the tab on the protecting muslin for quick and convenient removal.

Firestone

Tire Accessories

The Firestone line includes Hook-on Boots for Clincher or Straight Side Tires, Lace-on Boot, Blow-out Patches, Cure-Cut Cement, Air Gauges, etc.

All of these Firestone Accessories are made of that quality which has made the name Firestone mean confidence.

Dealers will find that we are always ready to give our co-operation.

Write for information.

FIRESTONE TIRE AND RUBBER CO.
Akron, Ohio Branches and Dealers Everywhere

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THE NEW ADAMSON MODEL "E"

5-MINUTE VULCANIZER

Five minutes with the "Adamson" Model E, the tube is repaired to *stay repaired* and—you are on your way again.

Anywhere, you can mend a puncture without fuss, muss or delay. Gasoline—always handy—is used to provide heat. And an "Adamson" patch is as strong as the rest of the tube—it defies frictional heat, however fast you drive.

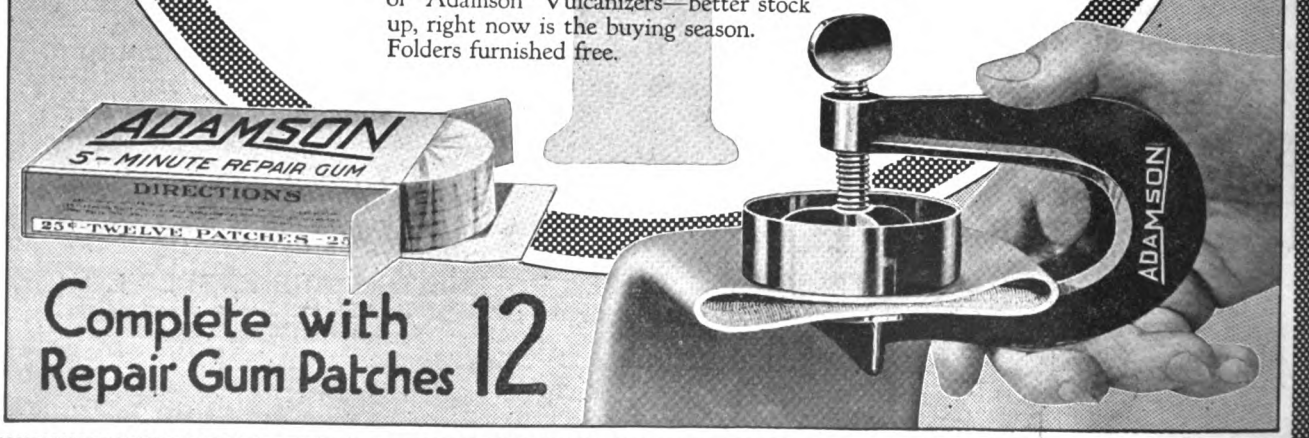
The price is inconsiderable—just a dollar for the complete outfit, including a box of a dozen "Adamson" 5-Minute repair gum patches. Extra box of 12 patches, 25c.

Next time you're in your dealer's store ask him for an "Adamson"—he sells lots of them.

ADAMSON MANUFACTURING CO.,
EAST PALESTINE, OHIO.

Complete Line of various sizes of "Adamson" Vulcanizing Outfits for tube and tire repairing; prices range from $1.00 to $12.00.

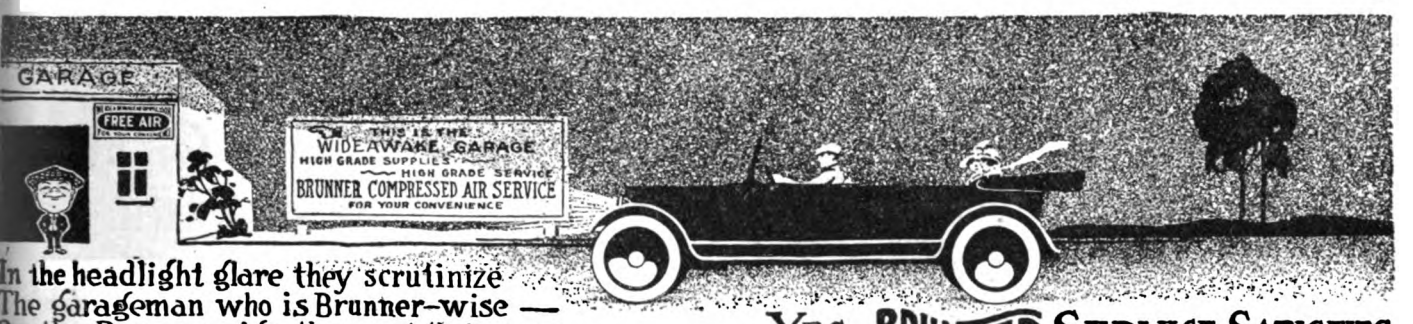
Wise Dealers realize the enormous popularity of "Adamson" Vulcanizers—better stock up, right now is the buying season. Folders furnished free.



Complete with 12 Repair Gum Patches

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BRUNNER



In the headlight glare they scrutinize
The garageman who is Brunner-wise —
On the Brunner sign they rest their eyes
And stop for air and – some supplies.

YES, BRUNNER SERVICE SATISFIES

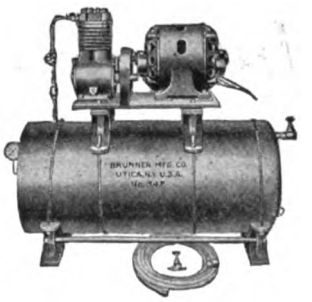
SERVICE that satisfies is the one big dominant factor in the administration of the garage business of today, and the success of the modern garage is dependent entirely upon the class of service it renders.

Mr. Garageman, when they flash their headlights on you at night, are you prepared to render such service? Does your service satisfy? If not, then you should seriously consider the matter of installing Brunner Service, because Brunner Service always satisfies.

INCREASE YOUR INCOME BY IMPROVING YOUR SERVICE

INSTALL A BRUNNER AIR COMPRESSOR

No matter how good your compressed air service may be, Mr. Garageman, Brunner Service would be an improvement, because it would strengthen your standing with the trade you have and—it would bring to your door the trade of the Brunnerwise Motorist and increase your sales of gasoline and supplies, because the Brunnerwise Motorist is a liberal spender and appreciates the service that satisfies.



The Brunner is the pioneer of the present day air compressors—it was not put on the market ten years before the garage was thought of—it was designed and built especially for the garageman's use and it has been consistently demonstrating its sterling qualities to the garageman in the garage ever since we have had garages.

The sale of the Brunner Air Compressor to the garageman is far greater than any other air compressor made—the reason is obvious.

YOU CAN BANK ON A BRUNNER AIR COMPRESSOR

And any one of the high-class reputable jobbing houses who distribute the Brunner Line will be glad to recommend and guarantee a Brunner outfit to meet your special requirements. We will be glad to send you the name of the Brunner Jobber covering your town, and our engineers will be very glad to assist you in making your compressed air service—a service that satisfies.

Our No. 14 Catalog and Garageman's Handbook on Compressed Air are yours for the asking. Write for these books today and get the facts regarding the Garage Air Compressor situation.



BRUNNER MANUFACTURING COMPANY

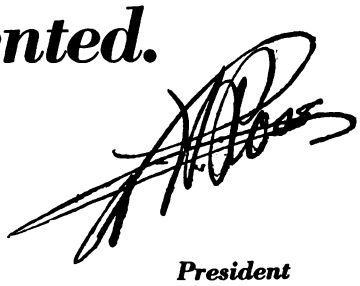
Main Office and Plant:
UTICA,
N. Y.

Cincinnati Branch:
CINCINNATI,
OHIO.



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Give me the Chalmers line on its remarkably sound basis of today for the rest of my years, and I shall, indeed, be contented.



President
L. H. ROSE - CHALMERS COMPANY
San Francisco, California

We help all Chalmers dealers to make money.
E. C. Morse, Vice-President
CHALMERS MOTOR COMPANY



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Ford Owners and Dealers Prove A. B. C. Starter

BEST "FIND" OF THE YEAR

Hand-cranking is dirty, laborious, and out of date.

Up-to-date Ford dealers have found the way to increase dealer profits and user satisfaction—by urging Ford owners to install the efficient A. B. C. two-unit Starting and Lighting System.

This remarkable system puts Ford starting in the same class with the highest priced cars.

A·B·C

TWO-UNIT SIX-VOLT

STARTING & LIGHTING SYSTEM

for Ford Cars

Last January it made its first appearance in a national way. Today it dominates the field. Thousands are in use in all parts of the world.

The A. B. C. Starter conforms more closely to Ford engineering and construction than any starting and lighting device ever invented. Its overwhelming structural advantages are conceded by Ford dealers and owners.

Its weight is distributed, by units, on both sides of the engine. No drag or strain from starting or generating.

Noiseless and powerful in operation. Its effective generator-drive employs a fibre, leather and metal link belt moving in a V-type pulley. This gives the highest possible degree of pulling contact.

The A. B. C. operates under all weather conditions, at the pressing of the button. Guaranteed to be efficient and mechanically correct. Easiest to install, ruggedly built, and longest-lived.

Many letters from grateful Ford owners bear witness to the supreme service-value of the A. B. C.

Ford dealers who have not taken on this most essential of all Ford accessories should find out at once all about the A. B. C. For your convenience, a coupon is attached. Fill out and mail it today, and learn our generous and stimulating 1917-18 dealer proposition.

Dealers never drop the A. B. C.

A. B. C. STARTER CO., Detroit, Michigan

A·B·C STARTER·COMPANY DETROIT

A. B. C. STARTER CO.,
Dept. H, DETROIT, MICHIGAN

Gentlemen:—Please send me full dealer information regarding the A. B. C. Two-Unit Starting and Lighting System for Ford Cars, including booklets, price, terms, discounts, and the 1917-18 dealer proposition.

Name.....

Address.....

City.....

State.....



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PHONES 2015 AND 2016

Norton Taxicab Company

"WE GO ANYWHERE"

OFFICE AND GARAGE 220 W. SIXTH ST.

Joplin, Mo., June 18th, 1917.

McQuay-Norris Manufacturing Co.,
612 Bryant Bldg.,
Kansas City, Mo.

Gentlemen:

In reply to your inquiry relative to the results we are obtaining from your McQuay-Norris Leak-Proof Piston Rings which we have installed in our taxicab fleet, wish to state that we keep a record of the cost to operate our cars and find we are getting more mileage on gasoline and oil, and a great deal more power than we used to get before using your rings - and we have very little trouble from carbon deposits on the pistons and spark plugs.

We certainly consider your rings a good investment as they pay for themselves in a short time and save money for us.

Yours very truly,
NORTON TAXICAB COMPANY.
By Verne Norton

LEAK-PROOF

All garage and repair men install them. Complete service stocks carried by 300 jobbing and supply houses all over the country.

SEND FOR FREE BOOKLET

"To Have and to Hold Power" — the standard handbook on gas engine compression. Tells what piston rings are, why they're used and what they mean in motor efficiency. Write Dept. R

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

Mfd. by McQuay-Norris Manufacturing Co. St. Louis, U. S. A.

BRANCH OFFICES:

New York Chicago Philadelphia Pittsburg San Francisco Los Angeles Cincinnati
Seattle Kansas City St. Paul Atlanta Denver Dallas

Canadian Factory: W. H. Banfield & Sons, Ltd., 372 Pape Ave., Toronto

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A Man Is Judged By The Customers He Keeps

And whether you keep your customers or whether you see them going across the street to trade, after buying from you a few times, depends entirely upon how much SATISFACTION you wrap up with every item purchased at your store, and you know it, too.

THE HALLADAY LINE

The Halladay line of Bumpers and other Automobile Necessities is the line which gives COMPLETE SATISFACTION, both to the customer in performance and to the dealer in profits.

It is the Nationally Advertised line that keeps your customers crossing your threshold, smiling, and keeps the cash register ringing and you smiling.

PART OF THE HALLADAY LINE

Halladay Bumpers include Front and Rear type to fit all cars of Standard design and several cars of specialized design, such as Buick, Cadillac, Cole, Chevrolet, Franklin, Ford, Mitchell, Overland, Packard, Pathfinder, Briscoe, Dodge and others.

Halladay Flexlevers were the first and remain the foremost of the lever type of shock absorbers. They are made in two styles: heavy type for all cars with full or three-quarter elliptic springs and a Ford type for all Ford Cars.

Halladay Double Arm Shock Absorbers are the cheapest, really efficient shock absorbers for Ford Cars on the market.

Halladay Tilting Steering Wheel is an instantaneous acting, self-locking, tilting steering wheel for Ford Cars. It is applied in place of the steering wheel without any alteration of any other part of the steering gear.

Halladay Can Tipper is the greatest convenience ever offered for Public or Private garage. It carries standard, square or round, five-gallon cans in such manner that oil can be drawn from the cans with one hand, allowing the other hand free to hold the receptacle in which the oil is being poured.

The Halladay Line includes many other conveniences and necessities such as Running Board Luggage Carriers, Side and Rear Tire Holders, Valve Lifters, Jacks, Oil Can Holders, etc.

Live Hardware Dealers who wish to know more about the Halladay Line of Satisfaction and Profit Producers may have our catalog and full particulars. Just address us as shown below.

L. P. HALLADAY CO., Streator, Illinois

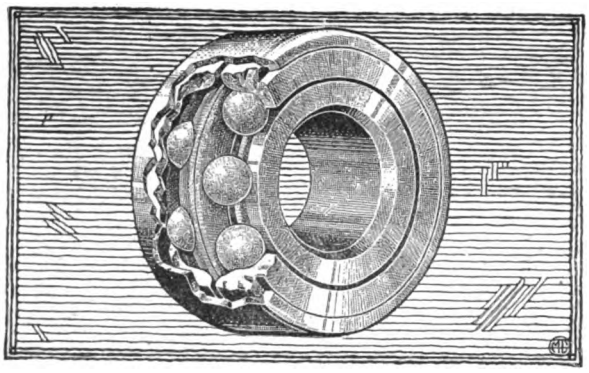
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Asch & Co., 16-24 W. 61st St., New York City E. L. Thompson Co., 817 Boylston St., Boston, Mass.
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SOUTHERN DISTRIBUTORS: Sanford Brothers, Chattanooga, Tenn.

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NEW Departure Ball Bearings are held in very high regard today.

This esteem is born of an intimate knowledge of their service—an estimation which is highest among those who have used them longest.

It is unnecessary to take our word for this high quality—the service record of New Departure Ball Bearings in all types of machines is sufficient.

Any recommendation made by our engineering service department may be depended upon to give absolute satisfaction. May we have your bearing problems?

The New Departure Mfg. Co.
Bristol Connecticut

NEW DEPARTURE BALL BEARINGS

Let the Crane TRADE MARK Pump Profits for You

BY pumping *more air*—with less size and weight —than any other pump you stock—

The CRANE "pumps" *more profits* in your pockets—with less effort and cost.

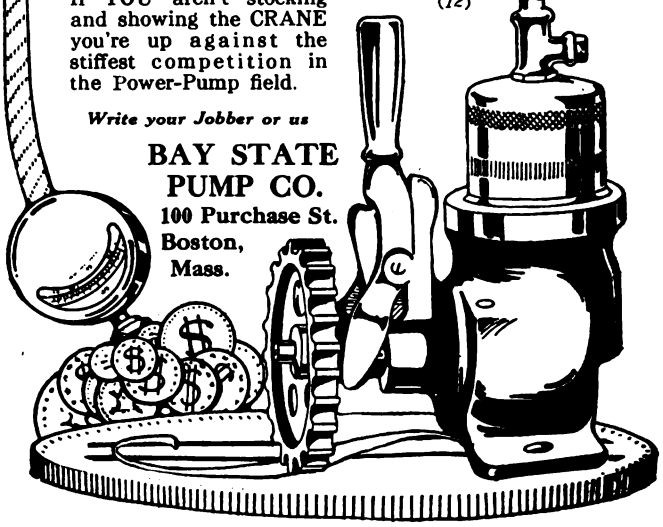
50% more efficiency! 50% less weight! PURE AIR — absolutely oil-less! 50% lower price!

80 *pounds pressure in* 4 *minutes* in a 34 x 4 tire; $2 to $5 saving in price!

If YOU aren't stocking and showing the CRANE you're up against the stiffest competition in the Power-Pump field. (12)

Write your Jobber or us

BAY STATE PUMP CO.
100 Purchase St.
Boston,
Mass.





"The Nation Must Save Gasoline"

Uncle Sam is calling for gasoline economy.

Get together with your customers and show them how Inlands will save gasoline for the country and save money for them. This is a double saving—less cost per mile for fuel and less cost for gas-tight piston rings.

Over 1,000,000 Inlands already in use.

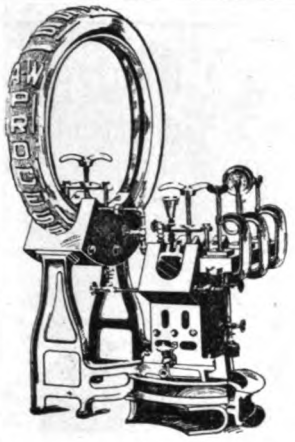
Booklet and big piston ring chart FREE—Write.

Inland Machine Works, 802 Mound Street St. Louis, Mo., U. S. A.



INLAND 1 PIECE PISTON RING

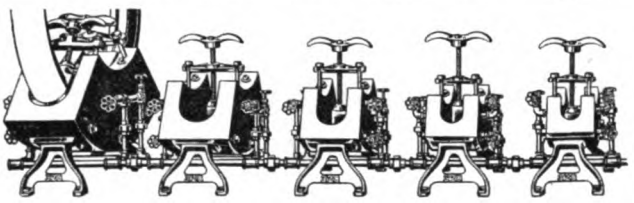
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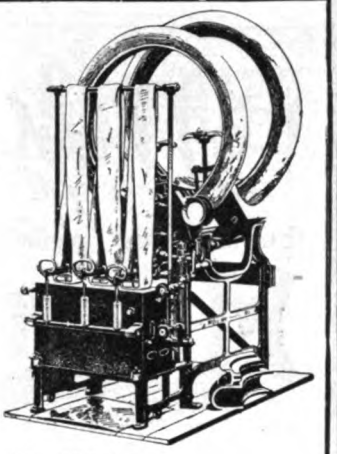


Akron-Williams

TIRE REPAIR EQUIPMENT

A Size for Every Garage





Do Tire Repairing the Approved Way —with Akron-Williams Equipment

Four million cars are wearing out tires and tubes every day; motorists are spending over a hundred million dollars this year to keep their tires repaired; and the business is growing by leaps and bounds. Scarcely any other line offers such large and sure profits on such a small investment.

Start a Tire repair shop or add vulcanizing as part of your garage or supply business.

Success or failure depends upon your equipment. Don't risk time and money—get Akron-Williams equipment, and succeed *right from the start. We do not take other equipment in exchange.*

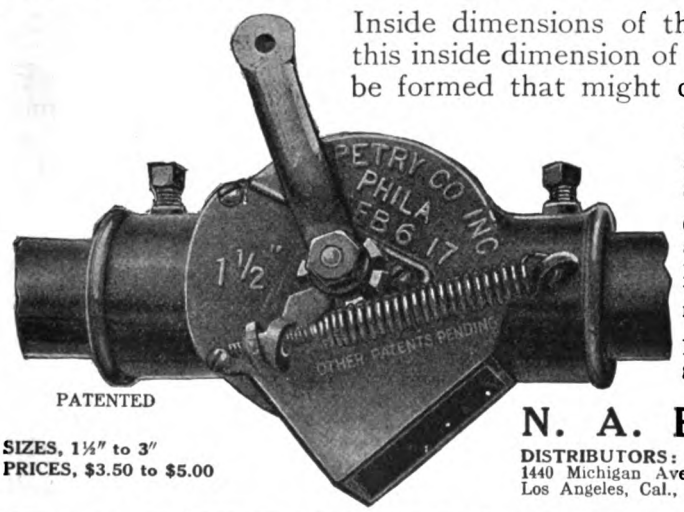
Don't wait for someone else to start in ahead of you—*start first.* Write at once for Free Booklet on tire repairing and Catalog of the latest and most approved equipment.

THE WILLIAMS FOUNDRY & MACHINE COMPANY

GLENDALE STREET **AKRON, OHIO**

Exclusive Distributors for California: The Waterhouse & Lester Co., San Francisco

No Back Pressure With the Petry



PATENTED

SIZES, 1½" to 3"
PRICES, $3.50 to $5.00

Inside dimensions of the cut-out at every point are larger than this inside dimension of the exhaust pipe, and no air pockets can be formed that might cause back pressure.

The Petry Cut-Out is quickly and easily installed, having seven points of adjustment—and once applied, its position is permanent.

Gas-tight joints. Adjustable spring well away from all heat. No fluttering of valve. No strain on exhaust pipe. Gases are discharged through a flaring opening which intensifies sound, facilitating tuning up of motor.

Easy to install and operate—no complicated parts to get out of order. A size perfectly suited to every car.

N. A. PETRY CO., Inc., 1313 Race Street PHILADELPHIA

DISTRIBUTORS: Geo. L. Holmes, 1733 Broadway, New York City; Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Hughson & Merton, Inc., San Francisco, Cal., Los Angeles, Cal., Portland, Ore., Seattle, Wash.

PETRY CUT OUT

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Multiply—

the cylinders in a motor and you multiply the need of a spark plug **with ability to withstand the rigorous punishment delivered by a multi-cylindered motor—**

MASTER Calorite Spark Plugs

have been designed to meet the heavy demands of present day gasoline engines—**Neither extremes of heat or cold, nor trip hammer blows of high compression, high speed motors—can worry them—**

Their scientific design—

The superior materials entering into their construction provide a factor of resistance to trouble practically double that of ordinary plugs—

True, Master Spark Plugs command a reasonable price but they prove that quality is economy—In their long lived, dependable service—

There is a Master Calorite Spark Plug for every variety of motor,

And the retail price is amply justified by their efficiency and durability.

$1.00 and $1.25 Retail—Depending Upon the Size

Let us send you full details regarding our proposition to the trade. You will find it most attractive.

MASTER CALORITE SPARK PLUGS

Made in U. S. A. and Guaranteed by

Hartford Machine Screw Co., 514 Capitol Avenue, Hartford, Conn.

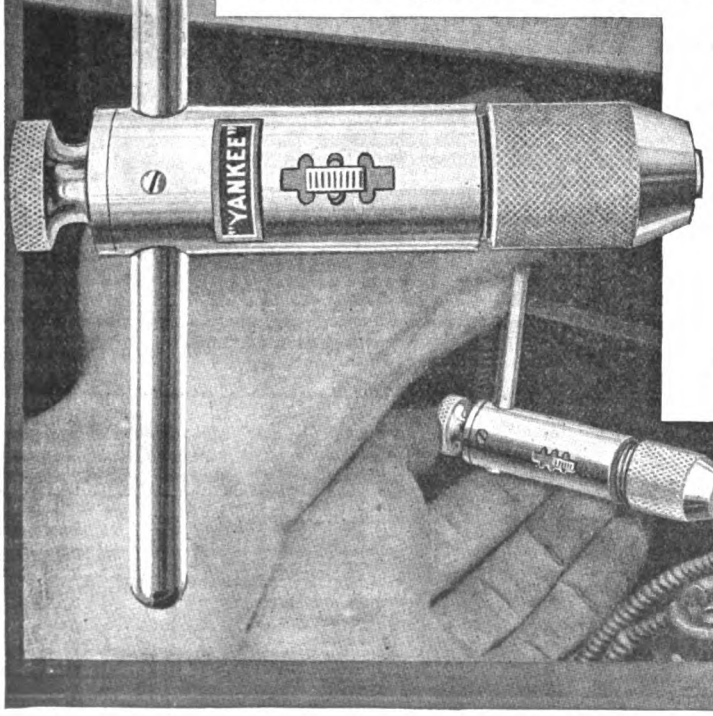


Master Calorite Spark Plug
Regular Length, $1.00 each

"YANKEE" Ratchet Tap-Wrench Saves Work

Lots of places about a car or engine where, when you want to tap a hole with an ordinary tap-wrench, you must "take the Job down."

This "YANKEE" Ratchet Tap Wrench No. 250 will enable you to tap a hole in the tightest corner in the shortest time. Right and left hand motion and rigid adjustment. Cross bar gives ample leverage for large taps; three positions of cross bar, or it can be removed for packing in kit. Knurled thumb-piece for starting or backing taps.



"YANKEE" RATCHET TAP-WRENCH

No. 250 Small, Price, $1.60 No. 251 Large, Price, $2.20

No. 1251, same as No. 251 but with exception, shank giving reach of 13 inches, Price $2.80

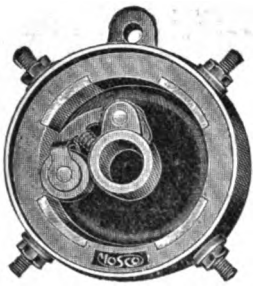
Your Dealer Can Supply You

Write for "YANKEE" Tool Book showing all "YANKEE" Tools for the garage man or mechanic.

NORTH BROS. MFG. CO., PHILADELPHIA

"YANKEE" TOOLS *Make Better Mechanics*

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MOSCO

Timer For Ford Car

Extra heavy pressed steel shell, aluminum finish. Insulating ring of gray bone fibre. Terminals insulated all the way through. One-hand, self-closing oiler. Pressed steel arm and compression spring on brush assembly. Brush assembly sold separately. Interesting prices.

IMMEDIATE SHIPMENT GUARANTEED

MOTOR SPECIALTIES CO.

MANUFACTURERS

WALTHAM ***MASS.***

PYRAMID BRUSHES

For Starting Motors and Lighting Generators

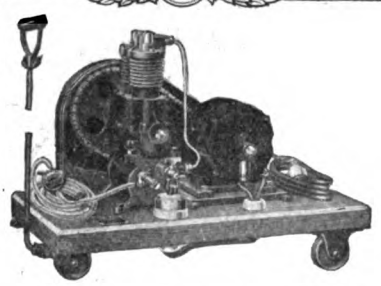
Why not add this profit-making line of starting and lighting brushes to your business? Pyramid Brushes are standard equipment on the great majority of starting and lighting outfits.

Sooner or later they must be replaced and nothing will make your customers more satisfied than to supply brush renewals of the same reliable type.

Let us show you how easily you can order the brushes you need with the aid of our Automobile specification sheet. The proper brush for every car equipped with a starting and lighting outfit is listed in a simple manner.

NATIONAL CARBON CO., Inc.

CLEVELAND, OHIO



With competition among garages and repairshops getting keener every day, SERVICE is becoming the biggest factor in *getting* and *holding* new customers.

MAYO ELECTRIC GARAGE PUMP

will put your garage or repairshop in a class by itself. in your town—attracting enough new business to shortly pay for itself. Portable—can be taken anywhere about the garage—out to the curb or into the street.

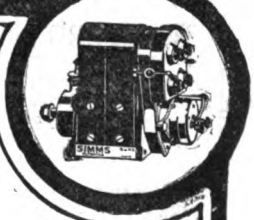
Operated by ¼ h.p. electric motor with silent chain drive. In ordering state whether for alternating or direct current. 110 or 220 voltage motor is required.

Send for prices and full details

MAYO-SKINNER MFG. COMPANY

2115 Elston Avenue CHICAGO

The Best Spark

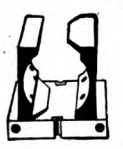


in the retard at low speeds and in the advance at high speeds.

HIGH TENSION

SIMMS MAGNETOS

with their patented pole shoes give the same hot spark when the engine is barely turning or when it is racing. This means easy starting, rapid accelleration, added flexibility and horsepower.



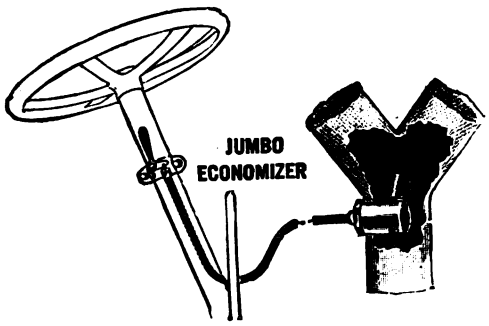
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The SIMMS MAGNETO COMPANY

274 No. Arlington Avenue

East Orange, N. J.

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Retail Price, $3.00

Write Us for Agents' Proposition

The Jumbo Economizer

THE ONLY GAS SAVER ON THE MARKET THAT IS ABSOLUTELY GUARANTEED TO SAVE 20% GASOLINE

The Jumbo Economizer is an auxiliary Air Valve which is to be attached to the manifold of any gasoline engine for the purpose of increasing the speed of the engine by introducing air into the manifold after the engine is started, and in this manner accelerate the engine without the additional use of gasoline. This principle is well-known and the fact that the Economizer has been on the market since 1912 is sufficient proof that the Economizer is a success from every standpoint.

Manufactured By

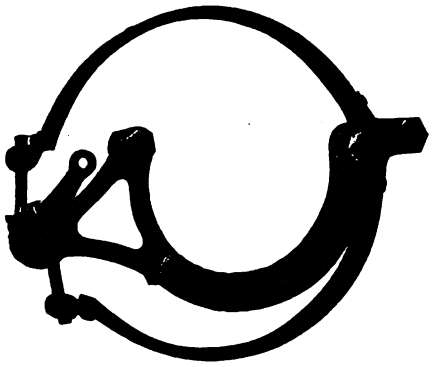
E. EDELMANN & CO. - CHICAGO

357 E. OHIO STREET

HOLDFORD BRAKES

SAFETY FIRST

PRACTICAL



POSITIVE

ASSURES YOUR SAFETY

HOLDFORD BRAKES are high-grade external contracting brakes for Ford cars which can be easily and quickly installed to act from the hand lever as emergency brakes, or from the foot pedal as service brakes. Designed in accordance with the best engineering practice; the band and brace are of steel, the toggle crank and bracket are dropped forgings and the lining J-M non-burn. Do not drag when released, no readjustment for wear is necessary and oiling is easy.

HOLDFORD BRAKES save wear and tear and will be attached by the wise owner on his pleasure car, delivery car or truck. They will positively stop a Ford with locked wheels on *any grade, at any speed, with any load.* Not necessary to remove old brakes.

When Ordering State Whether for Hand or Foot.

THE G. H. DYER COMPANY, Cambridge, Mass.

VULCANIZERS MILLER TIRES

Complete Cure—One Heat — Extra Ply—5,000 Miles

NEW 1917 MODEL "4 CAVITY" EN BLOC

Insulated Air-Cooled Flanges Prevent Marking Tires

Complete---Gas Burner

$125.00



One of 53 Kinds and Styles

From 75c up

We teach Tire Repairing FREE OF CHARGE at factory or by mail.

Extra Ply Tires

Give More Miles at Less Cost

"COG" & "Wrapped" Treads contain 25% more Fabric and Rubber than Standard.

More Fabric Means Less Blowouts—More Miles

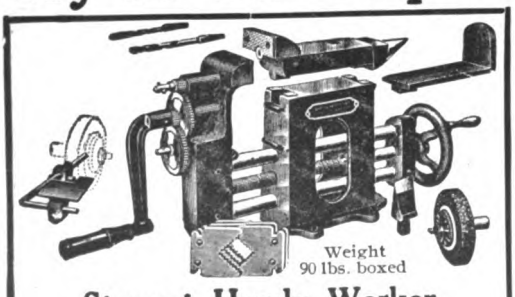
New 80-Page Catalog on Request

Exclusive Tire Distributors are Repeating Sales

For Price-Lists—Repeat Sales System

WRITE DEPT. "H" CHAS. E. MILLER ANDERSON, IND., U. S. A.

Try at Our Expense this wonderful Repair Outfit



Weight 90 lbs. boxed

Stewart Handy Worker "SIX-IN-ONE"

Price Complete $14

Handiest combination of tools you ever saw. Just the thing for the garage, public or private. Wonderful value for the money. If you were to buy separately all of the tools you get with this outfit, and get tools of the same high quality, strength and durability, THEY WOULD COST YOU AT LEAST $25.

A COMPLETE, COMPACT WORK-SHOP

A strong, practical anvil; powerful vise up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ in. pipe; A Corundum grinding wheel 5 inches by 1 inch; a two-speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing handle grip. It operates grinding wheel, buffing wheel, and many other similar tools.

With the STEWART HANDY WORKER you can do car repairing, blacksmith work, home repairing, make plumbing repairs, keep knives and other tools sharp and in good working condition.

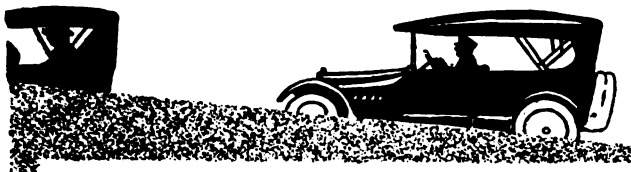
OUR SPECIAL TRIAL OFFER

Send for one of these great combination outfits today. Order with this understanding: If you aren't thoroughly satisfied in every way, you can ship it back and we will return every cent you paid out. THOUSANDS HAVE BEEN SENT OUT ON THIS BASIS AND NOT ONE HAS BEEN RETURNED.

Send only $2 with your order, and pay the balance when it arrives. BOOKLET GLADLY MAILED ON REQUEST. But the best way to appreciate this wonderful outfit is to order it, on our special trial offer.

CHICAGO FLEXIBLE SHAFT CO., 320 N. La Salle St., CHICAGO, ILL.

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NOT every good-looking top you see is new. Many are old ones refinished with

"F-S" "Evernew" Auto-Top Dressing

which brightens and waterproofs the fabric, leaving it pliable. Easily applied and dries quickly.

Write for prices

FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 North Fourth Street - Philadelphia



"Evernew" Auto-Body Enamel in eight standard colors. Special shades to order. 2

Guaranteed for 10,000 Miles



EVERY Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser.

"Absolutely Puncture Proof"

Brictson Tires are puncture proof, and proof against blowouts, skidding, rut wear, rim cuts, and can't be damaged by oil or gasoline. Wonderful resiliency, easy riding and economy commend them to every car owner.

The Big One-fourth Retread Feature

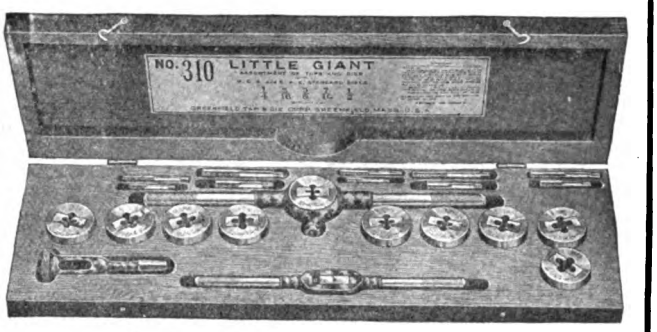
Should the tread surface wear out after 10,000 miles of service you can get a new retread for one-fourth the original cost of the tire, instead of buying a new tire and you keep the remaining three-fourths in your pocket. With ordinary service the Brictson Tire should run enough beyond the 10,000 miles to require one or two extra retreads. The more retreads you use the cheaper your service.

FREE TRIAL OFFER

To convince you the Brictson Tire will give satisfaction TRY THEM ON YOUR CAR AT OUR EXPENSE. Write today for this Free Trial Offer, a copy of our guarantee and full information about Brictson Tires.

The Brictson Mfg. Co.
197 Brictson Bldg.
Brookings, South Dakota

Brictson Pneumatic Tires



Little Giant Screw Plate

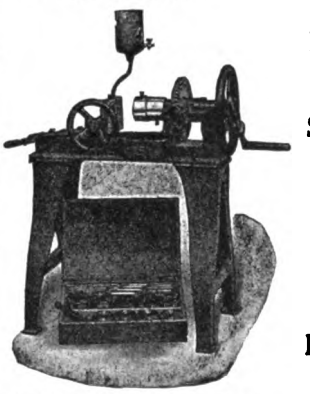
THE COMPLETE LINE OF THREADING TOOLS



Hand Taps



Little Giant Die



G. T. D. Threading Machine

Whatever your requirements in the screw cutting line may be, we can meet them, as our line is the most complete in the world. Bear in mind that our service in the threading tool line is unexcelled.

Ask for a copy of our No. 37 General Catalog which contains besides the products listed below, many tables of valuable information for garage repairmen, etc.

Below is a partial list of products shown in the catalog:

Taps—All kinds, for hand and machine use, in all thread standards.

Dies—Several styles, for hand and machine use, in all thread standards.

Screw Plates—Many styles for bolts, nuts and pipe, with Automobile (S. A. E.), or U. S. S. threads, combination assortments with both U. S. S. and S. A. E. thread taps and dies.

Reamers—Hand and machine, bit brace and straight shanks, all types.



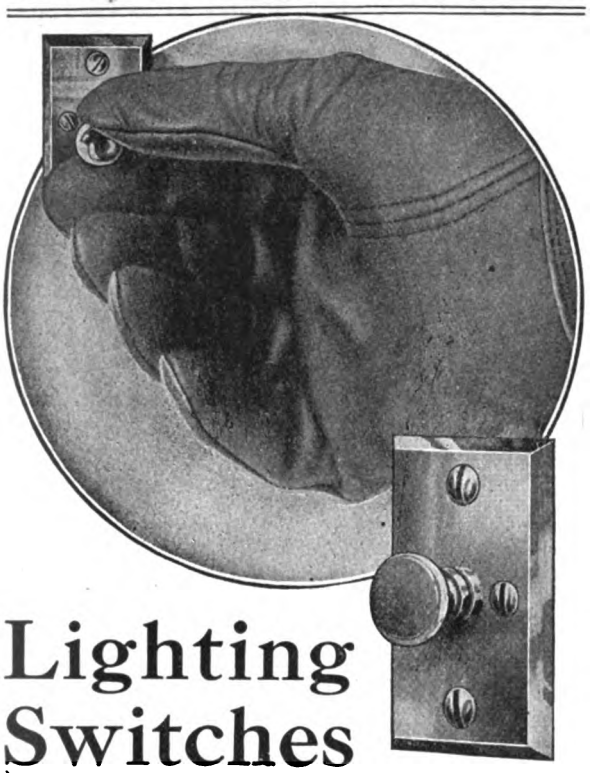
G. T. D. Burring Reamer

Greenfield Tap & Die Corp'n
Greenfield, Mass.

New York, 28 Warren Street
Chicago, 13 South Clinton Street
London, 149 Queen Victoria Street
Canadian Factory, Wells Brothers Company of Canada, Ltd., Galt, Ont.

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CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS

The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

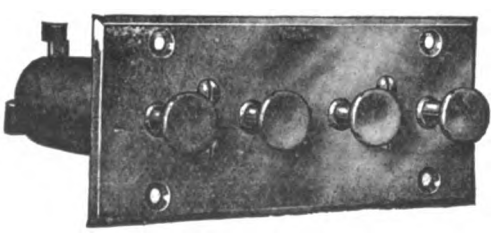
HEAD, SIDE AND TAIL LIGHTS

Head and tail lamps on and off together. Side and tail lamps on and off together.

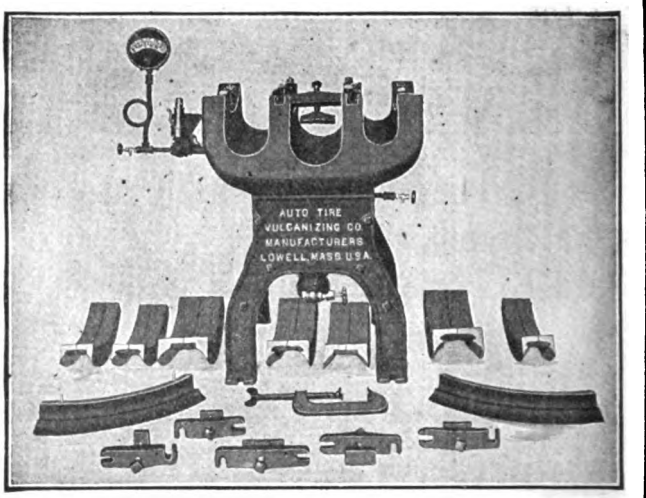
DASH LAMP

Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.



Exceptionally Large Profits can be made by Repair and Garage Men with

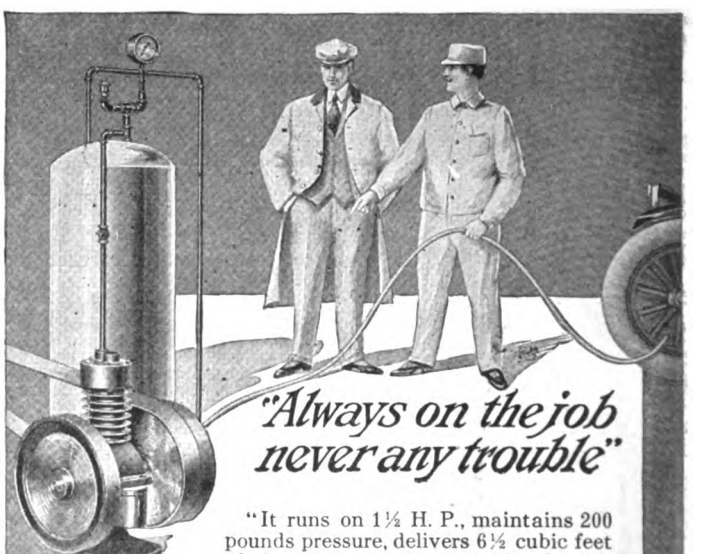
No. 8 Lowell Adjustable Sectional Vulcanizer

It's different, superior, economical in operation, in fact beyond comparison:

Complete and thorough work can be accomplished with this vulcanizer at all times.

DON'T LOSE A MINUTE—WRITE TODAY!

Auto-Tire Vulcanizing Company,
140 Powell Street - - - Lowell, Mass.



"Always on the job never any trouble"

"It runs on 1½ H. P., maintains 200 pounds pressure, delivers 6½ cubic feet of air per minute, the only thing I touch it with is the oil can—and it runs as perfectly as when I bought it.....years ago." No user of

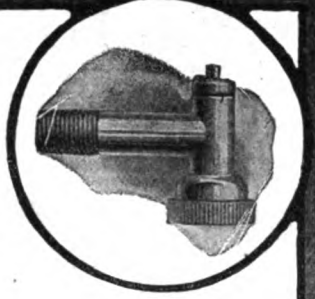
The AU-TO AIR-COMPRESSOR

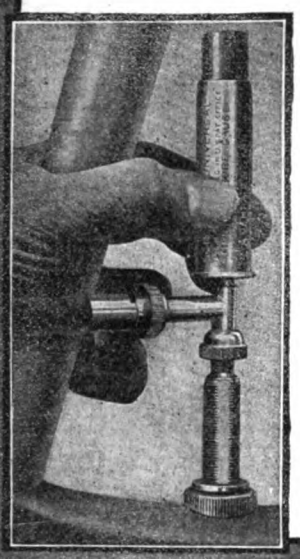
has ever paid us a repair bill. Forged high carbon steel, asbestos gaskets, very best bronze bearings, and perfect balance of fly-wheel against pulleys is part of the answer. Sold by all jobbers. *Catalog free. Write to-day.*

THE AU-TO COMPRESSOR COMPANY
Dept. 62 Wilmington, Ohio, U. S. A.

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You Can't Tell How Much Bengal Tiger there is in a White Rabbit Until You Put Him on a Meat Diet.





.... and you can't tell how many miles your tires *can* give you until you put them on a REGULATED, MEASURED, air diet.

Just so many pounds pressure, no more and no less.

If you pumped up your tires every time they fell below the pressure specified by the tire-maker they would last for the maximum distance.

Don't say pumping is too much trouble. With a

SCHRADER UNIVERSAL PUMP CONNECTION

it is no trouble at all.

Ask your dealer to show you how it works

Price, Thirty-five Cents

A. SCHRADER'S SON, Inc.
783-803 Atlantic Ave.
BROOKLYN, N. Y.

REFLEX SPARK PLUGS

The great volume of Reflex Spark plug sales comes from *repeat* orders. And dealers, to give repeat orders, must secure them. The motorist who once uses Reflex Plugs uses them again, and ten to one his friends begin to use them—and *continue*.

The secret of the success of Reflex Plugs is found *inside each plug*. When quality is combined with a design that is *right* and labor that is right, too, you are bound to secure a quality product that will stand up regardless of how stiff the punishment may be.

Reflex, then, when you want Spark plugs. There is a model for your motor—and *every* Reflex Plug is fully guaranteed.

DEALERS:

Reflex Spark Plugs are just as good to *sell* as they are to *buy*.

THE REFLEX IGNITION CO.
1711 Payne Ave.
CLEVELAND
OHIO





"KEEP THE CAR ON THE GO"

"NORMA"

"NORMA" BALL BEARINGS

(Patented)

The failure of a magneto bearing will stop a car or truck as completely as a broken axle. The failure of a bearing in the lighting generator is as serious as a break-down of the whole electrical system. No bearing in a car or truck is more important than the magneto and generator bearings.

As to the superlative dependability of "NORMA" Ball Bearings, makers of high-grade magnetos and lighting generators are practically unanimous—expressing their confidence by standardizing their apparatus on "NORMA" Ball Bearings.

Be Sure—See that Your Electrical Accessories are "NORMA" Equipped

THE NORMA COMPANY OF AMERICA

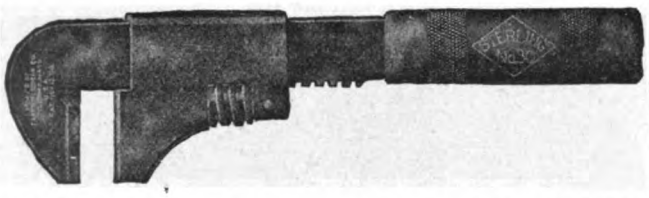
1790 BROADWAY NEW YORK

Ball, Roller, Thrust and Combination Bearings.

"NORMA"

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The Symbol of Satisfaction



MOSSBERG TOOLS

Yield Quicker Turnovers

Attractively arranged on the Dealers Display Boards, they have a distinct pulling power. Prospective customers quickly and easily find just the wrench they want. Fine tools tastefully displayed on nicely finished stands offer an appeal that cannot be denied. The impulse to buy can't be resisted.



"X" Board

The "X" board displays regular Double End, and "S" Wrenches with openings ¼ in. to 1¼ in., Single End Wrenches with openings ¼ in. to 1 in., Adjustable Sleeve Wrenches and Slip-Joint Pliers.



"R" Display Board

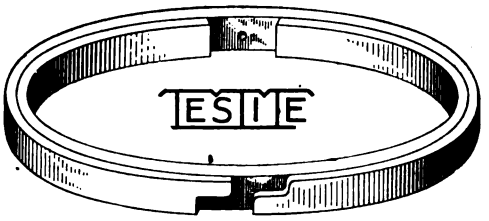
"R" Board for Fords displays 27 Tools for Ford adjustments. Each Tool does a particular job well.

Send for Catalog 191-B

FRANK MOSSBERG CO.

Attleboro, Mass., U. S. A.

ALL YOUR GAIN



It Is a Hobby with Some Men to See How Good They Can Make a Thing

IN THIS CASE IT HAPPENS TO BE THE

TESTITE PISTON RING

And a very—VERY Good Ring It Is

Made with an eye single to absolute technical precision. You would hardly imagine it possible that such a supposedly common thing as a piston ring could be made so uncommonly good.

Testite Piston Rings are made in all sizes to fit all motors.

Testite Piston Rings save gas by utilizing the entire fuel charge in the production of power. There is no waste. No loss of power, no waste of exploded gases past piston ring openings.

Testite Piston Rings are a boon to marine, and also to aeroplane motors, where the highest compression is so vitally important.

Testite Piston Rings make your motor measure more power, make it more responsive, and though the highest in efficiency, are the lowest in price for piston rings of their character.

Every ring is inclosed in a separate envelope with directions for installation and are packed twelve in a box for the trade.

Our literature, we believe, treats the Piston Ring question in an intelligent manner—learn more—write us—today—that's better than forgetting it.

STEVENS PISTON RING CO., Inc.

FREEPORT, N. Y. - BRIDGEPORT, CONN.

—AGENTS—

Fairfield Auto Co., Bridgeport, Conn. E. J. Willis Co., N. Y. City
Standard Tire & Rubber Co., 104-6 Portland Street, Boston, Mass.
Martin-Evans Co., Brooklyn, N. Y.

GASCO

GASOLENE ECONOMIZER

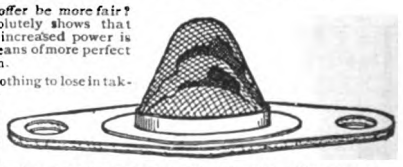
NOW—IT'S UP TO YOU!

Truth is never crushed to earth if given a square deal. Pin a dollar bill to your letterhead—mail it to us and prove Gasco's distinguishing traits.

First, determine the speed of your motor while idling and with the throttle all the way down.

Then unbolt the carburetor flange from the intake manifold and insert the Gasco as if it were a gasket, tighten up the bolts and start up the motor.

If the motor doesn't run faster than it did before, just send the Gasco back and we'll refund your money.



Can any offer be more fair? This test absolutely shows that with a Gasco increased power is obtained by means of more perfect fuel combustion.

You have nothing to lose in taking advantage of this offer, and you can readily prove for yourself that Gasco will save its cost in a short time in the saving of fuel, besides adding power, reducing carbon, and preventing fire due to backfire.

Thousands sold—one large concern purchased 3200.

Dealers everywhere find it a quick seller and a good profit-producer. Our sales plan calls for a small investment and gives a quick turnover. Write today for particulars.

GASKET SUPPLY COMPANY
17th & Ludlow Sts. Philadelphia, Pa.

Mfrs. of Gaskets, Packings, Washers, Stampings, Punchings and Dies.

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Mileage Means More Than Ever Before

to your customers. War-time economy demands maximum service. Sell them the lubricants that will help them to get utmost efficiency out of their cars.



DIXON'S GRAPHITE Automobile LUBRICANTS

serve your customers and your best interests equally well. You can build business of the better kind by banking on Dixon's.

Write to us for Dixon's Dealer's Deal No. 184-G

Made in JERSEY CITY, N. J., by the
JOSEPH DIXON CRUCIBLE CO.
ESTABLISHED 1827

DO YOU HEAR the UTILITY KID signaling you to go ahead and get UTILITY VARNISH RENOVATOR



"The ONE That WILL"
GIVE SATISFACTION TO ALL

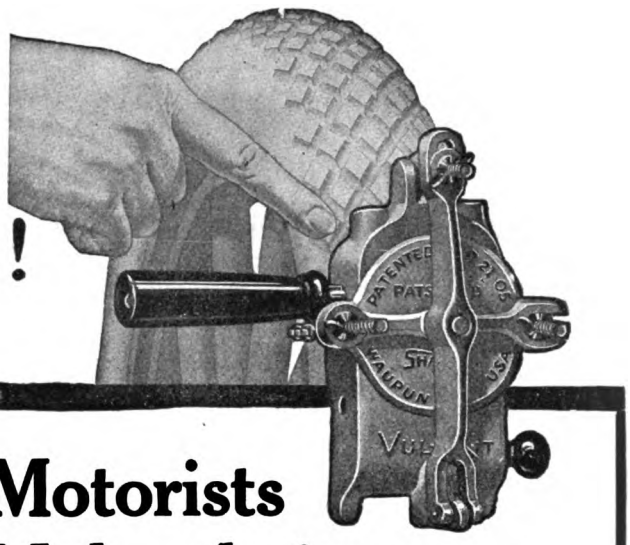
Keeps that auto looking "spick and span" at a minimum of time, labor and expense and with perfect SAFETY to the fine varnish finish. And that's just why we called it "Utility"—that whole car washing job is minimized to a piece of cheese cloth and a bottle or can of "Utility." Or, if desired, we furnish sprayer.

DEALERS: This is a NECESSITY, not a luxury. The great demand has enabled us to offer you "Utility Varnish Renovator" at a figure we don't think you can duplicate—at the same time receive the advantage of our "Additional Sales Getting Plan." Remember, it is the Necessity that Sells.

"Utility Varnish Renovator" is sold with our GUARANTEE, thereby making a "safe bet" for both dealer and consumer.

LIST PRICES
4 Ounce Bottles, 25c Quart Cans, $1.00
12 Ounce Bottles, 50c Gallon Cans, $3.00
Sprayer, 25c

POUGHKEEPSIE UTILITIES CORP.
46 Winnikee Avenue, Poughkeepsie, N. Y.



Motorists Make their own Tire Repairs!

Thousands of motorists who thought they could never repair a tire are now using the Shaler Vul-Kit. They find it easy to mend tubes and casings with this wonderful vulcanizer. They carry it right with them in their tool box and they're always ready for any blow-out or puncture, no matter how far out in the country it happens. With a Shaler Vul-Kit, you can seal the small cuts in time—before sand, dirt and moisture have been pounded into them to rot the fabric and ruin the tire.

SHALER

Vul-Kit For Tubes and Casings **$3.50**

Simple to use. Automatic heat control. No need to watch or regulate it. No chance to overcure or undercure the tire. No exposed blaze or liquid fuel to spill. Seals the cut in the tire with new rubber, protecting the fabric and making the damaged part like new.

Dealers—Write! Besides the Vul-Kit shown here there are other models of Shaler Vulcanizers for Motorists and Garages from $1.50 up, as well as complete plants for public repair shops. Write on your letterhead for our new catalog.

C. A. Shaler Co.
808 Fourth Street
Waupun, Wis.



This is one of the Shaler big family

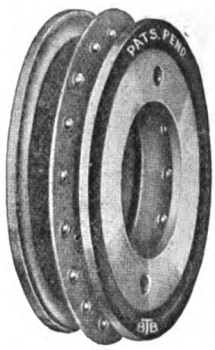
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BAILEY BALL THRUST

Replaces Thrust Washers at Left (Gear) side of

FORD and CHEVROLET 490 DIFFERENTIAL

Here is the real answer to that far reaching cry for an efficient remedy of axle difficulties, noisy or broken gears—the answer to that need for a bearing that will replace the old style, inefficient thrust washers used as standard equipment in Ford and Chevrolet 490 differentials, that through their sliding contact wear thin in no time, and cause drive gears to shift away from the drive pinion, creating havoc with the gears.



THIS NEWEST INVENTION

Of a master engineer, the BAILEY BALL THRUST BEARING, is an exact replacement made to fit to the thousandth part of an inch, and will positively keep gears in proper mesh, make them run quietly and last indefinitely. They will not wear thin.

DEALERS GARAGEMEN REPAIRMEN

All over the United States and Canada, wise men are stocking this bearing. Go after this replacement business. It is a source of profit for you and yours providing you can supply the customer's needs at a moment's notice. It will not do to order at the last minute, because the car-owner insists upon immediate service, and you must be prepared.

LIST PRICE, $3.75

LIBERAL DISCOUNT TO DEALERS. ORDER TODAY.

ASK YOUR JOBBER, OR WRITE DIRECT

GEORGE D. BAILEY CO., 1118 S. Michigan Ave., CHICAGO, ILL.

Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri





THERE IS NO ARGUMENT

WITHERBEE BATTERIES

FROM the very start—years ago—we were determined to keep away from slip-shod methods—with the natural result that Witherbee Batteries are today famous all over the world—for longer service than others of the same rated capacity.

People do appreciate high quality—and they've beaten a path to our door. When we accept your money you can rest assured that you are getting the very highest quality battery known to man.

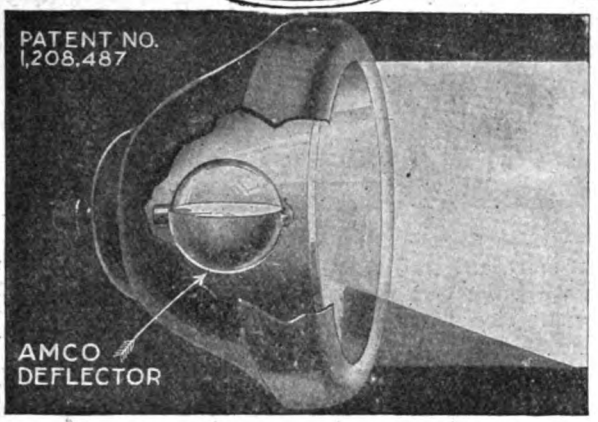
Every requirement in Lighting and Starting Batteries may be filled from our line.

Details of Dealer's proposition will be mailed—write to us this day. Are you a quality man? Desirable Territory still open.

WITHERBEE STORAGE BATTERY CO.
1904 Broadway, New York City
Factory: 643-649 West 43rd St., New York

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KILLS THE GLARE- AMCO RETAINS THE LIGHT



"AMCO"

Is the trade name of the most PRACTICAL, EFFICIENT and LOW PRICED device on the market for the elimination of the "GLARE" of Automobile Headlights.

The "AMCO" is a small WHITE ENAMELED metal cup that snaps firmly on the underside of the lamp bulb, the WHITE surface of the cup deflecting the rays of light to the upper part of the silvered reflector, causing them to be projected Outward and Downward on the road ahead of the car.

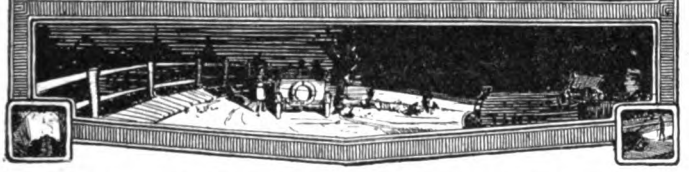
The "AMCO" has been licensed by Five States and has received unqualified endorsement from coast to coast. Sold with a positive "MONEY BACK" Guarantee.

U. S. Patent No. 1,208,487

Price, $1.00 Per Pair

Manufactured only by

THE ART METAL MFG. CO., - CLEVELAND, OHIO





PEDEX

The Adjustable Pedal Extension

eliminates the driver's clumsy cushion and gives the correct leverage to insure greater control, safety, comfort and convenience.

PEDEX clamps on backs of pedals leaving them free for use when desired.

Retails at $5 Per Set

When ordering name *make, model* and *year* of your car.

DEALERS—Write for our interesting trade offer.

SLOCUM, AVRAM & SLOCUM LABORATORIES, Inc.

American Car Accessories—Dept. B

531 WEST 21st ST. NEW YORK, N. Y.

2

Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

This Tirefiller is made of the finest quality of pure rubber treated under special processes, never gets "flat" and will last indefinitely.

One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.

National Rubber Filler Co.

MIDLOTHIAN . . . . . TEXAS.

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Here's The Trade-Mark That Buyers Of Automobile Springs Are Learning To Look For

Harvey RACINE

The Harvey trade-mark is our guarantee of quality and means extreme limit in auto spring service. It protects the dealer and repairman, too, for it means that we, the manufacturers, must maintain the high standard we have established for Harvey Springs. These good springs are a live, money-making proposition for any dealer or repairman who wants to increase his spring replacement business—and profits. If you don't know our jobber in your territory, write for his name at once.



Harvey RACINE Springs Do Not Break

They are made of the finest selected steel, have no weak spots and are guaranteed from end to end. If a spring proves defective at any point we will replace it. Harvey springs are made in sizes for practically every make and model of car. Each spring is an exact duplicate of the spring it is intended to replace and fits with an accuracy that will surprise you.

You owe it to your customers—to your own best business judgment to sell springs of recognized merit. Harvey springs meet every demand for wear and service and give absolute satisfaction to the car owner.

FREE

Every Dealer, Garageman and Repairman should write for the Harvey Auto Spring Book No. 4, just off the press, which contains a complete list of springs for all the leading makes and models of cars. Gives sizes, weights, measurements, prices, and other valuable information about automobile springs that has never been published before. It is a quick and ready reference book and an invaluable aid in ordering replacements. We mail it free.

HARVEY SPRING CO.
849 17th Street, RACINE, WIS.

20th Century's No. 6



Self-Vulcanizing Patch

Note carefully from above illustration the construction of this Patch—how the Semi-Cured Rubber is vulcanized on to the Fabric, which gives an absolute GUARANTEE against leakage, while the RED RAW Rubber Guarantees a perfect Job of Vulcanizing on to the Tube.

GUARANTEED SATISFACTION or Money REFUNDED

Made in 3 sizes
2¼x16— 36 Square Inches .....$ .50
4 x15— 60 Square Inches .....$ .75
6 x18—108 Square Inches $1.50

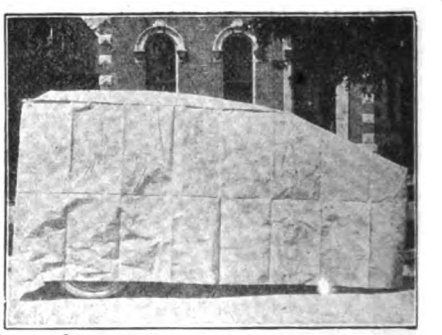
If you want a Patch, call for "20th CENTURY"
We make all kinds of Patches, all Sizes and Prices.

If your JOBBER or Dealer has not got them, write to us direct.

20th CENTURY TIRE PROTECTOR CO.
MIDLOTHIAN, TEXAS.

KENNEDY AUTO STORAGE COVERS

will protect your car in storage during the winter season from dirt, dust and moisture. They are made of heavy durable paper in standard sizes and will fit any cars.



7 Passenger
5 Passenger
Ford Special
Electric

ORDER NOW

THE KENNEDY CAR LINER & BAG COMPANY, SHELBYVILLE, IND.



FOR FULL POWER AND EFFICIENCY

In weak motors use

PRESSURE PROOF PISTON RINGS

Pat. Mar. 2, 1915; Feb. 29, 1916

Your motor may be weak from loss of compression, too much oil and consequent carbonization, oily spark plugs, etc.

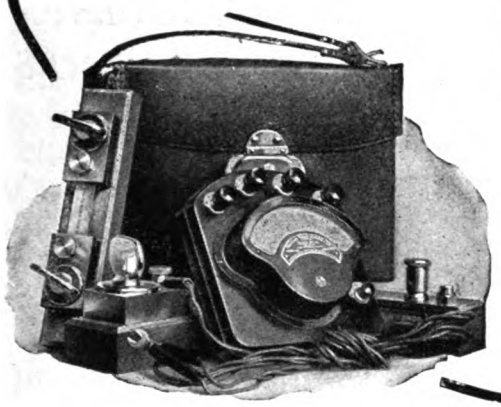
Pressure Proof Rings Will Give It New Life

and will permanently eliminate these troubles, give reserve power, greater mileage and save oil.

If you want to know the facts about these rings, send for "New Facts About Piston Rings." It's yours upon request.

PRESSURE PROOF PISTON RING CO.
167 MASSACHUSETTS AVE. BOSTON, MASS.

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Will Somebody Else Get Your Share?

If you can repair and adjust Electrical Equipment, you will get the cream of the garage business and make more money. With the increasing demand for service of this sort, you must equip to handle the business, or lose it to your more enterprising competitor.

Weston

Model 280

GARAGE TESTING INSTRUMENT

is your one great and urgent necessity, to enable you to locate electrical troubles quickly and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electrical equipment you can install.

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.

WESTON ELECTRICAL INSTRUMENT CO., 2 Weston Ave., Newark, N. J.

23 Branch Offices in the Larger Cities

Whitney Chains



are used by the leading truck makers in order to insure dependable service.

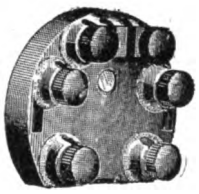
You can give your customers the same maximum service by specifying Whitney Chains when replacements are necessary.

Whitney Chains may be purchased from the leading jobbers of auto supplies from the Atlantic to the Pacific Coast.

The Whitney Mfg. Co.
Hartford, Conn.

Chains — Keys — Hand Milling Machines.

MAGNETO PARTS



FOR ALL MAKES OF

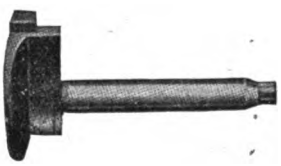
MAGNETOS AND COILS

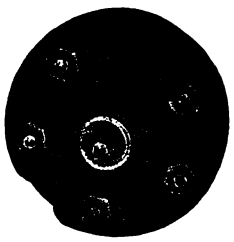


SPARK COIL PARTS TUNGSTEN CONTACTS
STARTER AND GENERATOR BRUSHES

ALL PARTS ARE GUARANTEED AGAINST DEFECTIVE MATERIAL

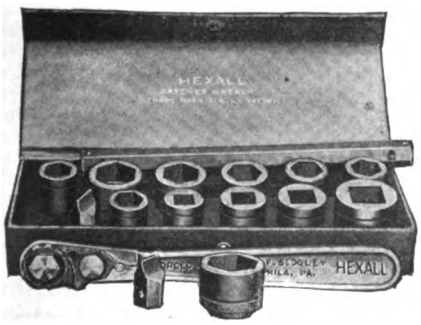
Write for our Catalogue and special agency proposition.





GUARANTEED MAGNETO PARTS CO.
1765 BROADWAY NEW YORK CITY

"HEXALL" RATCHET WRENCH No. 1



Contains 7 inch, Steel Forged, Ratchet Handle; 2 Screwdriver Bits; 7 inch Extension Bar; 8 Hexagon Sockets; 4 Square Sockets. Packed in neat, strong cloth case Weight, 35 ounces. Price . . . **$4.00**

Hexall Wrenches will stand the keenest competition and reveal the fact that they are more than "just a little better." We want you to prove it—send for our very latest Catalog—just off the press.

Break any Sedgley Wrench and we repair it—no charge

R. F. Sedgley, Mfr., 2311-13 No. 16th St., Philadelphia, Pa.

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Save Shoe Leather

Conserve America's Dwindling Supply, for Its Most Valuable Uses

THE world faces a leather famine. Tremendous demand and decreasing supply have caused an alarming scarcity. Sole leather has already sold for over a dollar a pound. Shoes have advanced from 50 per cent to 100 per cent, and shoe manufacturers predict that, without quick relief, leather shoes of good grade will sell for $15 to $20 a pair.

The largest leather consuming industry is the shoe business. Automobile upholstery ranks next. Every automobile upholstered in leather takes leather enough to make 3 dozen pairs of shoes. Hence:

Motor car buyers must soon decide which they will do without—leather in shoes or leather in automobiles.

Du Pont Fabrikoid Motor Quality offers the best solution to the problem. More cars are now upholstered in it than any other material.

Those automobile makers still using split leather acknowledge to us that it is inferior to Motor Quality Fabrikoid, but they hesitate to adopt the latter for fear some buyers may still think split (commonly sold as "genuine leather") is better. When buying an automobile tell the dealer you prefer one upholstered in Du Pont Fabrikoid Motor Quality. You will get a more serviceable—more lasting and more superior upholstery than split leather and you will do your share in the conservation of leather.

Many cars are already upholstered in Du Pont Motor Quality Fabrikoid. You can get it on *any* car if you will ask for it.

Write for names of makers using it.



DU PONT FABRIKOID COMPANY

Wilmington, Del.
Toronto, Canada

World's largest makers of leather substitutes.

Leave Your Tube in the Vulcanizer
AND WAIT ON YOUR CUSTOMERS
Why Not?

AMERICAN AKRON

Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

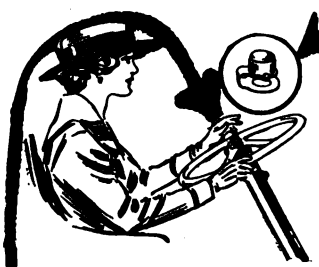
Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

IF YOUR VULCANIZER IS YOUR BOSS, DECLARE YOUR INDEPENDENCE TODAY

Write for Prices

The American Rubber & Tire Co.
AKRON, - - - - - OHIO



The HANDY PUSH BUTTON AND HOLDER FOR FORD CARS

DEALERS! GARAGEMEN!
Don't Wait, Order Now!

Price 75c

Here is a little article, easy to handle—small investment—right discounts—needed by every Ford Owner in the land.

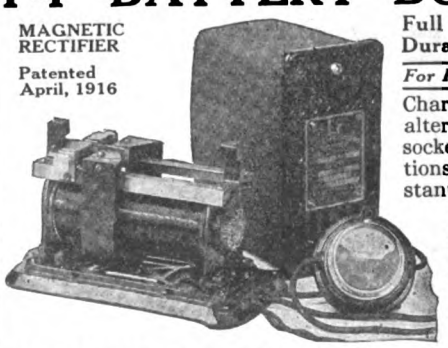
Eliminates reaching thru or around the wheel to blow the horn—brings horn button within easy reach—in the center of the steering wheel. Attached in 5 minutes.

Ten Buttons Mounted on a Handsome Display Card

THE FRANCIS-RAND CO., CLEVELAND, OHIO

F-F BATTERY BOOSTER

MAGNETIC RECTIFIER
Patented April, 1916



Full Wave — Powerful
Durable — Fool Proof

For Public or Private Use

Charges batteries from alternating current lamp socket. No fixed conditions of installation, constant attention or expert knowledge required. Its performance and endurance will surprise you.

$18 Complete, and up. F. O. B. Cleveland.

For 25, 50 and 60 cycle circuits.

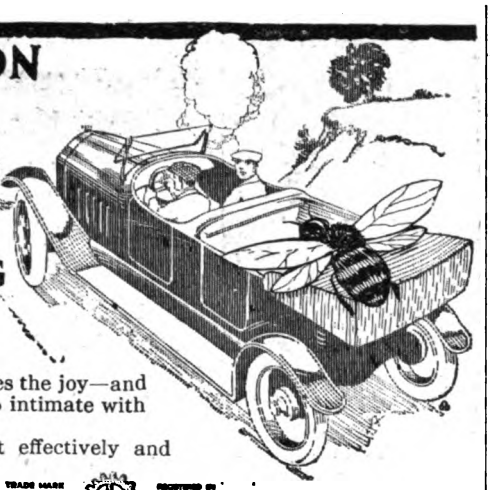
Get Bulletin No. 10

THE FRANCE MANUFACTURING CO., Cleveland, Ohio

Jobbers and Dealers Throughout the United States and Canada

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FRICTION is the BUSY BEE that takes the HONEY out of MOTORING



It takes the sweetness out of the running qualities of your car. It removes the joy—and makes your car too intimate with the repair shop. Kill Friction. Do it effectively and efficiently with

NON-FLUID OIL

It will keep your car a better car for a longer time. Non-Fluid Oil in the transmission, differential and bearings will check the wear and tear of Friction; will quiet gears, cushion metal-to-metal contacts and make your car the sweetest running thing on wheels.

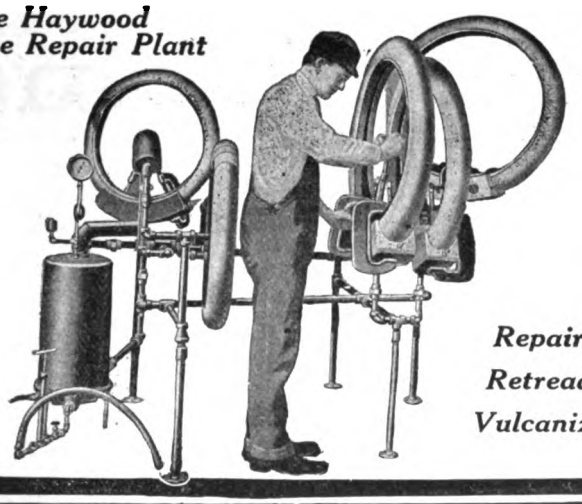


Non-Fluid Oil is three times as long-lasting and durable as any grease at any price. It is the most efficient lubricant in grease form. But it is not a common grease. It is infinitely better, because it starts checking friction the minute it is applied. Non-Fluid Oil does not melt under high temperatures, cannot thin out or leak from bearings or gears.

Ask your dealer for Non-Fluid Oil. Sold only in orange colored cans. Send today for sample and literature.

N. Y. & N. J. Lubricant Co.
165 Broadway, New York

The Haywood Tire Repair Plant



Repairs
Retreads
Vulcanizes

Give Haywood Service

HERE'S a standardized method of Tire Repairing—a method Nationally Advertised and known to motorists. Big money can be made either as side line to your present business or as a business by itself. **Equip your garage or store with a Haywood Plant.** Let it earn extra profits, or open a Haywood shop in your locality. **It's a rich opportunity.**

Write For Attractive Offer

ALL you need is one machine, a little training and you are ready to make money. A letter or post card brings all details. Interesting catalog explains **New Scientific Method** and gives particulars of our Co-operative Business Building plans. Write today.

Haywood Tire & Equipment Co.
965 N. Capitol Ave. Indianapolis, Ind.

TWO-STAGE AIR U.S. AIR COMPRESSORS

All Autoists Endorse the Two-Stage Idea

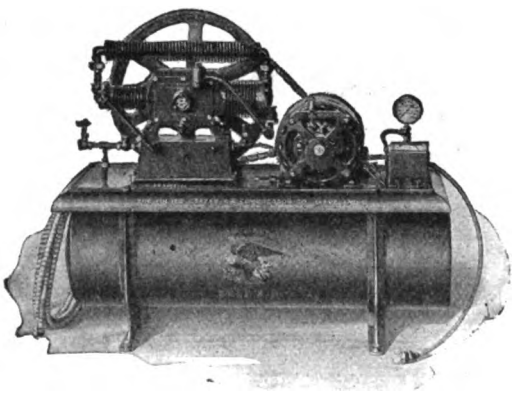
SUPPOSE, next time you saw an autoist inflating a tire with a hand pump you were to enquire why he didn't used a single cylinder (single-stage) pump.

He'd probably reply, with no small amount of sarcasm, that: "he wasn't doing it for exercise and he didn't have all day for the operation either."

Of course, you wouldn't think of asking such a question in view of existing circumstances. You know, and everyone knows, that the compound or two-stage hand pump has completely annihilated the single-cylinder single-stage pump, simply because it was superior beyond comparison.

The first compound hand pump was designed to utilize a principle already existing in two-stage power driven compressors, and the success of the compound pump in millions of instances proves the correctness and superiority of this principle beyond question. In other words, autoists using two-stage pumps and abandoning others endorse the two-stage idea as distinctly superior.

United States **two-stage** compressors are made in a range of sizes and combinations to meet every requirement. To buy them means to obtain the fullest possible measure of satisfaction. Send for Catalog today.



U. S. Two-Stage De Luxe Automatic Air Unit. Being installed in a majority of the finest garages.

The United States Air Compressor Co.
6542 Carnegie Ave.
Cleveland, O.

Gentlemen: Please send your Catalog as advertised in Auto. Dealer and Repairer.

NAME .....

ADDRESS..... CITY.....

TWO-STAGE AIR U.S. AIR COMPRESSORS

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BUNTING BRONZE

CORED BARS

Bunting Bearing Metal is overwhelmingly favored—because we have steadfastly adhered to an ideal which subordinates everything to the prime question of quality.

Beyond the shadow of a doubt, we can suit you to a "T"—for our Cored Bars are made of the world's best—yes—very best phosphor bronze. Over 300 of the largest manufacturers of machinery, engines and motors have adopted it for use in their products and they are more than satisfied.

If you, too, wish to use Bunting Bronze, the wise practical expedient way would be to write us a letter today—why not—it's for your own good.

Write for Pamphlet "X"

STOCK SIZES

PIECE No.	Outside Diameter	Inside Diameter	Length	Approximate Weight
A	1	½	12	2
B	1¼	½	12	3½
C	1½	¾	12	5
D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15⅝
K	3½	2½	12	17
L	4	3	12	21
M	4¼	3¼	12	20



The Bunting Brass & Bronze Co.
740 Spencer Street Toledo, Ohio



Have you received your copy?

It is a *Book of Knowledge* that enables you to become an electrical expert in your automobile work. No more guessing at what you need. It is a complete illustrated catalog of contacts, starter and generator brushes. *Free* to every repair man. This is a line that will build up a splendid business. Ask about our Cash Register of contact parts proposition. Write today.

PAUL G. NIEHOFF & CO., Inc.
Metallurgical Laboratories Clark St., at Kinzie, CHICAGO, ILL.



90,000 SPRINGS IN STOCK
REPLACEMENT SERVICE UNEXCELLED

Jenkins Vulcan Spring Co.

Saint Louis, Mo. ..... 1402 Chestnut St.
Minneapolis, Minn ..... 1024 Hennepin Ave.
Reading, Pa. ..... 538 Franklin St.
Fort Worth, Tex ..... 708 Commerce St.
Sumter, S. C ..... 29 Caldwell St.

Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

1500 SIZES. YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING

WRITE NEAREST OFFICE

GEORGE NASH CO.
804 Hudson Street
New York City

EDGAR T. WARD'S SONS
44 Farnsworth Street
Boston, Mass.

THREADING PIPE, BOLTS, NIPPLES



THREADING straight pipe, bent pipe, nipples and bolts, and requiring only a few square feet of floor space, an

OSTER

COMBINATION MACHINE

pays big dividends in money saved over hand-threading. 3 days' work a month pays profit. Catalog free—Ask for List 30.

THE OSTER MFG. CO.
2102 East 61st Street Cleveland, Ohio



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The New Sectional Overlap Lazyback Cover

An Exclusive Feature in

GORDON Seat Covers
TAILORED TO FIT

That Revolutionizes the Sale and Application of Seat Covers

Patent Applied For

This new sectional overlap feature provides four advantages not heretofore offered in any make of Seat Covers:

Easy Application of Covers Makes Misfits Impossible No Strain on Fabric or Buttons Easy Riding Qualities

They are the missing features which have stood between the car owners' demand for Seat Covers and the Dealer's success in meeting it.

The sectional construction of the new "Gordon" Seat Covers makes their application merely a job of following illustrated instructions sent with each set. You can't misplace a part and cannot fail to secure a perfect, smoothly fitting Seat Cover.

Put on one section at a time. Each section bears a ticket telling where it goes.

The overlap provides for the variation in the upholstery of Cars of the same model.

When you lean back, the overlap gives with the lazyback and there is no strain on the fabric or fastenings.

This new style "Gordon" Cover is not more difficult to put on than spare Tire Covers. One man can handle the job alone. You can now sell "Gordon" Seat Covers "put on" and make a good, clean profit on every sale. They remove all the troubles that have taught you to fight shy of Seat Covers—they put within your reach a market that promises more than anything else in the accessory field.

"Gordon" Seat Covers are made for more than one thousand American made automobiles—from twenty-four beautiful, strongly woven fabrics in sun-fast shades of brown, tan and gray.

We make shipment of your orders in three days, tell you how to put them on and furnish fasteners in the same color as the Cover fabric.

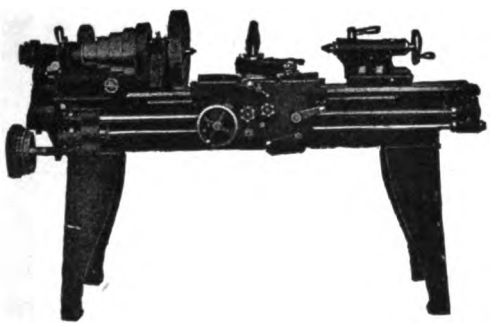
Investigate this new style "Gordon" Cover at once. It means real money to every accessory dealer.

THE J. P. GORDON CO., 306 No. Fourth St., COLUMBUS, OHIO

GORDON Easy-On Tire Covers

INSURE MORE MILES from tires. They PROTECT tires from sunlight and sunheat which ROTS RUBBER. They prevent premature blowouts. They are made to fit all makes and sizes of tires and for use with every type of spare tire carrier.





14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices.

THE MONARCH MACHINE TOOL CO.
SIDNEY, OHIO



Why Are So Many Cars *Leakless?*

Largely, perhaps, because people realize the expense and annoyance of leaks. So they seek materials which will stop them.

ENDURA Sheet Packing is oil-proof, gasoline-proof, hot-and-cold-water-proof. People have found it, and are asking for it in larger quantities each year.

Do you sell it? Do you stock it? Discount sheets and a full dealer plan gladly on request. No obligation.

ENDURA Manufacturing Company
6305 Eastwick Avenue
Philadelphia, Pa.



Gentlemen:—Please send me full information on selling and stocking ENDURA. Of course this does not obligate me.

Name.....

Address.....

City..... State.....

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Norwesco Soldering Paste

A scientific compound that causes the solder to flow on and fuse nicely and is much easier to handle thanacid. Retail Price, 25c



Norwesco Rim and Gasket Shellac is a much needed article in the repair shop. It is used for perfecting gasket joints and for cementing bicycle tires to their rims. 2½ oz. Swab Bottles 15c. Larger containers from 25c to $3.00.



Brass-Kote is a quick drying enamel that transforms the brass part of a car to a gloss black or hard rubber finish. Requires no filler. Dries quickly and does not chip nor crack.

Pint Cans 60c, Half Pint 35c



Norwesco Valve Grinding Compound. This valve grinding compound grinds a valve down quickly to a smooth, uniform seat, contains no ground glass nor powdered emery. This double-end box contains two ounces of fine and two ounces of coarse.

Retail Price 25c



Norwesco Graphite Coating

Is a perfect rust resistant for auto rims and springs. It also serves as a lubricant between rim and tire. Dries in three minutes and can be applied while changing tires.

Half Pint Cans 40c

Profitable to Dealers because Popular with Motorists

That's the simple secret of the growing demand for

"Chemically Correct" Automobile Specialties

Every "Chemically Correct" article offers the motorist a short cut in car upkeep enabling him to get more efficiency as well as more pleasure out of his car.

Write for complete catalog or consult your jobber at once.



Norwesco Neatsfoot Compound restores clutch and brake facings giving them their original grip, whether they be leather, cork or composition.

Pint Cans, 30c



Carbonox. The "Chemically Correct" carbon remover. Loosens the carbon and it is blown out the exhaust. Used twice a month it keeps the engine free from carbon all the time.

Pint Cans, 50c



Never-Burn is a baking enamel for automobile engines. The heat bakes it on and it adheres like part of the metal itself. Two finishes: Gloss Black and Battleship Gray.

Pint Cans 60c
Half Pint 35c



Skalex is the "Chemically Correct" radiator cleaner. It is a dry powder that dissolves in the hot water of the radiator and removes all rust scale and sediment. Does not attack the metal. Retail Price, 50c



Norwesco special Mohair Top Dressing both dyes and waterproofs mohair with one operation. A quart can does a touring car top; a pint is sufficient for a runabout top.

Quart Cans 90c
Pint Cans 50c



SE-MENT-OL

The Original Self-Acting Radiator Cement

It is popular with motorists everywhere because we advertise it nationally and because it

"Finds the Leak and Fixes It"

In ten minutes it repairs one or more radiator leaks. The motorist then drains and refills his radiator and it is just like new.

Write for complete catalog of the "Chemically Correct" line.

THE NORTHWESTERN CHEMICAL CO.
Marietta, O.

Ford Painting Outfit

A complete outfit for refinishing Ford and other small cars in black. Price of outfit complete, $4.00.





Norwesco Color Varnishes

are made especially for one-coat work, the color being ground into the varnish. Assortment of eight colors.

Quart Cans $1.25
Pint Cans .75



Norwesco Lining Dye

IS NOT A WATER-PROOFING, but simply a dye used to cover and obliterate dirt and grease spots, that mar the good appearance of top linings.

Pint Cans, 40c



Pioneer Body Polish

is popular because it feeds the finish. It does not cut away the varnish, but reinforces it and restores its original luster

6 Oz. Bottles, 25c
16 Oz. Bottles, 50c

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Automobile Dealer AND Repairer

A JOURNAL OF PRACTICAL MOTORING

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VOL. XXIV, No. 1. NEW YORK, SEPTEMBER, 1917. PRICE { 10c PER COPY $1.00 PER YEAR

LOCATING THE GARAGE.

How Westerners Solve Problem of Housing the Motor Car on the Premises.

BY FELIX J. KOCH.

The housing of the automobile is a problem that should be solved by those contemplating the building of a home, and the garage should be considered even

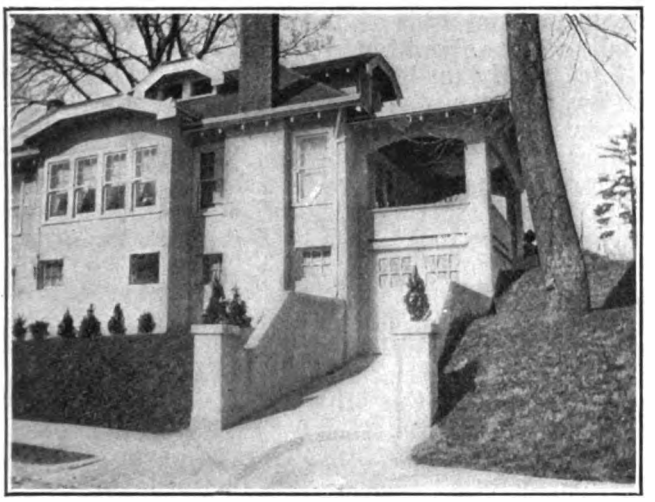


Fig. 1.—An attractive type of attached garage which is convenient and heated by house system.

if one is only slightly interested in the motor car. It does not require other than a little thought to decide where the garage should be located, and having arrived at a decision it is easy to determine what type you would build if you decide to invest in the automobile.

Personal taste determines largely whether you would have this connected squarely with your own residence,—off a ways,—or else sufficiently distant from your own home to comprise almost a distinct edifice and provide a home for the chauffeur and his family. Presented herewith are some interesting examples of garages in the big American Middle West and taken in the environs of Cincinnati.

The illustration shown at Fig 1 is of an attractive type of attached garage, that is to say, it is built under the veranda of the owner's dwelling. This admits of its being heated in the colder months by the same system which heats the owner's home and makes it warm and convenient for working in without extra cost at all seasons.

Where no chauffeur is maintained, this garage seems to possess every advantage. Properly cemented and with due provision against fire, it avoids the possibility of unpleasant odors reaching the house proper. The design is said not to increase the house insurance rates. With a driveway cut to it through the lawn, and this neatly edged, as shown, one may drive in, after the theater,—lock the door and leave the machine after simply extinguishing the lights. It is but a step for the owner up the stairs on his way to bed.

Some folks, however, do not care for this type, particularly if several members of the family use the same car. However careful one may be with the machine he is almost certain to wake the sleeping members of the family on his return, if it be kept in what is substantially the cellar.

The picture shows the home of a western newspaperman who in coming home through the dark streets has found it of decided advantage to use his own machine and garage it at home. His home, however, is built on an attractive knoll, the top of which is about on a level with the garage roof, —and in this way the family is spared the noise made when an automobile is run squarely into practically one's cellar.

More pleasant still for all concerned, and for those who can afford chauffeurs, is the structure shown at Fig. 2.

In addition to an attractive residence of concrete there is built at one side of the garden and so well to the rear that no sound or odors can reach the dwelling, a two-story garage. The ground floor front is used for automobiles. At the rear is the wash-room and supply-room.

Stairs lead to the upper floor, a cozy apartment or flat being provided for the chauffeur, although only unmarried men are employed at this place. The arrangement is convenient for both the owner and driver.

The detached garage possesses numerous advantages and particularly appeals to the man who



Fig. 2.—A detached type of garage which combines dwelling for the chauffeur at the rear.

builds a small home such as a bungalow. With the attached type of garage the residence is subordinated to a certain extent; that is, when the residence is very small the garage detracts from it.

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AMONG THE PENNSYLVANIA MOUNTAINS.

Interesting Points for the Garage Man and Car Owner.

BY JAMES F. HOBART, M. E.

A Good Old Ford.

"Yes, I've been up here in this crack in the mountains, on the headwaters of the Schuylkill River for more than seven weeks and I have seen some things in automobiling which were not to be found along the gravel stretches in Indiana."

Just a few Pennsylvania Dutch around here. At least "four out of every three" confess by their speech to such parentage. One of them, working as a laborer at 22½ cents per hour, has a considerable farm, carried on by his women and children. He comes to work each morning in a fine buggy, drawn

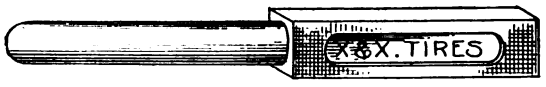


Fig. 1.—Stock Tire Tool.

by a good horse, and in the evening, you may see him and his entire family speeding to town in a good touring car—his own property, and paid for too.

Stopping for weeks at a Road House, miles from a village or town, has its drawbacks, of course, but many things are to be seen there, of interest to automobile drivers, and I like to spend all spare moments talking with the car drivers who stop to change tires, pump in a bit of air and incidentally to "unload schooners on the bar."

Just now, a contractor from a neighboring village stopped to change an inner tube. He came from town with a tire not pumped up quite as it should have been and struck two miles of state road which had recently been treated with a spreading along its center of broken stone. Part of the road was covered with stone about three-quarters of an inch across each broken side, while other stretches of the road had been covered with stones much larger, many of them one and one-half inches across. And the state, in mending this road, instead of covering the broken stone, or at least rolling it down, leaves the freshly broken stone just as it was spread from the teams and the automobiles which pay a heavy license each year, have to roll down the sharp stones with their expensive rubber tires. And it is an expensive way—for the tire owners.

A little Ford car pays $10 a year for the privilege of rolling down crushed rock on state roads. That is "going some" even for mountain travel! The contractor above mentioned had a little Ford of 1910 make which was still doing full duty, being driven almost continually and carrying five or six men to work in the morning and bringing them back at night. Between whiles, the little car was used as a motor truck and carried lumber and material over the mountains, where it is "up hill both ways."

The car had been so arranged that a truck platform seven feet long could in three minutes' time be slipped over the frame back of the seat and the contractor stated that he often carried half a ton on the little truck platform, besides three or four men upon the seats. He also stated, in reply to my questions, that the car was owned and operated by himself and his two brothers, all contractors; that the car cost him $125 in 1910, and that some one of the three had been driving it almost continually since that date.

They had kept careful account, he said, and figured that the cost of running the machine since they owned it, was just about 1¼ cents per passenger mile.

"All winter," he said, "we have been building some houses five miles across the mountains. Each day, we take five men, sometimes six, up there in the morning and bring them home at night. The cost for the round trip, about 10 miles for 5 men, is 31¼ cents against a 14 cent fare on the railroad, or 70 cents per day for the five round trips." He said, "The railroad hasn't anything here on my little old Ford."

In getting ready to change the inner tube, the gentleman brought out, with the jack, two little tools, one a stock affair about as shown by Fig. 1. The other was a tool which he said was a great saver of time. This tool is shown by Fig. 2 and was evidently home made from a bit of old wagon spring.

Each tool was about ten inches long. The stock tool, Fig. 1, evidently made of cast or malleable iron and given away as a tire advertisement. But the "XX" tire exists only in the imagination of the writer, therefore, don't try to find that make of tire in order to get one of these tools, which, the contractor said was good when starting to take off a tire, but after once started, the tool shown by Fig. 2 had the other one "skinned a mile!"

The tool shown by Fig. 2, as stated, made from a bit of wagon spring, was about 1¼" wide, worked down quite thin at either end and both ends were bent in opposite directions, one end being bent to a longer radius than the other end. With this tool, after the tire had been started with the stock tool, it could very quickly be freed from the rim of the wheel and before I had fairly examined the home made tool, the contractor had placed another inner tube inside the rim and was putting it back again upon the wheel.

An Advertising Scheme.

One "Pennsylvania Dutchman" who evidently had been crossed with Yankee stock, worked a bit of clever advertising whenever he had a few minutes in town. He had a printer strike off several thousand neat little cards of attractive design, the cards giving

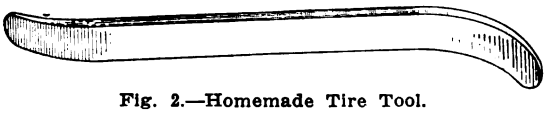


Fig. 2.—Homemade Tire Tool.

the advertiser's name and address and a comprehensive list of the things which could be done at the repair shop in question. The card ended with the legend:

"Good work, Quick work and Honest Prices."

Whenever the advertiser found cars parked, he would place one of his cards conspicuously upon one of the seats of the car and go on his way rejoicing. The scheme was a clever one and should bring in a good deal of work for "trial trips" at least. Further patronage, would of course depend upon the manner in which the first job was handled and charged for. However, the scheme has the earmarks of success. Should the garage man have no time to distribute the cards, a boy or a girl could do the work as well and a good deal cheaper than he could do it himself.

In view of the tremendous number of parked auto-

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mobiles to be found at nearly all times in towns and cities, it seems that some enterprising individual might carry the matter a bit farther and print a folder, souvenir style, containing useful local information, together with the publicity notes of several standard automobile accessories and requirements and have the pamphlets distributed regularly to parked automobiles inside the district which would naturally benefit the several advertisers.

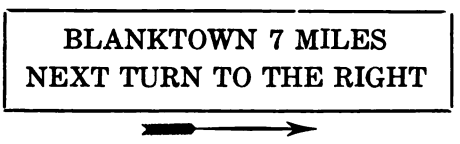
Marking Inner Tubes for Patches.

One day, while watching a garage man test out an inner tube for leakage, I saw him use a neat little kink for locating and sizing the patch to be applied. When the tube came from the water trough, the surface of the rubber was of course, very wet and the bubbling of the air through the leaks could be very plainly seen.

As fast as the leaks were found, while the tube was still wet, the garage man marked on the rubber with an aniline pencil, the size and shape of the patch to be applied. Then, taking care not to handle the marked places, as soon as the water dried off there were several patch sizes and locations, from which shapes the patches were quickly cut with the shears. The aniline markings also served as very convenient guides for applying the cement, also for placing the patches upon the tube.

A Road Sign Kink.

While motoring along near Lancaster, Pa., recently, a very comprehensive road sign came into view, bearing information of just the right kind. The sign, a wooden board of the usual construction, was lettered as follows, the words being painted in letters at least four inches high and so plain that there was no need of reading the words for they simply THREW themselves at the passerby. The sign read:



That "Turn to the Right" was what did the business. It helped a whole lot and perhaps prevented the driver of the car from becoming crosseyed through watching both sides of the road at the same time.

Testing Inner Tubes.

A tank about thirty inches long, eight inches wide and ten inches deep, partially filled with water, forms the tube testing apparatus of some repair shops. The better tanks are built of galvanized steel. Cheaper ones are made of wood. In some shops, half of an oil barrel does tank duty for testing tubes and in more than one instance, the writer has seen the test tank "hived" in a dark corner where it is almost impossible to see well enough to detect small leaks.

One of the best tube tanks the writer has seen was made of plate glass, bottom, sides and ends, all bolted and cemented together in regular aquarium fashion. This tank was not hidden in a dark corner. It was placed where there was a good light, and to make things still easier, two powerful incandescent lights were located upon "lazy-tongs" fixtures in such a manner that the lights could be placed almost anywhere either underneath or around the tank during a tube test.

As the light could shine through the walls or the bottom of the water tank it was easy to detect leaks, even while the tube was under water, for it was not necessary to remove the tube from the tank in order to see whether or not air was escaping through the walls of the tube.

But, certain conditions must be met in order to detect leaks. It is sometimes necessary to do more than barely fill a tube with air and place it in the tank, in order to find the leak. The writer recently saw a man spend more than an hour looking for a leak in a tube, but, try as he might, he could not locate it. Still, he knew that a leak existed because the tire "went down" slowly, as often as it was pumped up, thereby showing that the leak was a small one.

The owner, after trying in vain to locate the leak, and having failed even when the tube was lathered by means of a brush, with soapy water, the garage man took a hand in the game. He tried the tube in the tank just once but did not waste five minutes in searching for the leak, then he pumped more air into the tube and a second immersion in the tank showed just where the trouble was.

"It's this way," said the garage man. "When you put just a little air into a tube, the strength of the rubber may be sufficient to close the hole so tightly that no air can get through it. But when you put on a bit more pressure, the force of the air overcomes that of the rubber and you can find the leak at once. You must be careful, however, not to pump in too much air or the the tube may be stretched and weakened. Usually a pound or two pressure is enough to show almost any leaks. There is another thing. You see that I barely submerge that portion of the tube where I am looking for a leak. If the tube be immersed too deeply, the static pressure of the water will tend to keep the air from leaking out for the water is trying just as hard to get into the tube as the air is trying to get out. If you immerse a tube 26 inches deep, the static pressure of the water will be about one pound per square inch, and that will help much to keep the air from coming out. However, we never immerse tubes that deep, but I always take care to do the testing with the tube barely immersed."

Tightening Nuts with a Brace-Wrench.

It goes without saying, that a socket wrench either fitted into a bit-brace or else with a handle made like a brace, is a very good tool with which to remove and replace wheel bolts. But it should also go without saying—which it doesn't always—that a good many men don't use the brace wrench right. When a nut is caught in the brace wrench, the nut should be screwed home without once removing the wrench from the nut.

But there are occasionally times when it is pretty hard work to do thus and even experienced workmen prefer to remove the brace-wrench when the nut is nearly home and replace the wrench again and again in order to obtain a more favorable leverage.

It is well and proper to use the brace-wrench thus, but it is not good workmanship to remove and replace a brace-wrench each time a sixth or a quarter turn is given to the nut. But recently the writer watched a man put on all the bolts which hold the wheel together and he made a removal and a replacement of the wrench for each of the six sides of the "hex" nuts, at each and every turn.

It seemed very unmechanical to the writer, the

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wasting of time in that manner, but there were compensating points to be considered, especially from the view point of the garage man, who, when the writer remarked to him the waste of time by the automobile owner, said:

"Now don't you say a word to that man. Just let him go his way and take his time. While he is monkeying with that wheel, he is not burning up gasoline or wearing out tires. But he is paying for my time and for that of my man who is waiting on the nut-screwing business, therefore, don't you say a word to him about the matter."

Perhaps that point is worth considering from the garage man's standpoint, but I noticed that his men never took short strokes with the brace-wrench. Instead of that, the brace went right around and around until the nuts were screwed home. When the nut got nearly home and went hard, the workman would obtain the leverage necessary to give the required turn by shifting the position of his elbow. The elbow of the arm which did the turning act would be moved in one direction or another until the forearm was perpendicular to the portions of the brace which acted as crank arms. With the arm and elbow in this position, a considerable leverage could be exerted to revolve the brace, something which could not be done when the forearm and the brace were all in the same line. Just bear this matter in mind next time you have trouble in sufficiently tightening a hard going nut with a brace-wrench.

Reversed Throttle and Gas Connections.

I saw a queer happening recently. A car was put together and the engine started for a test when, to the surprise and disgust of the man at the wheel, the spark, the gas and the throttle were found badly mixed up. When, after starting the engine, the levers were moved to advance the spark and to cut down the gas, just the reverse happened and the engine "died" two or three times before it was found that the lever connections on the wheel were badly reversed.

Upon looking for the cause of the troubles, it was discovered that the several connections to the levers were by means of small cranks with connecting links, and, when the cranks and links were connected together in a certain way, the opening and closing movements of the several levers on the wheel were exactly reversed, thus causing the confusion and the "killing" of the engine as above described.

While all automobiles cannot be mis-connected in the manner noted above, still it is a very good plan, when connecting up levers and links of any description, to see for sure, whether or not the movement of the hand lever is in the right direction after connections have been made.

PLAN FUEL ECONOMY CAMPAIGN.

Automobile Organizations Urge Conservation of Supply to Aid Nation.

A nation-wide campaign is under way to conserve the fuel supply so that there will be ample gasoline for the legitimate requirements of owners and the army and the navy. The National Automobile Chamber of Commerce, Society of Automotive Engineers, Motor and Accessory Manufacturers and the American Automobile Association are co-operating in the movement.

It is estimated that the United States army will require 350,000,000 gallons of gasoline for airplanes, trucks, tractors, automobiles, etc. This does not mean that owners need lay up their cars, but should use them either for trade or pleasure purposes thoughtfully and judiciously. If this be done there will be no shortage of fuel in this country.

Those familiar with the fuel situation do not believe there is any reason for anticipating drastic action by the government or the suspension of the customary useful operation of pleasure cars, but these experts do point out that it is the patriotic and unselfish duty of motorists to be economical with fuel. It is not a question of saving money or saving fuel to prevent its price being raised, but of conserving the supply of fuel itself so that there will be ample for war needs.

The situation in this country cannot be compared with that of England, because England is entirely dependent upon imports for her fuel supply, whereas this country is a large producer and exports huge quantities of gasoline and oil. During the fiscal year ending June 30, 1917, the United States exported 425,703,130 gallons of gasoline and naphtha as compared with 294,779,809 gallons in the previous fiscal year. Exports of crude, illuminating, lubricating and other mineral oils increased from 2,148,668,174 gallons in the twelve months ending June 30, 1916, to 2,323,735,304 gallons during the last fiscal year.

Of the 2,500,000,000 gallons of fuel obtained in this country last year about one-half was utilized by motor vehicles in this country. If only a 10 per cent. saving is effected by the conservation or economical plan by motorists it will save 125,000,000 gallons of fuel in the next twelve months. This economy is possible and without involving any great hardship to the motorist; in fact, the suggestions made for effecting the economy will be a benefit aside from the actual cost thereof. The plan involves the economical operation of motor cars by adjusting the carburetor to the leanest possible mixture and the placing of the machine in the best possible operating condition.

This campaign of economy is to be conducted through dealers, distributors, manufacturers, garagemen and repairmen. It is the intention of those having direction of the campaign to issue to the 27,000 dealers, 24,000 garages and 13,000 repairmen a placard to be hung on the walls of the service station, garage, repair shop, etc., urging users of fuel to economize, and among the means available are the following:

Do not use gasoline for washing or cleaning. Use kerosene for removing grease and other foreign elements from articles to be cleaned.

Do not spill gasoline or allow it to drip when filling a tank, etc. This is wasteful and dangerous.

Do not expose gasoline to the air as it evaporates rapidly and gives off a vapor that is easily ignited.

Do not run your engines when the car is standing. Cars are fitted with motor starters. Use them, as it is good for the battery under normal conditions.

Adjust carburetors to the leanest possible mixture. A lean mixture tends to prevent the formation of carbon.

Properly fitting piston rings means good compression. A poor compression means loss of power.

Form the habit of shutting off the fuel supply at the tank or feed supply pipe. It will avoid the possibility of loss of fuel should the carburetor flood.

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Keep all bearings well lubricated, for friction is the foe of fuel economy.

In cold weather keep the radiator and hood covered when leaving the car exposed. It is a good plan to cover part of the radiator even when driving on cold days.

Keep tires inflated to the pressure recommended by the maker. Soft tires take considerably more power than those properly inflated.

Do not drive at top speed. The fuel consumption increases with speed. Ascertain the speed at which the car operates most economically.

Change gears, drop into the second rather than attempt to climb a hill with a wide open throttle. It will save both fuel and the car.

Do not use cars needlessly or aimlessly. By exercise of forethought a number of errands can be combined, so that one trip to town or elsewhere will serve as well as two.

Reduce the amount of riding for mere pleasure by shortening such trips or cutting down their frequency.

Effort is to be made to extend the campaign of economy to all users of gasoline, and in many instances it is possible to filter the used fluid and use it over again. There is a possibility that many of the whiskey distillers will produce alcohol in the near future and this fuel mixed with gasoline is being used successfully by the French government.

New oil fields, new refining processes and the campaign of economy are expected to and will help the fuel situation to the benefit of the government and all other users.

Frothing in a Battery During Charging.

Gasing, or boiling of the electrode of a battery, takes place near, and on the completion of, a charge. When a 2-volt cell is charged, its electromotive force rises rapidly from 1.8 to a little over 2.2 volts, and then slowly to 2.3, at which point the charge is almost complete. After attaining this pressure a rapid rise takes place to about 2.6 volts, during which period gas is freely evolved, the electrolyte having the appearance of boiling. If the electrolyte be at all dirty the rapid gas production will result in frothing to a certain extent, and it would be advisable to subject the acid solution to a close scrutiny.

Too high a charging current, or, what amounts to the same thing, too rapid a charging rate, results in exceedingly rapid decomposition of the electrolyte and violet gasing. The area of the plates is too small for the current to act upon, and in consequence the energy is wasted in decomposing the solution. The rapid gas production tends to drive the active material off the plates, especially if the positives be at all fragile or unhealthy. The displaced active material forms a mud or sediment in the cells, and may, when gasing is taking place, result in discoloration of the bubbles.

The charging rate for best results should be about one-tenth of the capacity of the cell in ampere hours. Thus a 40 ampere hour cell requires a charging current of 4 amperes, etc.

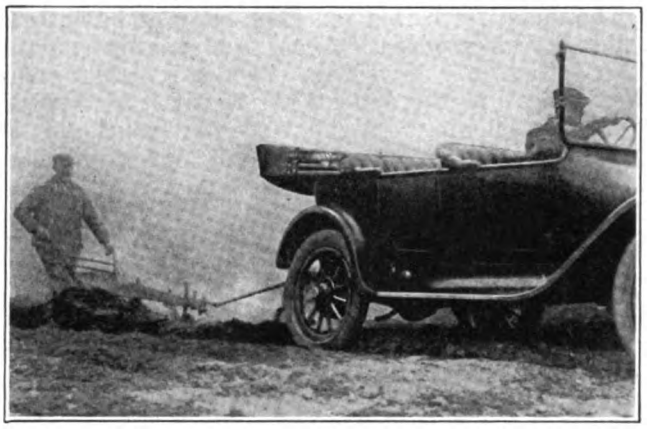
Care should be taken to ensure that only pure distilled water is used for refilling purposes, and if acid be spilt the liquid must be made up again to the correct strength.

Actual frothing, apart from gasing, is to be traced to the use of wooden separators between the plates. Such separators undergo a special treatment to rid them of injurious wood acids, and it may be that during this treatment products are formed which lead to frothing on charge, especially if a cell be new.

If the vent plugs are in good order and allow of free ventilation without spilling taking place, no harm will result, even if the cell does froth, as very careful analysis has failed to reveal any detrimental results. Inferior celluloid cases, under certain conditions, give rise to the production of nitric acid, and this may have a disintegrating action upon the plates.

How He Plows.

A. H. Long, a gardener of Belmont, Mass., solved the plowing problem without much worry. He hitched his plow to his Dodge Brothers motor car. With a friend at the wheel and the car going six miles an hour Mr. Long turned over approximately 2½ acres a day. A double gang plow used in the same manner would turn five times as much soil a



Latest method of plowing.

day as is possible with a single plow and team. In many cities, amateur gardeners are being charged high prices for plowing, owing to the excessive demand, but Mr. Long's suggestion offers a ready remedy. A speed of twelve miles an hour was maintained for some time during the experiment but the possibility of danger, due to the presence of stones, was responsible for Mr. Long's opinion that half as fast was fast enough.

New Dyke's Encyclopedia.

The sixth edition, the 1918 model, so to speak, of Dyke's Automobile and Gasoline Engine Encyclopedia is out. The series published under this head in the past have always been noticeable for the practical manner in which the principle, construction, operation, maintenance and repair of motor cars have been treated, but the new edition is even more so. The work of revision has been most complete and a large number of new subjects with illustrations have been added. One of the features of the book is the simple manner of discussing the subjects. It will appeal to the novice as well as the experienced motorist and will be found to be a valuable book of reference for the repairman and garageman, containing as it does the latest developments in motor vehicle construction. The index is well arranged and the desired information is readily obtainable.

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SPARK GAPS.

Varied Steps in Their Development and How They Have Been Improved.

From a paper delivered in Chicago at the National Gas Engine Convention by Morris R. Machol.—The history of the spark gap goes away back to about 1900. Racing drivers discovered that when spark plugs went bad by forming an auxiliary gap outside of spark plugs could make these spark plugs work. The method was to tie a piece of wood to the spark plug, tie the wire to the wood and thus form a gap. The spark plug worked all right, but the spark in the open air brought with it many disadvantages. There was the very great loss of electricity which was discharged into the air; the high resistance of the air, resulting in a very heavy amperage drawn from the system, and the result was that the batteries ran down quickly and coils were very frequently punctured, due to high amperage, and because of the increased resistance of the air gap, also a higher voltage. Spark gaps of this nature appeared on the market even within recent years.

The usual form is a red fiber body and two brass points for electrodes. Of course high amperage and high voltage not only drain the battery and damage the coil, coil points and magneto, but it also results in finally burning off the electrode points of the spark gap, so that the device soon burns itself into an inefficient condition. It was, however, continually open to the objection that it was not fireproof and that the exposed spark was liable to cause damage from fire.

The next step in the process was the development of a glass enclosed device. The glass cylinder was made, to the end of which was attached metal caps, carrying the electrode points. This device still has the disadvantage of discharging all of the current across the air gap with consequent high resistance, high amperage and heat, and although this design would seem to make the device fireproof it had the disadvantage of confining the air around the points —the result being that the discharge soon ionized or nitrogenized the air inside the device, which practically short-circuited the device itself, and excepting when starting the motor, it very materially reduced the efficiency of the device. The effect was that ionizing the atmosphere inside the device still further increased the heat with the result that the points burned off very rapidly, and the glass cracked and broke.

The next improvement was to introduce a dielectric block which would mechanically hold the two caps together. The effect of this was that when the heat broke the glass the device did not fall apart. The next improvement was to use mica instead of glass, and this did overcome the disadvantage of breaking the glass, which did not, however, make the device entirely fireproof, and neither did it overcome the effects of excessive amperage, excessive heat and necessity for readjusting or renewing the spark-gap electrode points.

There were some spark gaps introduced in the market in which the entire gap was surrounded by a cylinder of metal. This device is fireproof, but it does not give the advantage of a visible spark, and it does not prevent the electrode points from corroding or burning off, due to the high amperage or intense heat, resulting from discharging all of the current across the air gap. The ionizing of the atmosphere inside of this device also materially assists the corrosion of the electrode points.

The only practical spark gap is one that will be fireproof and ventilated, and one in which there is no possible chance for the electrode points to corrode. Such a device must first have a distance or center block of fiber or bakelite or some other substance of extremely high dielectric resistance. This center block holds firmly in place the terminals which contain the spark-gap electrode point. Through holes drilled in the center block the spark becomes visible. The device has two caps, one at each end, which are made of fiber and impregnated with carbon so that they become electrical conductors. Between the caps, and surrounding the center block, is a screen which has the official mesh of the Davy miner lamp. This screen is made of copper, oxidized black so that the spark across the gap is easily visible. The Davy gauze makes the device absolutely fireproof even against as inflammable a substance as marsh gas. The device now becomes a true electrical condenser. One type of condenser consists of parallel strata of tinfoil, separated by layers of mica, where the conductor is the tinfoil and the dielectric is the mica. In the device I have described the copper gauze is the conductor, conducting the electricity in parallel lines, and the air contained inside the gauze is the dielectric, so that the device becomes a true electrical conductor, increasing the voltage and decreasing the amperage. Practically, in this device, only a portion of the electricity jumps the air gap, which, of course, keeps the amperage very low. The device is amply ventilated through the Davy gauze, which prevents even a low amperage from developing any heat at the electrode points.

The electrode points in this device are made of platinum substitute, as platinum is too expensive and difficult to get. The platinum substitute is composed largely of nickel and will do absolutely the same work. This spark gap has a peculiar effect on electric current. In the case of battery and coil, the direct current from the battery becomes a pulsating current, when it leaves the coil.

In the case of a magneto we get straight alternating current electricity—in either event, the current in jumping the gap changes its nature, becomes an oscillating current of very high frequency and takes on some of the properties of static electricity, in that it will seek its opposite pole. The result is that even when a spark plug is short-circuited with carbon, graphite or oil, this current will ignore the short and jump the gap at the spark plug points. The use of this spark device, therefore, first absolutely insures against possibility of spark plug trouble. Furthermore, the spark plug cannot fail to fire. Broken porcelain, carbon, oil and even water will not prevent the plug from firing. The next advantage is the visibility of the spark. The device becomes practically a window into the cylinder. If the gaps show a spark and there is any trouble, it stands to reason that it must be carburetor trouble. If but one gap fails to show a spark, then the trouble must lie in the distributor, and following that particular lead to the distributor will locate the trouble at once. If the motor will not start and none of the gaps show a spark, the trouble must be with the

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magneto. The visible spark is a wonderful aid in timing a motor. A finger held over the pet-cock will indicate when that cylinder has compression, and the spark gap will then tell which terminal is giving a spark at that time, whereupon it becomes a simple matter to connect up that particular terminal with the cylinder compression.

The spark that is produced at the point of the spark plug when the spark gap is in series with the spark plug is a fatter, stronger, better spark than would otherwise be produced. This gives a little more power and quicker ignition. It is self-evident that the better spark makes easier starting. You have all had the experience of putting a new magneto on a car and having to cut down the adjustment of the carburetor, because with the better spark it was not necessary to have so rich a mixture. The spark produced with the spark gap permits of the use of a leaner mixture, which not only saves gasoline, but also cuts down carbon deposits in the cylinder. This is because carbon comes largely from the partially burned gasoline, resulting from the use of too rich a mixture. Oxygen has a greater affinity for hydrogen than for carbon, and with too rich a mixture the hydrogen is burned out, leaving the carbon.

Another advantage is that with the spark gap all plugs give the same intense, high-frequency spark, no matter whether they are old or new, good or bad, dirty or clean, broken or whole. The result is an even torque motor, which means less vibration, less pounding of the bearings and less wear and tear.

The fact that the device described is a condenser means that, although the voltage is increased, amperage is reduced, consequently with the lower amperage the spark plug electrode points will not burn out. The lower amperage lengthens the life of the battery. Even in the case of a short-circuited plug where the electrode points are in actual metallic contact, the spark gap becomes a safety gap and prevents the possibility of drawing all the amperage that the system will produce across the magneto or coil points, and thus burning out these expensive platinum points.

Auto Thieves Have New Scheme.

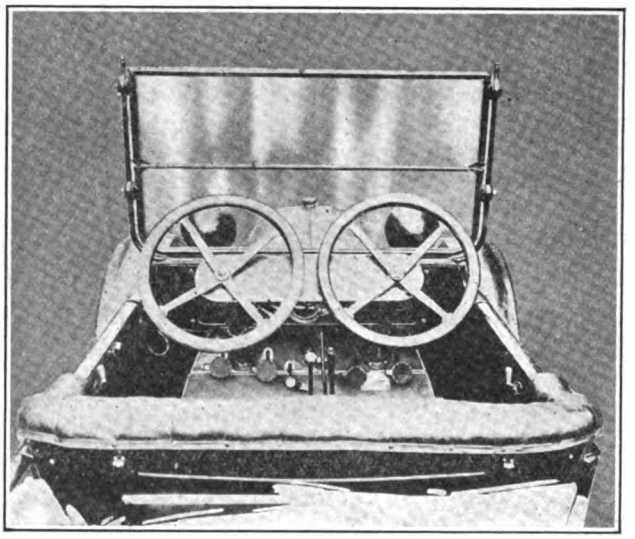
That the automobile thief is ingenious and can be classed as brainy is revealed by a new scheme uncovered by the police of New York City. It appears that the police officer is no longer safe to ask a suspect about to drive off with a car if the machine is being stolen, for the person may be the owner and again he may not. The policeman cannot very well dispute the evidence offered as to ownership, which is an owner's card, license, etc. It appears that the new method of stealing a car is one that is likely to give the authorities some trouble, for according to the Police Bulletin, the first step taken by the average automobile thief is to ascertain the make, type and horsepower of the car he intends stealing. With this information at hand he goes to the office of the Secretary of State, gives details of the car he has in view, pays the specified fee and receives the usual license plates, the owner's card certifying that his car has been duly registered being mailed to the address given."

Then the gentleman in question, having obeyed the law so far, goes out and steals the car. If the car is stopped by an officer a few minutes later he is in at least the position of being able to make the suspicious cop stop and scratch his head meditatively while looking over the "proofs of ownership." The suggestion has been made that the method of issuing owners' cards be changed to the extent of requiring the applicant to bring the car to be registered to the headquarters of the Secretary of State in order that some physical proof of ownership be offered.

Device for Teaching Driving.

Several months of successful operation of a double steering wheel car by Bishop, McCormick & Bishop, of Brooklyn, N. Y., have supplied the comforting assurance that a day is coming when embryo motorists will learn the art of driving with much greater safety to themselves, to other motorists, and to the general public.

The double steering wheel device shown herewith permits the instructor to retain control over the car at all times, even though the pupil is doing the actual driving and gear shifting. This arrangement enables the pupil to try his hand almost immediately on traffic-ridden streets, with the result that he is



Steering device enabling teacher to retain control over car.

far better equipped to drive alone after one or two lessons than the average new motorist is after three or four. The instruction car is not only equipped with two steering wheels but with two sets of brake and clutch pedals. Because of this arrangement both instructor and learner feel a confidence that cannot exist when there is a single control in unskilled hands. The nervous strain that is eliminated can best be appreciated by those who have been through the experience.

The Brooklyn firm precedes this instruction by a series of lessons in an "anchored car", which is set on a platform in such a way as to leave the wheels free. In front of the car is a semaphore with which the instructor flashes signals to the driver. "Sharp turn," "steep hill," etc., direct the pupil to manipulate his controls accordingly, while a special brake lever enables the instructor to produce practically the same conditions as would result on the road. Both the dual control and the anchored car were originated by Bishop, McCormick & Bishop and patents have been applied for on each.

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MOTOR TRUCK ENGINES.

What Constitutes Long Life and the Proper Design to Secure It.

From John Younger at the recent Cincinnati Meeting of the A. M. of Mechanical Engineers.—The question of life in a motor truck engine is naturally one which the engineer must compromise. An intense search after long life, to the exclusion of everything else, would result in a monstrosity which would be too heavy, too bulky, and too costly to run.

An approximate definition of long life would, therefore, be "that length of life which is something more than the average expected life, based on present day knowledge and all around conditions."

At the present day a life of 50,000 miles, without overhaul, would be considered long. This would correspond to a continuous run day and night for 12 months, at a speed of about 400 r.p.m., with no attention beyond oiling and fueling. The load will fluctuate between less than zero (as when in coasting downhill with clutch in, the chassis drives the engine) to the full power of which the engine is capable. The majority of the hauling will be done at an average of one-third full engine power. An engine should be capable of at least five or six overhauls, or 300,000 miles, before renewal of the major parts.

This does not look at all severe to the casual glance of the power house engineer, but when one considers that this power plant is operating under widely varying temperatures, power and speed conditions, and that its various axes are constantly changing relatively to the bed to which it is fastened, it will be seen that the problem of long life is not so simple as it looks.

Long life depends on three factors: (1) Design, (2) manufacturing excellence, (3) operating conditions.

Design.

This may be considered under headings such as: (a) Bearing surfaces, (b) lubrication facilities, (c) materials used, (d) factors of safety, (e) general design and use of governor.

Explosion Pressure.—All calculations should be based on full load, not on average load. This can be taken as an explosion pressure of 300 pounds per square inch on the piston with a 22 per cent. compression volume.

Connecting Rod Bearings.—The pressure per projected square inch should be about 700 pounds per square inch, excluding area of oil leads and fillets at ends, or 1 square inch per 2.33 square inch of piston area.

Oil is conveniently introduced through a hole in the crankshaft, and the bearing may either be grooved with a slightly spiralling oil groove around the whole circumference, or a groove around the bottom half only, or a series of slots or labyrinth checks on the sides, or even no grooves at all. Any of these methods prevent ridge wearing on the crankshaft.

The bearing itself should be a thin shell of hard babbitt metal about 1/32 inch thick, backed up by a thick shell of hard bronze running on a case-hardened or otherwise hard surface. This gives the advantages of the babbitt as a bearing metal, and prevents it from pounding out. The bronze should be carefully turned and have peg holes in it to give perfect union between the two. The running clearance should be small, between 0.0015 inch and 0.0025 inch, satisfying practically all truck engines. The split surfaces should be carefully fitted together to prevent rocking or cater-cornered work.

Gudgeon or Wrist-Pin Bushings.—Owing to the slight oscillatory motion, pressures may be higher. Under the conditions of space and the necessity for keeping down the weight of reciprocating parts they may be as high as 1,800 to 2,000 pounds per square inch (or in square inch per 6 square inches of piston area).

Lubricating oil should be brought by a small tube (where pressure lubrication is used) direct to the bearing and allowed to ooze out. The majority of bushings are at present lubricated on what might be called the "chance" method—the chances being, however, chiefly against. The metal should be a very hard chill cast phosphor bronze, running on a case-hardened steel surface.

Running clearances should be kept exceedingly low, 0.00025 inch being satisfactory. Very little tolerance should be allowed.

Pistons.—The side bearing pressure is low, inasmuch as the facilities for lubrication are poor. Sixteen pounds per projected square inch is satisfactory. The piston should be as light as possible consistent with strength, so as to minimize the loads due to the reciprocating masses.

Three rings above the gudgeon pin are ample. They should be thick radially, and preferably of the concentric type, to even the pressure on the slots and prevent them wearing away. A pressure of about 10 to 12 pounds per projected square inch is ample to keep the rings against the cylinder walls.

The piston should be made of a softish gray cast iron, running against a harder cylinder metal. The clearance should be great at the top to allow for expansion due to heat, being four times the piston diameter in thousandths above the top ring, and equal to it in thousandths on the skirt. This bearing surface is, as a rule, relieved around the gudgeon pin.

Cylinders.—Cylinders should be of a hard, close-grained, high tensile strength cast iron. Its scleroscope hardness (though this is of doubtful value) will be found to be about 35. It should be made thick enough in the walls so that actually about 0.006 may be ground off the diameter to take care of wear, without causing weakness. For a 5-inch bore cylinder, 5/16 inch walls are sufficient.

Crankshaft.—Three bearings—front, center and rear—are considered ample for a four cylinder truck engine. Consider the area of the connecting rod bearing (big end) as 1, then the front and center bearings may have an area equal to 1 and the rear bearing 1.5. If splash or trough system of lubrication is used, the areas of the front and center bearings should be increased to about 1.12.

An approximate rule for the diameter of crankshafts in the usual sizes of motor truck engines is that the square of the cylinder bore shall be twice the cube of the crank pin. This gives a 2-inch shaft for a 4-inch bore engine, and about a 2 5/16-inch shaft for a 5-inch bore engine.

Running clearances lie between 0.0015 and 0.003 inch, depending somewhat on the nature of the lubrication.

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The bushings should be similarly constructed to those on the connecting rod big ends, except that the spiral oil groove will probably be found preferable to give a continuous supply of oil to the connecting rod bearings.

The material should preferably be about 0.40 to 0.50 per cent. carbon steel, carefully heat treated to give a tough, hard surface (scleroscope 36 to 40). The larger diameter shafts should have a percentage of chromium and nickel to ensure better heat treatment and resistance to fatigue.

Low-carbon, case-hardening material is sometimes used, but the shaft has to be increased in diameter to compensate for the lessened resistance to fatigue.

Good-sized fillets, no machine tool scratches and general smoothness of outline will materially help long life.

Camshafts.—Camshafts should be made of low-carbon steel, case-hardened on the wearing surfaces. The bushings should be of a good grade of phosphor bronze. Three bearings are ample for a four-cylinder car. The diameter of the shafts should be from 1 inch to 1⅛ inches, for the sake of smooth operation. The projected area of the bearings, front to rear, should be approximately 4 square inches, 3 square inches, and 2 square inches, depending somewhat upon whether oil pumps or governors are driven from the camshaft.

Valves.—The cams operating the valves should be so designed that just before the valve seats itself the velocity will be considerably diminished, allowing the last few thousandths of its travel to take a comparatively long time. This prevents the valve hammering on its seat. It does not interfere with the fuel economy or power, but gives quieter action.

A 45-degree valve seat is advisable, as carbon will not be driven into the seat, but will more easily clear itself.

Valves containing a percentage of tungsten from 2 per cent. upwards are most satisfactory as regards life and freedom from warpage. By scleroscoping them while hot, they will be found to hold a hardness of over 40. Cast iron remains about 30, while other steel and nickel alloys drop to 25 or lower. The tungsten valve has thus a reason for its long life.

Sundry Parts.—The rest of the engine should be designed in proportion, such as wide faces on the timing gears and ample bearings for their spindles. The water pump should have ample bearing area, and if of the centrifugal type proper, provision should be made for the thrust of the blades.

Studs may be used for fastening down the cylinders, but they should have a length equal to twice their diameter screwed into the aluminum alloy, if such be used. A coarse thread is necessary, but for all purposes where aluminum is concerned, best results are obtained by the use of through bolts.

Lubrication.

Considerable change has taken place in this in the last few years, although even yet all questions have not been settled, and cylinder lubrication is still somewhat on the hit and miss principle.

The method most in favor at present is to carry a supply of oil, about one gallon, in the crankcase of the engine, and pump it under a pressure of anything between 2 pounds and 20 pounds per square inch to a header pipe, from which issue leads to the crankshaft main bearings, and often the camshaft and timing gear bearings. The surplus oil is by-passed by a regulating valve back to the crankcase. This oil and that which has done its work in the cylinders and crankshaft and various bearings drains down to the bottom of the case through a strainer and thence into the pump to renew the circuit.

When the oil gets dirty enough—or say every 300 miles or so, it ought to be thrown out and replaced with clean oil.

The system described works surprisingly well when it is considered that a certain amount of gasoline filters past the pistons and dilutes the oil—that some of the aqueous products of combustion also get past and help form an emulsion.

However, it can only be a matter of time before the adoption of some much better system of introducing fresh, clean oil to each bearing in predetermined quantities. Many oils are on the market and most of them are good.

Incidentally, as a point of design, it should be made easy for the driver to make sure that his oil is in good condition and of ample quantity.

Materials and Factors of Safety.

Naturally extreme consideration has not been given to weight, as has been in the case of aeroplane engines, when 2½ pounds per horsepower has been reached. A fair weight for a motor truck engine is nearer 20 pounds per horsepower at a piston speed of 1,000 feet per minute. Aluminum is used for the crankcase and its covers. Cast iron is used for the cylinders and pistons. 0.40 to 0.50 carbon steel is used for the crankshaft and connecting rods. Case-hardening steel is used for the camshafts, valve tappets and gudgeon pins.

In order to ensure the proper factor of safety being maintained, it is advisable to scleroscope each part for correctness of heat treatment or hardness. Forgings like connecting rods, camshafts, crankshafts, should be straightened before machining.

The general design should be such that extreme climatic conditions can be guarded against. Roads, for example, in winter time are exceptionally bad, causing a weaving of the bed of the engine as would correspond to one of the wheels being lifted 12 inches off the road. The engine should be mounted so that no stress due to this will come on the moving parts.

The engine power should be ample for its work. Too much gear work is detrimental to long life. The transmission reduction should be such that the great majority of road work should be done on high gear. For instance, the hilly city of Cincinnati requires a lower transmission ratio than would the comparatively level cities of Buffalo or Cleveland. This prevents the engine from working at maximum capacity for too much of the time.

Speed should be carefully limited. A maximum piston speed of 1,000 feet per minute is desirable, and drivers and purchasers should be educated to the economy of a governor which will enforce this. The governor should be so designed that it will not restrict the power, but should go in or out of action with a maximum of 5 per cent. variation in speed round the predetermined point.

Too much stress cannot be laid on this. Poor workmanship cannot be tolerated in an internal com-

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bustion engine. Cylinders should be ground to a maximum tolerance of 0.002 inch, as should pistons, and in addition a process of selection must be used which will ensure pistons on the high limit being put into cylinders of the low limit. The running clearances should not vary by more than 0.002 inch.

Piston complete, should be weighed, the maximum variation in any one of a set being not more than ½ ounce. Similarly, connecting rods should be weighed and balanced, the variation in one of a set being not more than ½ ounce, with the ends varying also by as little.

Connecting rod and crankshaft bearings should be selected so that a maximum variation from standard running clearance of 0.001 inch plus or minus should be adhered to.

There is some diversity of opinion as to the best way to finish these bearings, but the writer believes that a reamed bearing is superior to the usual hand-scraped one. Reamers mounted on a rigid bar will true up crankshaft bearings in a way impossible by the hand reamer. Further, the surface left is as nearly round as possible, corresponding to that of the ground crankshaft. The personal element in hand-scraping is entirely eliminated.

Crankshafts should be ground smooth with a maximum variation of .0015 inch in diameter and 0.001 inch eccentric. Each shaft should be scleroscoped at every bearing. Similarly with the camshafts, pump and magneto drive bushings and so forth, a uniformly high standard should be insisted on.

It follows naturally that rotating parts should be put in static and dynamic balance.

When the engine has been assembled, it should be placed on a stand and run in. Here again opinions differ, but the writer believes a run of at least 30 hours, at a piston speed of about 800 feet per minute, varying the load from zero at the start to practically maximum for one or two hours at the finish is necessary.

Most of this test, if indeed not all, should be done with some kind of fuel, either gas or gasoline, to get the engine thoroughly warmed up. This will ease off the high spots, let the valves find their seats, and generally take the harshness out of the engine.

At the end of this run, the engine should be partially disassembled and valves reground, piston rings touched up, carbon cleaned and the engine carefully inspected for signs of wear or scoring flaws.

When reassembled, the engine is ready for work.

Operating Conditions.

One of the secrets of success in gasoline engines is oil and lots of it. After a comparatively short run, the oil (in the average system) is contaminated by gasoline and carbon. It should be drained out every 150 to 300 miles and replaced entirely by fresh oil.

The strainers leading to the pump should be kept clean and inspected frequently.

About once a month the whole engine should be cleansed by washing it out with kerosene, turning the crankshaft by hand and thoroughly draining the kerosene all out.

Screens should be provided on the air intake to the carburetor to prevent entrance of road dust as much as possible.

Gasoline should be cut down in the carburetor as much as possible, not only for the sake of economy in consumption, but also for the prevention of harmful effects by an overplus.

The point of ignition should be properly controlled so that evils following an "advanced spark" will not result.

Drivers should change to a lower gear immediately there are signs of the engine laboring.

Drivers should be carefully selected and trained men. Good horse drivers make good truck drivers, as they are accustomed to giving care and attention to their "motive power."

A regular system of inspection should be carried out by a good mechanic to detect any signs of trouble developing.

It is understood that hilly country or heavy roads will materially add to the work the engine has to do, and that the life will be proportionately shortened and inspection and overhauling will have to be done more frequently.

TIRES AND HEAT.

The Wise Owner Will Look Carefully at the Matter of Pressure.

From H. C. Brokaw, Principal West Side Y. M. C. A. Automobile School, New York City.—Should the pressure of tires be decreased in hot weather? Is it true, as some tire manufacturers claim, that tires heat more on lower inflation than when run at the full pressure given by them? Are tires injured by a slight decrease in the pressure to take into account the increase due to friction and hot pavements?

There have been some criticisms since my relation of an experience with tires while on a tour, in which it was stated that there was a 12-pound increase in pressure after going 40 miles; so I have been checking up and testing conditions in city driving.

Recently, to determine what effect the hot weather has on tires in the city, I drove a 3,200-pound Model L Locomobile, equipped all around with 34x4½ inch tires, through the park and on Riverside Drive for 15 miles at ordinary city traffic speed, which always is under 20 miles an hour. The thermometer registered 86 degrees and the day was partly overcast, so that the full effect of the sun on the pavements was not obtained. The tires were inflated to full 90 pounds, which is the pressure recommended by many manufacturers.

At the end of the run one tire registered 101 pounds, two were 100 and one was 99 pounds. The conditions were not excessive in any way and the weather was not abnormal, the road was smooth except for very short stretches, the speed was low and the tires were of ample size for the weight of the car and load.

After this test, a gauge was made to test the flattening effect on the tires from a lowered pressure. With the car loaded it was necessary to decrease the pressure in the tires to 65 pounds to have 1/16 inch bulge of the side of the tire. At 70 pounds pressure there was no perceptible flattening.

I believe that more tires are damaged by underinflation than by overinflation, also that new tires will stand more than 20 per cent. overinflation without damage to them. But it is reasonable to believe

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that if a tire has become weakened from any cause that it will blow out quicker under increased pressure. It is also a fact that a tire inflated to the pressure recommended by many manufacturers has very little resiliency and the riding qualities of the car are very greatly impaired, and when the pressure rises slightly higher, the tire loses its chief function, that of absorbing small road shocks. Anyone who has had the experience of riding on hard tires knows the discomfort of it; one might about as well ride on solid tires. But all of this comes back to the question: What is underinflation? A tire with ten pounds less pressure than recommended possibly will heat more than when carrying a full pressure; but it will very quickly come up to the required pressure when in use.

As the pressure recommended by many manufacturers is the extreme so far as comfort in riding is concerned, the car owner must take his choice between comfort and tire mileage, assuming that a slightly less pressure does decrease the life of the tire. I presume the average owner would rather have comfortable riding, even at the expense of tire mileage, and I am not prepared to admit that decreased mileage would be an inevitable result with ten pounds less pressure. I do not think the average man would use a substitute for gasoline which gave him all sorts of discomfort because it did not run the engine smoothly, even if it gave a slightly greater mileage to the gallon.

One manufacturer of fabric tires recommends 56 pounds pressure for a 4-inch tire and guarantees 5,000 miles, and makes the claim that this pressure makes riding much more comfortable. Another well known manufacturer advises inflating the tire only to the point where there is no bulge or flattening, and another type of pneumatic tire has become very popular because it requires still less pressure and makes riding much more comfortable.

Where tires are hard and roads are rough, the machine jumps around so that it is more likely to jump off the road, so that there is an element of safety as well as comfort involved.

For all around comfort, consistent with good tire mileage, I have concluded that a ten-pound decrease in pressure in hot summer weather is desirable. The tire cannot be damaged because after a very few minutes on really hot pavements the pressure will equal that recommended by the most exacting manufacturer and any overheating due to this cause would be a matter of very short duration.

As I said in a previous article, the wise owner will test out his car and tires and find out just the proper amount of decrease the tires will stand. As a matter of fact, I have done considerable riding with a tire salesman, one of the fellows who is quite insistent upon a certain pressure, and it was his invariable practice to deflate his tires ten pounds in hot weather, notwithstanding the fact that he was after tire mileage.

All of which goes to show that some people do not always take the advice that they give.

Sound Death Knell of the Cut-Out.

The members of the National Automobile Chamber of Commerce have voted unanimously for the elimination of muffler cut-outs on the cars they build in future, so far as they can be operated from the driver's seat. With more than four million cars in use and supplying a great service in the transportation of the individual and of materials, the use of muffler cut-outs is held to be unfair to the public and to add an unnecessary noise to American life. Cars have ample power so that the slight increase in speed which may come from the use of cut-outs is of no importance. There may be times in adjusting motors where a cut-out is useful, but in such cases, it can be operated from under the car.

Almost half of the 110 makers in the Chamber do not fit muffler cut-outs to their present cars and all makers voted that they should be eliminated in the new products. The directors at a recent meeting adopted the following resolution:

"Whereas, Members of the National Automobile Chamber of Commerce are opposed to the attachment of muffler cut-outs to motor vehicles and do not fit them to the cars and trucks they manufacture, or will discontinue doing so on their product for 1918; and

"Whereas, The use of the cut-out is unnecessary, annoying and dangerous to other users of the highways and objectionable to residents along them,

"Resolved: That the Board of Directors recommends that all members of the National Automobile Chamber of Commerce refrain from attaching muffler cut-outs to their cars for the season of 1918 and thereafter and that no cars be sold by them after January 1, 1918, with cut-outs attached, or that where cut-outs are attached they be made inoperative from the driver's seat."

Government to Aid States Build Roads.

According to the Secretary of Agriculture the government has appropriated $14,550,000 to be used in the fiscal year ending June 30, 1919, by the several states in the construction and maintenance of rural post roads as follows:

Alabama, $313,456.47; Arizona, $205,540.58; Arkansas, $250,018.47; California, $456,167.23; Colorado, $257,278.92; Connecticut, $92,216.45; Delaware, $24,411.99; Florida, $170,723.88; Georgia, $403,909.45; Massachusetts, $221,261.85; Michigan, $435,356.37; Minnesota, $425,865.40; Mississippi, $268,751.60; Missouri, $508,603.98; Montana, $298,520.89; Nebraska, $319,445.25; Nevada, $193,229.82; New Hampshire, $62,610.11; New Jersey, $177,357.22; New Mexico, $238,634.55; New York, $749,674.20; North Carolina, $342,556.47; North Dakota, $229,585.91; Ohio, $558,043.42; Oklahoma, $346,489.34; Oregon, $236,332.74; Pennsylvania, $690,145.78; Idaho, $182,471.55; Illinois, $658,323.48; Indiana, $406,230.18; Iowa, $434,653.61; Kansas, $429,131.88; Kentucky, $292,984.62; Louisiana, $203,755.29; Maine, $144,807.42; Maryland, $130,871.43; Rhode Island, $34,972.38; South Carolina, $215,014.08; South Dakota, $243,175.61; Tennessee, $340,663.51; Texas, $876,986.70; Utah, $170,763.17; Vermont, $68,128.92; Virginia, $298,120.77; Washington, $216,530.19; West Virginia, $159,713.89; Wisconsin, $382,707.20; Wyoming, $183,805.78.

This is the third apportionment under the act, $4,850,000 having been apportioned for the fiscal year ending June 30, 1917, and $9,700,000 for the fiscal year ending June 30, 1918.

The most stylish color for autos is invisible gray, the only trouble being that the salesmen demand a visible green in exchange.

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STOP! LOOK! LISTEN!

Car Drivers Show Amazing Recklessness at Grade Railroad Crossings.

This magazine has arrangements for receiving brief outlines of the serious automobile accidents in the United States and not a day passes that a report of some fatality at a grade crossing does not materialize. Riding out through the country, it is astounding to observe the chances taken by car drivers. The practice of stopping the car at a grade crossing seems to be far more "honored in the breach than in the observance." Making a rather close estimate, we believe more deaths occur from automobile accidents at grade crossings than from all other sources.

Reminders, warnings, examples, precepts, seem to have no effect whatever. And more than this, a railroad official is authority for the statement that out of every hundred persons killed or injured at grade crossings, nearly half are occupants of automobiles. In one instance, a person was stationed at an important crossing and he learned that of 923 automobiles, 801 car drivers did not look in either direction when or before crossing the tracks. Only 83 drivers looked one way only, and but 39 looked both ways.

It is a strange thing, but nevertheless true, that many persons who are not ordinarily reckless will approach a railroad crossing and drive over it, placing their lives entirely in the hands of another human being, whom they know has been placed on the crossing to warn them, whereas the simple precaution of looking for themselves, which could be done with scarcely an effort, would insure them against a mistake which might be made by the flagman. In one case in particular which a railroad official investigated a man drove onto a railroad crossing where there was an automatic bell to give warning of the approach of trains. He was struck and severely injured. There seemed to be no question in this case but what the bell was out of order and did not ring, but the man afterwards admitted that he did not take the precaution to stop, look and listen because he depended upon the bell entirely.

In other words, he permitted the safety of his own life to rest entirely upon a mechanical contrivance, ignoring the possibility that it might not be in perfect working order. Of course, the bell was installed there to warn travelers on the highway, and it was expected to perform that function. However, something went wrong with it as might, indeed, happen to any machine. The slightest effort on his part, had he followed a habit of ordinary care, would have meant absolute safety in this particular instance.

Another time the same official listened to a complaint made by a man against an engineer because the engine whistle was not blown for a crossing. Yet, it was not long after that the man who made this complaint was seen to drive carelessly over the same crossing without paying the slightest attention as to whether it was safe for him to cross the tracks or not.

Railroad crossing accidents are sometimes contributed to by the fault of a railroad company or its employes, but whether they are or not it is unquestionably true that the great majority of these accidents can be avoided by ordinary care on the part of the motorist. Many of the accidents are caused merely through the failure to stop, look and listen. There are some, however, that occur because of sheer recklessness.

In one case a railroad official had occasion to investigate a case where an automobile was driven along a country road which ran parallel to and directly alongside a four track railroad. A freight train was going in the same direction as the automobile on the track nearest the roadway. The automobile passed the freight train, and at that moment reached a bend in the road where it turned abruptly and crossed the tracks at right angles. Instead of waiting for the freight to pass, the driver of the automobile spurted forward and crossed the first track perhaps a hundred feet ahead of the engine of the freight. He would have gotten over safely but he did not count on the possibility of a train on the second track. As it happened, a fast passenger train running in the same direction as the freight and obscured from view by the freight was approaching on the second track, running sixty miles an hour. This train shot by the freight and reached the crossing before the automobile could clear the second track and the result was the automobile was struck and two of the occupants instantly killed.

In this case the driver wanted to "beat out" the freight train and get over ahead of it. He simply took a chance and lost. This is a fair illustration of the manner in which persons will take chances to save a few minutes time. Such chance taking is merely a form of gambling. If a man bets on a horse to win a race, he puts up his money as a stake and takes a chance that his horse will win and that he will gain a few dollars. If you drive your automobile over a railroad crossing and do not stop to look and listen, you put up your life and the lives of others who may be in your car as the stakes, and you take a chance that no train or engine will happen to strike you and that you will win and gain a few minutes time. In other words, it is a gamble to save a minute's time with human lives as the stakes.

On occasions I have ridden with friends or acquaintances, and have held my breath as the machine was driven over a railroad crossing without the slightest effort to ascertain if the way was safe. It just happened that no train was approaching nearby. But what if fate had played a different hand and there had been a train? It is a thought to make one shudder. It is in just such manner that many have gone to death or serious injury, while just a little caution—just a moment's stop, a careful look up and down and a moment of listening, so easy to have done—would have made the way safe for the automobile party.

First, last and always the rule of "stop, look and listen" before crossing a railroad should be faithfully observed, no matter whether it is a protected crossing or whether it is an unprotected crossing in the open country. If every automobile driver would paste this rule alongside his speedometer where he can never fail to observe it, this class of automobile accidents would be almost entirely eliminated.

Someone has said: "It is a good thing to learn caution by the misfortune of others." There is a world of advice in that short sentence. Automobile owners and drivers can find only too many unfortunate examples of misfortune due to absence of cau-

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tion by reviewing the accidents that have occurred on grade crossings. May the lessons taught by the bitter experience of others sink deep into the minds of every driver of a car, to the end that caution at railroad crossings—just the ordinary, easily exercised self caution of stopping, looking and listening—will prevail, and many of these lamentable accidents will be prevented.

CAUGHT ON THE "FLY."

A Stranger Who Said His Automobile Bearings Had Melted.

From J. N. Bagley, Nebraska.—On the other side of a seemingly endless chain of hills, known as "The Whiterock Hills," runs the marked trail close to the boundary line of the State. Here we found a beautiful shady nook where the wild flowers had woven their lovely patterns for an eastern carpet. The springs set in tanks of moss and fern held that clear cold water which had no doubt cooled the fevered brow of many a weary and careworn traveler in days past. Here we had prepared to rest until the morning before attempting to resume our journey, for we were weary, and judging from the tents that were visible from our camp many other tourists had decided to do the same. At supper time could be seen many curling smokes from camp fires, and many happy voices rang and echoed from hill to hill. Together in little bands they would watch the light of the setting sun fade from the summit of some prominent peak far to the westward.

Not infrequently there were accidents along the trail, and occasionally some reckless driver would plunge his car over the embankment, but there are always many willing hands to help and to lend such parts as are needed to make repairs. The men that hovered about the camp fire were discussing some of these experiences when their meeting was interrupted by a motor car a little way off running very slow, but pounding until it could be heard for some distance. The unfortunate traveler came close to the camp and stopped his car.

"Hello, boys," remarked the stranger. "Are there any mechanics in this bunch?" He was told that we were all mechanics and to just state his case. He told us he had melted his crank bearings. At once we all decided he must have overlooked his oil and questioned him about it, but found that he had placed a quantity of oil in his case only a few miles back. We examined the oil level and found oil enough. Why the bearings had melted we were at a loss to understand, but set about to find the cause if possible.

Some one suggested that we remove the oil from the case and examine it, which we did. We found the oil to be very thin, having a kerosene smell to it, so we placed a little quantity of it in a vessel and lighted it. The oil burned quite readily, which indicated it was a very low grade of oil and not intended for automobile lubrication. The fact of the matter was that our friend supposed he had been economizing, for he had purchased a quantity of oil from some traveling oil peddler. He had filled a large can that he happened to have with him only a little way out of the town of B. We asked him why he did not purchase the oil at the garage as he came through, and he said that the salesman told him that the oil was the same as the garage man sold. In fact, he sold the garage man, but he would let him have it at cost, which was very cheap, of course, compared to the price the dealer must pay for a good oil. Instead of reducing the cost of traveling, our friend had added an unnecessary expense to his bill, which amounted to a good many dollars.

This illustrates how essential it is that the oil used in the motor should be only the best, and should be purchased from the local dealer who is responsible. The man who peddles oil about the country to the consumer direct usually has a very low price and a very low grade of oil.

It is a hard matter for a person to judge the oil which he uses. In fact, he can only depend on the company of which he buys to get the product he wants, and they can give him what they like. Consequently he trusts to their honesty in every instance when he buys his oil. We are not protected as we should be by law when it comes to lubricating the motor car. There should be a law compelling every concern handling oils and selling to either the jobber or the consumer to give a test of their oils on the package or barrel, whichever it be. This would cut out some of the fellows who are selling "dope" and labeling it oil and ruining many motor cars.

The first thing the motor car user should do after buying his car is to become familiar with the parts to lubricate and the kind of oil or grease adapted to the particular place, and see that nothing be substituted.

As to the kind of oil for the different seasons of the year, there is some difference of opinion among users. Some prefer a heavy oil and some prefer a light oil, but for my part I look more to the quality of the oil than to its body, for when the oil is subject to the heat of the cylinder it must become as thin as kerosene and it does not matter whether it is heavy or light. When it is heated it will all be about the same.

Many have asked me what the flash test meant, and how it was obtained, and if it had anything to do with the lubricating properties of the oil. It does, of course. To obtain this test, place a quantity of oil in a small basin and place it over the fire and heat it until it gives off a smoke. Now pass through this smoke a flame and the smoke will seem to flash and take fire immediately. This is the flash test. The degrees of heat at the time the smoke is given off in this instance will show the flash test of the oil, but, of course, to make the test it will be necessary to have the necessary equipment, and not many have it, or could use it in case they did have it. Now if we continue to heat the oil beyond the flash test we will get the burning point shortly afterward. When the oil has reached this stage, it would not do much lubricating but would burn and pass away in smoke. It is, therefore, very readily seen that an oil lacking these two things would not be a good oil to use in an automobile engine. The flash test must be taken into consideration.

A test for acid in oil can be made in different ways, but a very simple one is to take a wick and saturate it with oil and lay it on a polished steel plate out in the sun. After it has been out a few hours, remove the wick, and if the plate is just as it was, there is no acid in the oil, but if the plate

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has dark spots it indicates without a doubt there is acid in the oil and it should not be used for lubrication of the engine.

Another test for acid in the oil can be made with litmus paper. Take a small piece of blue litmus paper and dip it into the oil, and if there is acid in it the paper will at once turn to a pinkish color. Either of these methods while simple are practical and can be relied upon.

Over lubrication will cause trouble just as much as a scant amount of lubrication. Too much oil will find its way into the muffler, clogging it up and making the interior of it very gummy and sticky, which tends to cause the motor to overheat. It also causes a carbon deposit on the piston heads and valves, causing the valves many times to stick in their guides, thus affecting the working of the motor to such extent that it is necessary to take it down and clean it thoroughly. This deposit at first becomes gummy and as it becomes heated it finally gets hard, and can hardly be scraped off. These particles of carbon after getting hard will be heated red hot and cause what is known as pre-ignition; that is, the charge is ignited before the piston has reached the desired position, causing a knock in the motor. This knocking is very injurious inasmuch as it causes a strain on the working parts of the motor, for the momentum of the flywheel must carry the piston over the center against the pressure of the burning charge of gas that has been ignited by the hot particle of carbon.

When there is too much oil it indicates that the reservoir is too full, or the oil feed is not adjusted properly, and many times a heavy oil replaced with a lighter will remedy the cause. The old two-cylinder engines, which are little used today, used to have what we called a baffle plate to keep an oversupply of oil from getting into the cylinders, and when one of these came loose the oil was splashed into the cylinders until they would hardly run, and if they did run at all they would get hot and have very little power.

Now in case there is a lack of oil, the motor will heat from the friction. The motor will pre-ignite from the heat; the water will boil from the radiator; the motor will pound or knock, and have hardly power enough to run, to say nothing of propelling the car.

When the motor has got very hot with a scarcity of oil, the bearings will either seize or melt out. Many times the pistons will seize in the cylinders and necessitate the taking of the cylinders off to loosen them, and in many instances just before they seize they become so dry that the interior walls of the cylinder is scored to such an extent that they will not be of further use. This one thing makes a very expensive repair.

There are times when the oil pipes become clogged from some particle of waste material getting into the line, stopping the circulation of oil and allowing the dip pan to become dry, in which case the bearings will become dry and melt out. It is not a bad idea to strain the oil that goes into the case and avoid any chance of the line becoming clogged, for the pumps are delicately constructed affairs.

Going back to the beautiful shady nook and the patterns of wild flowers woven into a carpet over the ground of our camping place, we find the stranger again fixed up and ready to resume his long journey westward in search of the beautiful and profound sweetness that exists along the trail. He took a drink from the rock spring that found its way through the moss and fern to an open tank, cast a glance at the ceiling of green that hovered over us, and glided down into the canyon and disappeared. The little camp was broken up, each going his way, and I wondered when or where the next meeting would be.

Chalmers Replaces Leland.

At a recent meeting of the board of directors of the National Automobile Chamber of Commerce, Hugh Chalmers was elected first vice-president to take the place of Wilfred C. Leland, who leaves the automobile industry to enter the airplane industry as one of the owners of the Lincoln Motor Co., Detroit. H. H. Rice, of the General Motors Co., was elected vice-president of the gasoline division.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2208 Would Use Kerosene for Fuel.

From O. C. Winestock, Vermont.—Can you tell me how hot kerosene must be in order to be used successfully with a gasoline engine with no special carburetor? Would it be necessary to have such a device as close to the carburetor as possible, so that the kerosene would not become chilled? Would it be necessary to take hot air also from the exhaust pipe as is commonly done, supplying the hot air to the intake of the carburetor? I have always felt if kerosene could be heated enough it would be suitable without special carburetors in gas cars.

Reply.—The kerosene must be heated to that temperature that will insure rapid evaporation so that the minute particles of the fuel will be completely broken up and thoroughly mixed with the air. The successful use or rather satisfactory use of straight kerosene with the ordinary carburetor, is yet to be recorded although reports are frequently circulated. Relative to maintaining the kerosene and the resultant mixture, the best results are always obtained when any mixture of fuel and air is kept warm or dry. This is termed a homogeneous mixture, one that ignites readily. With all of the devices now marketed for using kerosene use is made of heat, generally that of the exhaust. The most successful one that has come to the attention of the writer is not marketed. It encloses a Venturi tube within the

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exhaust manifold which maintains the desired temperature required for successful vaporization of the fuel. Kerosene has not and will never be made to work successfully in an ordinary carburetor in connection with an automobile engine for the automobile engine is a variable speed, variable load engine. Where the load is practically stationary and the speed does not vary greatly kerosene can be used. Very good results are said to have been obtained by using 50 per cent. gasoline and 50 per cent. kerosene. It requires, so it is said, less air.

2209 **A Question of Flexibility.**

From Emil R. Schwandt, Wisconsin.—Will you please tell me if a Knight four-cylinder engine is more flexible than a four-cylinder engine (poppet valve) of the same horsepower? Is the Knight more flexible than a six-cylinder engine of the ordinary type? Has it any advantage or disadvantage over the common type of engine? Has it any drawbacks or is it almost a perfect engine? Will they outwear the ordinary engine and can the cylinders be rebored?

Reply.—There appears to be no reason why the Knight engine should be more flexible than a poppet type of valve of the same given bore and stroke. Some engines are more flexible than others. The Knight is not more flexible than a six-cylinder engine for the simple reason the six has more impulses a crankshaft revolution than the four-cylinder. Several claims are made for the Knight, the most noticeable of which is that valves are eliminated. One advantage is that there are no valves to grind or mechanism to adjust. Quiet operation is another feature of the Knight engine, but equally as quiet valve type engines are made. As to what constitutes a perfect engine, Knight or otherwise, there appears to be a considerable difference of opinion among engineers. Some claim the 12-cylinder is the best while others favor the eight. And again the six and four-cylinder types have their advocates. Much ink has been used by engineers in defense of their favorites, so our opinion as to the perfect engine would be but adding to the controversy. The cylinders of the engine referred to can be rebored.

2210 **Another Lighting System Trouble.**

From E. H. Madge, California.—I am experiencing great difficulty in getting the generator of my car to charge the battery. At times the ammeter will show charging all right and then suddenly it will stop charging, showing zero. If I open up the engine on the loose clutch, it will indicate charging and sometimes for quite a few miles. Then it will again drop off. The generator has been thoroughly overhauled, the commutator turned and new brushes fitted and still this occurs. It has been taken to pieces to detect the cause and by some accident in connecting up, the charging was regular. Of late, however, the above again happens. I should like some information regarding this.

Reply.—The trouble may be inside the generator or between the generator and the battery, to tell in which circuit the trouble is located, run the engine at different speeds until the ammeter shows zero, then connect the voltmeter across the generator terminals. If it shows a very high voltage, the generator is "O.K." and the trouble is between the generator and the battery. Look for loose wires or a broken wire under the insulation. Also examine the cut-out and see if it is closed. If not, push it closed with your finger. If the meter shows charge, the trouble is with the fine winding of the cut-out. If the generator shows a very low or no voltage the trouble is inside the generator, such as the brushes—though new, may not properly fit the commutator—a loose shunt field connection, loose connection in the wires connected to the brushes or terminals, or the trouble may be with the regulator, but as you do not state the make and type of generator it is impossible to state at what point to look for trouble in the regulator.

2211 **Relating to Compression.**

From Adolph Vlk, Illinois.—Is there, for the proper compression of the charge in automobile motors any established relative proportion between the volume of the combustion chamber, when the piston is at top of stroke and when at bottom of same? Should the distributor be timed (spark lever fully retarded) so the spark will occur at the time when the piston is in the uppermost position?

Reply.—If we understand your question correctly we should say there is not. The timing of the distributor of the present battery system of ignition is obtained by causing an interruption of the primary circuit by mechanical means, either the open or closed circuit. Theoretically the break is supposed to occur when the piston has attained top dead center or completed its compression stroke. Some manufacturers so set the timer-distributor that the break takes place with the piston at top dead center and with the timer fully retarded. Others allow a slight advance, or, in other words, the break occurs just before the piston reaches top dead center. This practice is more indulged in than formerly, due to the very general use of the motor starter, the speed of which largely obviates the possibility of a back kick which was so much feared in the days of manual cranking. If you time so that the points of the breaker mechanism separate with the piston at top dead center you will obtain satisfactory results. It is better, however, to learn the exact timing from the maker of the car or engine.

2212 **Is Troubled With Leaky Gearset.**

From Gilbert Zoellner, Wisconsin.—What do you think of patent carbon removers? I have used one in the form of tablets called "Worko". Is this preparation harmful? It seems to clean out the carbon and the motor runs as good as if the valves had been ground and the carbon removed. Do you think Johnson's carbon remover is better than the one I used? I have never tried it. Do you consider them practical? Our garage man said he would not use them but he would not give any reasons why he wouldn't. What is your opinion of the tire covers made by the Colorado Tire & Leather Co., of Denver, Col.? How high should the lubricant be in the transmission of the model 2 S Saxon? If it is carried higher than the top of the lower shaft it works back into the differential housing. Is it proper for it to do this? How often should steam cylinder oil be used? Please explain thoroughly how to grind the valves of the Saxon Six, giving the harmful results

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that might come from one doing this without any experience.

Reply.—Chemical preparations for loosening and removing carbon have been marketed for some time and if the material used did not injure the engine, and there is no reason why a properly prepared carbon remover should, it is the best answer to your question. Inasmuch as the writer has never used the remover you mention he cannot make any comparison with the other make. But it can be stated without contradiction that Johnson's carbon remover has given perfect satisfaction to a large number of users. Relative to the tire covers mentioned, these have been on the market for a long time and are endorsed by a large number of motorists. If they are not as represented, we have failed to hear a complaint. The cause of leakage of oil in the transmission of the car referred to is probably due to worn bearings. The gearset is in front of the rear axle and when thin oil is used and worn bearings exist, the lubricant will work into the differential housing. It should not do this but it will do no harm. Use a heavier oil than the one mentioned and just enough so that the bottom of the gears dip into it. Renew as often as required or according to number of miles the car is operated. To grind the valves will require considerable preparatory work. The wires to the spark plugs must be removed, also those leading from the timer-distributor to the coil, and the timer will have to be displaced before the cylinder head can be lifted. There is a rubber pipe connecting the cylinder head and the radiator and the fan will have to be removed to take off this pipe. After attending to these details remove the plates covering the valve mechanism, and with the valves seated compress the valve springs so that the divided slip collars can be removed from the ends of the valve springs. These collars set in recesses in the valve stem. To grind a valve its face is smeared with an abrasive—it is best to buy a prepared mixture—and the valve rotated with a screwdriver. Do not exert much pressure and occasionally lift the valve, also turn the valve slightly during the process. Clean valve and seats before renewing supply of abrasive. Continue grinding until you obtain a good seat; that is, until the pits, etc., are removed. Before replacing valves they and the seats should be washed with gasoline, taking care that none of the fluid gets in the cylinders. Make sure that a valve is seated before you begin to grind; that is, there be space between the stem and tappet. You will have to turn the engine over as you proceed from one valve to another. Of course you will scrape the carbon from the cylinder head and pistons and use a new gasket when you replace the cylinder head. If you are not familiar with the timing it is best to mark the wires, also the leads to the coil. In replacing the timer make sure the key of the shaft registers with the slot of the engine shaft and that the locking screw and nut be set up tight. To time, place the piston of the No. 1 cylinder, that nearest the radiator, on top dead center or completion of compression stroke. The breaker points should be about ready to separate and the brush of the distributor opposite the segment to which is attached the wire leading to the spark plug of the No. 1 cylinder. If not familiar with grinding valves it is best to have some expert supervise your work, also the timing.

2213 **Wants to Use Smaller Tires.**

From H. N. Andrews, Massachusetts.—Will you kindly give me your opinion on the following matters in your September issue?—Changing rear Ford tires to three-inch size, having K-W shock absorbers and keeping springs well oiled, load unusually light. Using reverse pedal occasionally as a brake.

Reply.—It would not be practical to use a three-inch tire on the rear wheels for several reasons. In the first place the weight of the car, etc., require a 3½-inch shoe and were it not essential the Ford Company would not spend the money for a size larger than three-inch. Another reason is that the rim is made for a 3½-inch shoe and a three-inch would have to be stretched considerably to go on the rim. We would suggest that you stick to the standard size shoe. The use of shock absorbers and maintaining the springs in a properly lubricated condition will save tires and make for much more comfortable riding to say nothing of eliminating road shocks to the mechanism. Conservative use of the reverse is not harmful.

2214 **Experiences Gasket Trouble.**

From J. U. Blose, Pennsylvania.—I have trouble with water leaking into the cylinders after putting a gasket in for the second time. On page 80 of their book of instructions they say do not remove the sticky composition from the gasket. What is this material? I have used shellac but it is hard to remove the gasket with this material, it sticking to the metal and head. I am compelled to use a new gasket every time I take the cylinder head off to clean out carbon.

Reply.—Inasmuch as you did not state the make of car it is difficult to advise you as to the material referred to. There are several compounds marketed for the purpose you mention. The using of the old gasket for the second time is not to be recommended. In the first place it is not always easy to displace it without injuring it, and besides the new gasket saves considerable time and labor. It may be that you failed to clean the cylinder head and top of block carefully before replacing gasket.

2215 **A Battery Charging Question.**

From C. L. Weygandt, Illinois.—A storage battery man recently told me my battery was holding a full charge too long and advised me to burn the lights during the day for about 4 hours while the car was in the garage. I do most of my driving at night and keep up a speed of 12 to 15 miles per hour with the lights burning dim, the battery showing charge while so driving. The car has been driven 3800 miles since January and the battery, a Willard, has never been recharged. Another battery man advised me to allow all the charging possible and informed me there was no danger of over-charging. Is there danger of over-charging and what shall I do?

Reply.—An overcharge of a battery is held to be beneficial and it is better to slightly overcharge than undercharge. The condition of your battery can be easily determined by yourself by the use of a hydrometer with which readings can be taken of each cell. Complete instructions accompany the instrument, which is easy to use. The fact that you have been using the battery over eight months and it is giving good service is a good indication

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that your present system is a good one. When in doubt drive up to the nearest Willard service station. Its expert will advise you fully and test your cells. That's what he is there for.

2216 **Several Electrical Problems.**

From Jacob A. Rettig, Indiana.—I have a 1915 Allen No. 34 model touring car. It leaks and lets grease out on the rear axle, and the brake doesn't hold. I have put felt washers on at two occasions but they never last long, and it will let grease out again. I also put one on a Ford car without success. 2.—The machine has a Westinghouse generator and a volt meter on it. It used to register up to 7¾ to 8 volts at about 25 miles speed, and at 15 miles an hour it would show about 7¼ to 7½ volts, but now it only shows from 6½ to 7 volts. The brushes show a glaze and not oily. 3.—How long do spark coils in a Ford machine last? Do they burn out or how can you tell when they aren't any good? Also how can you tell whether the trouble is in a magneto or spark coils? For what purpose is a spark coil on a machine? I am a blacksmith and will have to take up this work some day. Could anybody learn this trade through Correspondence Schools, or would he have to go to an auto school? The electric system is what puzzles me most of all.

Reply.—1.—Felt washers of the right material and fit if properly installed should remedy the trouble mentioned. If they fail we would advise taking the matter up with the maker of the first named car. 2.—The slight falling off in the output of your dynamo is not sufficient to cause any worry, providing the generator keeps the battery properly charged. If not it will be well to have the service station man look over your cut-out. 3.—The life of a vibrating type of spark coil such as used on the Ford varies considerably. There is no well defined life to these coils but if properly cared for should outlast the machine. In another section of this issue will be found a very comprehensive description of the ignition system of the Ford car and how to locate and remedy troubles. The object of a spark coil with a jump spark system of ignition is to build up or strengthen the primary current, or in other words, to so intensify it that it will bridge the gap of the electrodes of the spark plug. A course at a school would be a great help as you would become familiar with the principles of construction, etc.

2217 **Testing Magneto.**

From H. D. Pierce, New York.—I have a Bosch DU4 magneto that I cannot get a spark from. It has been on a Studebaker 20, fastened down with a strap and a nut, the same as the old low-tension Splitdorf. It was running fine at a car speed of not over 20 miles per hour on high when it began to miss an occasional charge. It ran a short distance on a level road. I had to drop back into low speed. The car ran a few yards and stopped entirely. I have tried an ammeter and dry cell of 20 amperes and cannot get any current from the armature core to the slip-ring. Am I right in thinking the coil has broken down? And what would cause this trouble? I have been careful not to damage the magneto when taking out the armature shaft and placed a keeper over the pole shoes while it was out of the magneto. Which way should the breaker arm run on a clockwise DU4? I have two cars, one with a magneto running clockwise and the other anti-clockwise and think them both wrong according to illustrations.

Reply.—The test you made does not necessarily prove that the winding is broken as the resistance of the secondary winding is too high to show any deflection on the ammeter. If you have a sensitive ammeter of low scale connect it in series with five dry cells, then touch one end of the battery lead to the magneto frame and the other side of the meter to the collector ring. If you get a deflection it shows that the winding is not broken. Place a piece of paper between the interrupter points and touch one side of the battery to the stationary interrupter point and touch the wire from the other side of the meter to the frame. If you get a deflection the primary winding is not broken. Examine the insulated interrupter point to see that it is not grounded. Make sure that the platinum contact points of the interrupter mechanism be clean, true and the break not over 1/64-inch. If the test of the safety spark gap fails to show a spark, it is best to take the magneto to the nearest service station of the Bosch Magneto Co. It may be possible that your magnets have become affected through an accident, such as a hammer or wrench striking them. The majority of magnetos, particularly the Bosch makes, are marked as to the direction of the armature shaft by means of an arrow. They are made to run clockwise unless ordered otherwise. This means that the armature shaft revolves clockwise when looking at the instrument from the driving end. When thus viewed the breaker member you refer to rotates clockwise with a clockwise instrument, but if you look or face the breaker box end the shaft and breaker mechanism will, of course, rotate anti-clockwise. The anti-clockwise magneto when viewed from the breaker box end would appear to have a clockwise breaker mechanism. You will avoid confusion if you bear in mind the direction according to the driven end of the instrument.

2218 **Would Change His Carburetor.**

From W. F. Ferguson, New York.—I have a Ford car equipped with a Holly carburetor. In my work I have unusually steep hills to go over and the engine sometimes stalls and I have trouble in climbing the hill. In an automobile instruction book I note it says that a model R Schebler carburetor with a special manifold is made for Ford cars. The valve of the manifold is controlled from the dash. Do you believe if I installed this carburetor I would get better hill climbing capacity out of my car? Could you furnish me with the price of the carburetor and where obtainable?

Reply.—Whether or not you would obtain better results by changing your carburetor depends upon the condition of the present one and how the make you mention would work on your engine. If your present carburetor is an old one it may not be adapted to the present heavy grade of fuel; that is, the best results cannot be obtained with it. There is no reason why your car should not surmount the steep hills you mention, particularly on the low speed. If the car has been in service for some time we would suggest that you go over the engine thoroughly and see if the valves are seating properly. Also make sure that none of the brakes are dragging as these frequently are the cause of lack of power.

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If adjusting the carburetor fails to give you the results you desire you might try a more modern type. There is no reason why you cannot install the carburetor you mention. Generally carburetors for the Ford include a special manifold which is easily attached. The maker of the carburetor you mention is the Wheeler-Schebler Carburetor Co., Indianapolis, Ind. They will supply prices and complete data.

2219 **Misses When Under a Load.**

From S. P. Leonard, North Carolina.—I have a 1914 model Ford car that misses on one cylinder and sometimes two when on a stiff grade. It runs fine when on a level road and will idle nicely. When going up a hill it will miss and explode in the muffler. It will sometimes stop unless I get into the low gear. I think the trouble is in the ignition. I have tried batteries but the miss is there just the same. I took out the spark plugs and laid them on the cylinders and cranked the engine slowly with batteries supplying the current. Two plugs sparked good but the others gave but one quick spark and quit. The vibrators work right on but there was no spark at the plugs. The car is equipped with a K-W master vibrator. What puzzles me is why the plugs will fire when in the cylinders and miss when on a grade. The plugs are in good condition. Have a new timer, wires and points on vibrator.

Reply.—If your plugs and ignition be working properly as you say you must look elsewhere for your trouble. The symptoms are those of mixture and valve trouble, particularly as you obtain a firing in the muffler. Generally speaking this is due to a weak mixture, a mixture that burns so slowly that the flame continues after the intake valve has opened and the fresh, incoming charge is ignited. Another cause of backfiring is faulty seating of the valves. The fact that the plugs on the cylinder head gave but a single spark and stopped sparking even with the coil vibrating may have been due to a short or ground of the plug or wire leading to it. If you have extra plugs remove the two which gave trouble and substitute the spare ones. If after doing this and adjusting the carburetor the trouble continues, look the valves over. The firing of the plugs when the car is running on a level road may be explained by the statement that the quantity of mixture taken in by an engine varies greatly with the speed.

Covering Ford Springs.

From Ralph O. Waterman, Vermont.—Cut a piece of rubber blanket, or any pliable waterproof material so it will nearly go around the spring between the frame and the end of the spring. Lace or sew it together, after you have cleaned and oiled the springs thoroughly, and your Ford will ride lots easier, even if you are driving in the mud a great deal.

Adjusting Ford Coil Vibrators.

From Oscar Barnes, Wisconsin.—Everyone realizes the importance of having the vibrators of the Ford spark coil adjusted to the same tension. Here is a method of doing the work easily and quickly. Remove all blisters and knobs with a thin file or a strip of sandpaper. Then select one of the coils as a pattern or model for adjusting the others. Lay the model and one of the others on a table with the vibrator end of each toward the other. Take a match or a toothpick and place one end of it against the vibrating spring of one coil and the other end against the spring of the other coil. Then adjust the coil so that the points start to separate on it at just the same time that the points separate on the coil used as a pattern when you slide the coils slowly toward each other. Repeat this with the remaining coils using the same pattern coil or model. The match or toothpick should rest against the vibrator spring at about the same distance from the end of the spring on each coil.

Ford Valves Made Adjustable.

From D. L. Moore, New York.—Having a Ford on which the valve and push rod clearance was too great, I fixed it in this manner. Removed the valve, and cut threads up beyond the small hole that holds the pin under the spring cup. When replacing valves, this small pin is not used. A valve spring compresser or remover is needed. Put valve back in motor, and screw two nuts of the proper size on valve stem, the thicker the better. Then the valves can be adjusted by raising or lowering the lower nut on the stem and locking with the upper nut which will also hold the spring in place. This provides a means whereby the valves can be adjusted at any time as they wear. The lower nut projects below the end of valve stem, and the push-rod being larger than the hole in nut provides a new surface to work on.

Likes the Trouble Department.

From W. G. Brown, Connecticut.—Enclosed please find my check for two years' subscription to your paper. My father says he has read a number of automobile papers but thinks yours is the best. I have never taken any other but I think yours is pretty good. I have read a number of interesting articles and obtained some valuable information. Had a similar experience to that of one of your readers who burned out his bearings, but in my case it was caused by running a very long distance on the low speed as the roads were in bad shape.

CARE OF THE FORD MAGNETO.

Some Pertinent Facts Explaining Why Trouble Is Experienced and the Remedy.

The general design and principle of the Ford magneto—or magnetic flywheel, as some term it—are merely a practical utilization of an old idea, dating back to the time when magnetism and electricity were beginning to be first understood, or experimented with, by scientists. We must concede that it is a clever utilization, as embodied in the Ford car, for here it is used, not only to provide ignition current for the engine, but also for lighting head lamps, sounding an electric horn, lighting up—momentarily at least—clock and speedometer, and also one's garage on occasions, not to mention its use at night on the road for inspection purposes.

Construction Is Simple.

Originally, Ford users were supposed to use the magneto solely for ignition purposes, but many soon discovered that it would also light headlamps and sound an electric horn; they used it for these purposes, and in consequence were not over-popular

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with the Ford organization generally. Public opinion, however, eventually proved too strong even for the Ford Company, and they so far conceded matters as to improve the magneto by enlarging and strengthening the magnets and the stator with its coil spools, to provide extra current for headlamps and horn; in fact, electric lamps are now standard fittings.

In itself, the Ford magneto is a very simple thing, and there is practically nothing to get out of order or give trouble, when it is new, or comparatively so, except through accident, ill-usage, or neglect. Nevertheless, there are many little points about it that it is well to understand, to save trouble. Possibly its worst feature is that, only providing an alternating low-tension current, it necessitates the use of low-tension wires, a low-tension distributer or commutator, and four induction coils of the vibrator type. These parts, with a number of terminals—no fewer than twenty-six in all, counting three on each coil unit and one at each plug—give far more trouble than the magneto parts proper, but as they are so well understood by users generally the writer need not refer to them again.

How Magneto Is Made.

The Ford magneto itself consists of two parts. First, there are bolted round the engine flywheel the sixteen permanent magnets which revolve at engine speed; then there is the circular stator, with sixteen coil spools, stationary, and bolted to the lower part of the cylinder casting.

The sixteen permanent magnets have been twice enlarged and strengthened. Originally (1909-10) they were $\frac{9}{16}$-in. on face, from 1911-15 they were $\frac{5}{8}$-in., and now they are $\frac{3}{4}$-in. The coil spools also were altered in size, the original small round ones being now replaced by larger coils, oval in shape.

The sixteen magnets are bolted at their curved or inner ends of the flywheel, while their poles are connected to each other by clamps—like poles, north or south, being connected together all round, and also bolted to the outer periphery of the flywheel.

On the stator the sixteen coil spools are connected to each other all round by soldered copper strips, one end of the wiring being insulated, and attached to a stud terminal at the top which forms the current conductor to the insulated terminal on the outside clamps are separated from the coil spool surfaces by 1/32 of an inch. In revolving quickly at engine speed the magnets, in passing the stationary coil spools, create an alternating low-tension current in the coils, and this is carried from the coils to the current conductor and external terminal before mentioned, the last-named being connected by a wire to the coil box on the dash.

How Troubles Develop.

While new, there is no trouble whatever to be expected with either magnets or coil spools, but after lengthy use, as may be imagined, various faults may develop to hinder a full flow of current and cause engine misfiring. The magnets themselves may weaken, though they do this but rarely within, say, five years.

Never should the owner, except under expert guidance, attach a battery wire to the magneto terminal, for this may demagnetise the magnets. In case the magnets become weak by long usage, or from any other cause, they can be remagnetised very cheaply, or a new set can be purchased. This necessitates, unfortunately, the removal of the whole engine unit from the frame, and the same work is entailed in case of any trouble with the magneto coil spools.

Dirty oil in the crank case may cause trouble. To avoid this drain out the old oil occasionally, then put in a quart or two of kerosene, and run the engine slowly on this for one minute, afterwards letting out the kerosene and filling up with fresh, thin, but good oil.

Trouble is not infrequently caused by dirt and obstructions gathering round the current conductor on the stator, under the magneto contact on the top of the transmission cover. Small pieces of brake band linings, worn from the ends of the fabric, may be a fruitful cause of this kind of trouble. Foreign matter of all kinds, generally in dirty oil, may get on the magneto coil spools, and also on the magnets themselves, and cause defective ignition. The coil spools or bobbins may also "short" within themselves.

Avoid Metal Particles.

As every motorist knows, wear of all the moving parts of the engine causes minute pieces of metal to become mixed with the oil, but these may be as large as filings or even larger; they may be seen in profusion if the oil be taken from the engine base chamber and strained through linen. These particles are apt to accumulate if fresh engine oil is invariably added without first drawing off the old oil, and for this reason alone it is most important, at regular intervals, to drain the old oil out and flush the engine out with kerosene, as mentioned. In the case of the Ford, the fine filings or miscroscopic chips of metal (if one may so call them), becoming mixed with the oil, are naturally picked up by the magnets and thrown on the cores or faces of the coil spools; they may be seen adhering to both when removed. As the magnets revolve so close to the cores of the spools, the metal particles may cause deterioration of the quality or power of the current.

A nut, cotter pin, washer, or even a wrench dropped accidentally into the transmission case of a Ford, may be picked up by the magnet and cause damage; all tools used inside this case should have a long piece of string attached, so that, if dropped, of the transmission cover. The other end of the coil spool winding is grounded on the stator frame bolted to the engine.

When properly fitted the faces of the magnet they may be recovered.

The spool coil insulation may break and set up a short circuit, or the same result may be caused by the grounded end of the coil wire becoming detached from the stator. Yet, again, trouble may be due to the soldered ends of the copper ribbons between the spools breaking. These mishaps rarely occur, but are always possible after years of hard service.

There is a tendency on the part of some owners to blame the Ford magneto for weak current or misfiring when the real cause may be looked for in the coil box wiring; that is, in the false bottom of the box, or in the induction units or the wiring. Fully one-half the troubles attributed to the magneto are due to dirt or foreign matter deposited by the oil on the magnets or spool coils. Ford repairers often receive cars with the instruction, "Magnets require magnetizing," when all that is needed is a good cleaning and washing out of the engine and transmission with kerosene. Some owners will run a

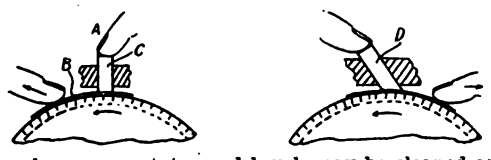
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car 10,000 miles or more and never think of removing the dirty oil, charged as it must be with all kinds of foreign matter.

The strength of the magneto can always be tested with a voltmeter. In this case, run the engine on the battery ignition, then try the voltage from the magneto terminal to ground. The reading should be six volts at cranking speed, and as much as thirty volts may be registered as fast engine speed. If the engine will start and run well on the batteries, but stops when switched over to the magneto, it will prove that the magneto is at fault. If it has to be dismantled, care must be taken when removing the magnets to lay them round a board just in the position they occupied round the flywheel, and in reassembling them to put them back as they were originally. Each magnet should be capable of lifting a weight of about four pounds.—J. T. Ward in the Autocar.

Seating Commutator Brushes.

To obtain satisfactory results from the generator or other electrical unit utilizing a commutator and brushes the brushes must bear evenly and uniformly upon the segments of the commutator, else sparking will follow and a burning action be set up on the commutator. This will result in a loss of energy or output of the unit. The accompanying drawings



Illustrating how commutator and brush may be cleaned and shaped by use of sandpaper.

illustrate how brushes may be fitted. That at the left depicts how a vertical type of brush can be fitted to the commutator by placing a piece of fine grade sandpaper B on the commutator, thereby pressing one finger A on the brush and another finger drawing the sandpaper as indicated by the arrows. The sketch at the right illustrates a brush held at an angle, but the direction of movement of the sandpaper is different as is indicated by the arrows.

VALVE TIMING.

Accuracy Absolutely Necessary for Motor Efficiency and Smooth Running.

From William H. Stewart, Jr., Stewart Auto School, New York.—It is hardly conceivable to the average driver why a slight disarrangement of the valve timing should cause loss of power and otherwise upset the proper working of the motor. However, if one studies the working principle of a gasoline engine it is not difficult to comprehend why accuracy in valve timing is necessary.

In the four-cycle type motor the crank shaft makes two revolutions to complete the cycle of operations. The suction and compression stroke is one revolution; the firing and exhaust stroke is the other. The charge of gas is taken into the cylinder by the down stroke of the piston and compressed by the up stroke. Likewise, when the charge is fired the piston is forced outward and on the second up stroke the burned gases are exhausted. In order to admit the new gases to the cylinder the intake valve, timed to open and close at the right instant, is necessary. Likewise an exhaust valve.

Ordinarily, one would think that these valves would open and close at the end of the strokes, but such is not the case. A fixed "lag" and "lead" are given the valves according to the design of the motor. Ordinarily the intake valve is timed to open at a point about 12 degrees past top center and to close at a point about 30 degrees past bottom center. The exhaust valve opens about 40 degrees before bottom center and closes about 10 degrees past top center. Top center is determined when the piston is up; bottom center when it is down. Since there are 360 degrees to a cycle, the flywheel is usually marked in a manner to fix these points of opening and closing.

Motors differ considerably as to valve timing. The size and lift of the valves, cylinder bore, and the revolutions per minute of the motor, together with numerous other factors, determine the valve timing. Take, for instance, the intake valves. When the piston begins to travel down a vacuum is created. At this time the exhaust valve must be closed and the intake valve opened to permit the gases being drawn into the cylinder as the piston travels outward. As the crank pin passes through the arc at bottom center the piston for a time is at a standstill. However, the inrushing gases continue to flow into the cylinder until the piston begins to travel upward on compression. The intake valve should close at a point when the piston would tend to force out the gases already in. The new gases drawn into the cylinder by the suction of the piston attain a certain velocity and for this reason the intake valve is held open as long as possible.

The piston on the upward stroke compresses this charge from atmospheric pressure to that of about sixty-five pounds. As it again reaches top center of compression the spark is timed to ignite the charge which, in burning and expanding, forces the piston outward on the firing stroke. As it travels outward on the firing stroke the pressure exerted is reduced, the effective pressure being exerted on the piston during the early part of the stroke.

The exhaust valve is timed to open before the piston reaches bottom center in order to permit excess pressure to escape before it returns on the up stroke. If this lead were not given to the exhaust valve, under pressure would be exerted on the piston during the scavenging stroke.

Since three of the four strokes are idle the energy consumed in effecting this would cause additional loss of power. As the piston travels upward on the exhaust stroke the burned gases are expelled through the exhaust valve, which is also held open as long as possible to take advantage of the velocity of the gases. In short, the exhaust valve may remain open until the piston begins to travel down on the suction stroke and tend to create a vacuum. At this point the exhaust valve must close and the suction concentrated at the intake valve, which should then open.

Heavy valve springs are used to return the valve to its seat quickly when the point of the cam leaves the roller. One may readily note the order of firing of cylinders by observing the action of either the intake valves or the exhaust valves. If it is 1, 2, 4, 3,

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No. 1 valve will actuate first, No. 2 next, No. 4 next, and No. 3 last.

In timing a multiple cylinder motor it is necessary only to time the intake and exhaust valve of one cylinder. Cam shafts are constructed so that timing of the other cylinders would be the same as that of the first.

When the flywheel is marked indicating the points of opening and closing of the valves it is an easy matter to determine the top center or bottom center of the piston and then give the necessary lead to the valve. If the flywheel is set in a position where the exhaust valve should open, the timing gear may be turned in position, so that the cam will be about to raise the valve lifter. Likewise, the intake valve may be timed by setting of gear. The design of the cams should take care of the duration of opening of the valve. A slight clearance between the valve stem and the valve lifter is given. This clearance is necessary to allow for the expansion of the metal when heated, otherwise when the motor is hot the valve will become unseated, due to the elongation of the valve stem. Likewise, if too much clearance is permitted at these points the lift of the valves will be lessened and the exact opening and closing points disturbed. This space should be in accordance with instructions of the manufacturers.

If the valves are not timed accurately the motor will not develop its maximum efficiency, or even may not run at all. Reseating occasionally is also necessary. Especially is this true with the exhaust valve, which is subjected to considerable heat and waste products of combustion. The inrush of fresh gases past the intake valve has a tendency to keep it clean, and for this reason this valve does not foul so readily. However, a slight particle of carbon on the valve seat will cause loss of compression, and when the compression is reduced loss of power results.

OBITUARY.

Arthur A. Hill, who has been editor of the Automobile Dealer and Repairer since this publication started in March, 1906, died at his home in this city Thursday, September 13, following an attack of apoplexy.

Mr. Hill was born in Greenwich, Massachusetts, and was in his sixty-fourth year. He at one time owned, controlled and edited The Haverhill Gazette, published at Haverhill, Massachusetts, giving to that publication a degree of influence which it had not previously enjoyed. In 1890 he became managing editor of the American Press Association, of New York City, leaving that organization for the purpose of making a trip to the Klondike gold regions. On his return from the Klondike he purchased an interest in The North Adams Evening Herald. Later on he sold his interest in The Herald, and became editor of The Blacksmith and Wheelwright and The Amateur Sportsman, published by the M. T. Richardson Company. In 1906 he also became editor of the Automobile Dealer and Repairer. He was one of the original members of the New York Press Club.

In his youth he was connected for a time with The Springfield (Massachusetts) Republican, and afterwards connected himself with a big publishing and printing concern in New York, to learn the business. Tiring of this, he went to Ohio, and entered Oberlin College, where he remained long enough to get a smattering of the classics, paying his way by work in the local printing office. Before he was 21 he had become a reporter on The Cincinnati Gazette and a compositor on the Chicago Times, and for a year a reporter and city editor on The Toledo Democrat and Herald.

Mr. Hill was the author of a novel of unusual merit, entitled "What's He to Me?" and published in 1914 by Howard O. Bullard, of New York.

He was a man of pronounced opinions, and a forceful writer upon any topic which interested him. He was especially sympathetic with all economic and welfare problems. He welcomed a condition which should be productive of moderate wealth widely distributed, rather than a concentration of wealth in a few hands. He possessed a rare vein of wit and humor, which fairly sparkled at times in his conversation and writings. He formed and maintained



ARTHUR A. HILL

warm friendships with a large circle of acquaintances.

Mr. Hill's generosity was proverbial. He could seldom resist an appeal for help and many a down-and-out fellow creature has had cause to remember him gratefully.

Leads in Automobiles.

There is one automobile for every twenty-nine inhabitants in the United States, according to figures for last year, made public by the Federal Public Roads Bureau.

Iowa with one car for every eleven persons, led the country in the number of machines registered in proportion to population. California, Nebraska and South Dakota ranked next in order. Arkansas, with one automobile for every 116, is at the foot of the list. The New England States were more uniformly supplied with motor cars than any other section, it was stated.

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Automobile Dealer and Repairer

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK SEPTEMBER, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

ARE MOTOR CARS TO BE DEARER?

Can there be any doubt about it, with the tremendous demand for constructive material of all kinds brought about by the war?

Everything entering into the construction of a motor car is likely to cost the manufacturers more than it did. That being the case, car manufacturers, it would seem, must increase prices, to save themselves.

The man who has been putting off the purchase of a motor car, either under the impression that they might be cheaper, or for some other reason, should wait no longer. If he does, he will undoubtedly have to pay more money for his car.

AN EASY DEATH.

To be instantly killed by collision with a railroad train, while it usually leaves the victim in a more or less mangled condition, may not be as terrible a death as it seems. Some years ago a friend of the writer was riding along in his automobile on a road that ran parallel to the West Shore railroad. At a certain point, the public road veered to the left, over the railroad track. The automobile reached the crossing at precisely the time that the train was coming along, and the train struck it squarely, hurling its occupant fifty feet or more. He was picked up unconscious, and did not regain consciousness for three weeks. He finally fully recovered. The cushions of the automobile in some way saved his life. After he was well he was asked one day what his sensation was when the train struck his automobile. He said that there was no sensation whatever. He did not know he had been hit. He was riding along in his machine, with no prospect of any trouble, and the next thing he knew he found himself in a strange bed, in a strange room, and had no idea how he got there, until the matter was explained to him. He was asked if there was not some sensation of a crush. or a noise, or something of that kind, but he insisted there was no sensation whatever. So if he had never regained consciousness, it would have been an extremely easy death.

GO EASY ON GASOLINE.

The prospect of a shortage in gasoline has moved the Government to recommend that motorists curtail the use of their cars for strictly pleasure purposes as much as possible. Unless this is done, the time may not be far distant when gasoline will be difficult or impossible to obtain at any reasonable price, owing to the great quantities which must be used for war purposes.

Oil wells in old fields are drying up, and new sources of supply have not been found—in this country—and may not be. Until the war closes, foreign fields cannot be depended upon to help out very much.

Many motorists for their own convenience are economizing in gasoline, especially Sundays and holidays, when the roads are so crowded with cars as to make motoring more than ordinarily dangerous and far less pleasurable than on week days.

PUSHING SALES OF AUTOMOBILES.

With the price of wheat guaranteed to the farmer at $2.20 a bushel and other farm products selling, many of them, at a corresponding increase over prices which prevailed before the war, there would seem to be a great opportunity for pushing the sale of automobiles. tractors, trucks, etc., in all agricultural communities.

We may be sure that manufacturers will not neglect the chances presented of increasing their sales among a class of people who have in the past been large purchasers of motor cars.

Manufacturers of accessories of all kinds should prosper with the increased sale of cars to farmers, as they usually buy a low priced car on which many devices can be used to advantage.

A WORD ABOUT TROUBLE.

We hope none of our readers who may be in need of information with respect to difficulties connected with their cars, will hesitate to communicate with us. We stand ready to serve our subscribers at all times, to the best of our ability.

We would ask, though, that all questions with respect to troubles be made as specific as possible. Sometimes the omission of an essential detail in an inquiry makes it difficult for our experts to answer with such precision as is desirable. Give us the facts concisely, and without too much elaboration, and our task in preparing a proper reply will be made easier, and the information we are able to supply will be all the more helpful.

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LESSONS FOR DRIVERS

Carelessness and Ignorance Responsible for Most Accidents.

An appalling number of absolutely inexcusable accidents, involving heavy loss of life, have been reported this summer. We refer to collisions between trains and automobiles at railroad crossings. We call an accident of this sort inexcusable because its avoidance only requires the use of one's eyes and ears. Where the track is invisible, a delay of two or three minutes at the most, while the driver alights from his car for a careful inspection, is all that is necessary. Usually, simply slowing down before a crossing is reached is sufficient.

Skidding has been a fruitful cause of accidents this summer.

Two Killed When Train Hits Auto.—A man was instantly killed and his wife seriously injured, when the auto in which they were riding was struck by a mail train near Gresham, Oregon. A granddaughter of eighteen was at the wheel. It is believed that when she saw the train coming she became confused and lost her presence of mind, permitting the car to reach the crossing.

Five Dead from Collision with a Train.—A baby's shoe on the cow-catcher of a locomotive of a Big Four line train at Paris, Illinois, revealed the fact of a serious collision with an automobile, in which five persons lost their lives. Apparently in this case the driver was paying no attention whatever, as the engineer stated that the driver drove his machine on to the track a few feet ahead of the train, and was leaning out on one side of the car, talking to one of the children. The driver and owner of the car and four children were killed.

Three Deaths from Collision of Train with Automobile.—A truck farmer, his wife, and little son, were killed when their auto truck was struck by a Union Pacific train at Topeka, Kan. The woman was driving, and the car stalled on the track. It is believed that the accident was caused by a desire on the part of the driver to save time by getting ahead of the train.

Passenger Train Hits Automobile.—In Dorchester, Mass., three members of one family lost their lives when their automobile was struck by a passenger train on the New York, New Haven, and Hartford line. The driver saw the train coming, but not soon enough to stop before reaching the crossing, although it was said he jammed on the brake, and his machine skidded.

An Erie Train Strikes an Automobile.—A woman of seventy was killed instantly, and her daughter and son-in-law were injured, when their automobile was struck by the Chicago Limited, on the Erie, at Ackerman's Crossing, N. J. Their automobile stalled on the track, and the occupants had ample time to get out, but apparently paid no attention to the approaching train.

One Man Killed and Two Others Badly Injured.—The failure of a driver of an automobile at Springdale, Pennsylvania, to notice the approach of a freight train recently resulted in his death and the serious injury of two others who were riding with him.

Dancing Pumps Cause Motor Car Wreck.—A pair of dancing pumps, according to the Omaha News, caused a collision between an automobile and a street car recently, by which four persons were seriously injured. The woman driving at the time of the accident explained that she saw the street car in time to stop, but could not apply the brake properly with the light slippers she was wearing in place of the high, strong shoes she usually wore.

Crushed by an Express Train.—A chauffeur for a New York contractor drove his automobile on to a West Shore railroad crossing at Dumont, New Jersey, just in time to be struck by an express train. Both the chauffeur and the contractor were instantly killed, and their bodies horribly mangled. The automobile was twisted and bent into scrap iron. The fiancee of the contractor was standing on the porch of her house and witnessed the accident.

Two People Killed by a Train.—Near Milton, New Hampshire, the manager of the Hotel Rochester and his fiancee were both killed, and the engine and a mail car derailed. The couple were to have been married in a week.

Too Much Speed at a Curve.—One man had his back broken, and several others were seriously injured when a car in which they were riding broke down a guard-rail over a creek near Danville, Pennsylvania, and plunged 26 feet to the bed of the creek. There was a sharp curve at the point where the accident occurred, and the driver of the car did not slow up in time. Serious accidents are all the time happening at sharp curves, because of too much speed.

Fatal Collision with a Traction Train.—When an inexperienced driver near Ampers Station, California, pulled the wrong lever of the car, and shot it into a swiftly moving train recently, two people were killed—a man and a woman. The driver, a woman, escaped with a few scratches.

Train Smashes Automobile.—Three persons were killed and one injured seriously when an automobile near South Sudbury, Massachusetts, was struck by a New York, New Haven and Hartford train. The driver applied his brakes when he saw the train, but the machine skidded.

He Didn't Notice It.—A woman of eighty-five was instantly killed, and three other people seriously injured when an automobile was struck by a passenger train near Carthage, New York. The driver did not look nor listen, and neither saw nor heard anything, he said.

They Didn't Hear the Whistle.—At Monocacy, Pennsylvania, two persons were killed and two others seriously injured when the automobile in which they were riding was struck by a Pennsylvania express train. The engineer of the train blew his whistle, but none of the party heard it.

Reckless Driving.—A reckless driver near Tarrytown, New York, during Flag Day exercises, drove into a crowd of school children and others, killing one man and injuring several other persons. The driver refused to stop, but was pursued, caught, and landed safely in jail.

Result of Recklessness.—Near Lansdale, Pa., a young man sixteen years old was driving a big car at fifty miles an hour on a stretch of macadam road when he undertook to pass a horse and buggy. This he did, but in trying to regain the road he slid to the opposite side, when the car twice overturned and landed right side up pretty well demolished, and the young man beneath it, where he bled to death.

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LEGAL RESPONSIBILITY FOR DAMAGE AS BETWEEN MANUFACTURER AND DEALER.

An Automobile Case.

(Copyright, April, 1916, by Elton J. Buckley.)

The law is becoming more and more firmly settled that a manufacturer who makes a machine, or a store appliance, or a food product, and sells it to a dealer to sell again, is liable to any purchaser who is injured by reason of some defect in its construction or manufacture. It used to be a theory—and there are some cases to support it—that where a manufacturer made something and sold it to a dealer, he was responsible only to the dealer, for the dealer was the only person with whom he had any contractual relations. If the product, whatever it was, was sold by the dealer to a consumer, and in the hands of the latter it went wrong, showing defective manufacture or construction, the consumer must look to the dealer for redress because it was the dealer with whom the consumer dealt.

The courts soon awoke to the fact that this was a gross injustice because it made a dealer responsible for something over which he had no possible control, and which he could not even know about, viz., the construction and composition of another man's product. The courts then began to decide that a manufacturer—who alone can know whether his product is good or not—should be held responsible for defective construction or composition in the hands of the ultimate consumer, no matter how many hands it had to pass through before it reached the ultimate consumer. This is of course as it should be, and nothing short of it would be fair.

The clearest decision on this point of law which I have ever seen has just been handed down by the New York Court of Appeals in a case involving an automobile. The manufacturer of the car sold it to a dealer, who sold it to a consumer. While the consumer was using it one of the wheels broke in a way that revealed defective construction, and some damage was done. The owner of the car did not bother with the dealer but entered suit at once against the manufacturer. The lower court gave him a verdict, the manufacturer appealed, and the verdict was affirmed by the Court of Appeals. In its decision the court in a very few words summed up the responsibility of the manufacturer to ultimate consumers, as the weight of the law at present holds it. The following extracts from the decision are clear. I think I should say that the manufacturer defended first on the ground that he was responsible only to the dealer, and second on the ground that he bought the wheel from another manufacturer and therefore was not responsible anyway:

> The manufacturer of a finished product of machinery which is to be used without new tests and which in the nature of things is reasonably certain to place life and limb in peril, is under duty to make it carefully, and for a neglect to do so is liable to the owner who purchased it of a retail dealer. Such liability is not relieved by the fact that the manufacturer obtained the defective part of a reputable maker if a reasonable inspection would have disclosed the defect.
>
> From this survey of the decisions there thus emerges a definition of the duty of a manufacturer which enables us to measure this defendant's liability. Beyond all question the nature of an automobile gives warning of probable danger if its construction is defective. This automobile was designed to go 50 miles an hour. Unless the wheels were sound and strong, injury was almost certain. It was as much a thing of danger as a defective engine for a railroad. The defendant knew the danger. It knew also that the car would be used by persons other than the buyer. This was apparent from its size; there were seats for three persons. It was apparent also from the fact that the buyer was a dealer in cars, who bought to retail. The maker of this car supplied it for the use of purchasers from the dealer. The dealer was indeed the one person of whom it might be said with some approach to certainty that by him the car would not be used. Yet the defendant would have us say that he was the one person whom it was under a legal duty to protect. The law does not lead us to so inconsequent a conclusion.
>
> We think the defendant was not absolved from a duty of inspection because it bought the wheels from a reputable manufacturer. It was not merely a dealer in automobiles; it was a manufacturer of automobiles; it was responsible for the finished product; it was not at liberty to put the finished product on the market without subjecting the component parts to ordinary and simple tests.

This seems unanswerable, but one of the judges disagreed with it and filed a dissenting opinion on the ground that the manufacturer should not be held responsible to anybody but his immediate buyer.

The above extracts represent what would be considered the weight of the law, not only in the case of an automobile, but in the case of everything else that is sold by the manufacturer to dealers to be sold again. If they go wrong the dealer cannot be held responsible unless he has made the transaction his own by giving his own individual guarantee. I will discuss that presently. There are several companion cases on record in which suit was begun against the dealer instead of the manufacturer, and in which the court held that the responsibility was not the dealer's, as he could know no more about the construction of the article than the consumer. These cases as well as the others of the type of the above automobile case, point directly back to the manufacturer, as they should do. They fix upon him the responsibility of warranting, either expressly or by implication, that his article is as it should be; that the wheels on his automobile are good enough to stand the strain; that the colors in his fabric will not fade unduly; that the steel in his farm implement are without flaw which inspection could discover; that the prepared beef in his tin is free from disease germs, and so on and so on.

But the whole situation is changed if the dealer gives a guarantee of his own. In that case he is just as responsible as the manufacturer and an injured consumer can sue him under his own guarantee. Many dealers are foolish enough to do this, but they always take a risk. No dealer should guarantee anything that he does not know absolutely about; his representation should be "the manufacturer's guarantee is so and so," and in all his literature and his advertising he should be particular to say "guaranteed by the manufacturer," never "we guarantee."

Highways Must Relieve Railroads.

With the railroads of the country already taxed to the limit, so that frequent embargoes against additional freight are necessary, other means of transportation must be utilized and developed to the utmost. Secretary Redfield, of the Department of Commerce, in a recent public statement, pointed out the patriotic duty of communities located on navigable inland waterways to divert as much shipping as possible to such waterways, as otherwise the coming demands of the government upon the railroads will inevitably produce a shipping situation from which the country will suffer.

Fuller use of the highway system of the nation, in addition to the waterways, offers the only relief. With record-breaking farm products to be moved

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this fall and greatly increased output by mills and factories, the highways will be called upon to carry a great deal more of the commerce of the nation than ever before. Not only will the volume of hauling to market over short roads be much heavier, but there is certain to be a big development in the use of motor trucks for local distribution and for freighting over through routes for distances of one hundred miles and more.

"It must be evident," says R. D. Chapin, chairman of the Good Roads Committee of the National Automobile Chamber of Commerce, "that the highways are a greater economic necessity in time of war than in normal conditions of peace. It would be foolish to limit road construction and maintenance any more than is absolutely necessary. If we are to get the crops to market it is of vital importance that the roads be maintained in usable condition. It will be the worst kind of economy to neglect them just at a time when they are called upon to carry the heaviest burden of traffic to meet the urgent needs of the country. Unless so maintained they will deteriorate rapidly. It is even more important now than heretofore that highway appropriations be properly spent and that road work go on as usual."

A Tire Repair School.

One of the natural results of the tremendous increase in the number of motor cars and their operation, is the insistent demand for expert vulcanizers to carry on the tire repair business which has followed in the motor car's wake. Among the tire repair schools that has set about to relieve this condition by training men in the art of repairing tires, with a remarkable degree of success, is the one established about eighteen months ago by the Goodyear Tire & Rubber Company at Akron, Ohio. It is an interesting group of men who gather in the class-room of this school on beginners' day, seeking expert instruction from D. R. Cain, dean of the school. In every class representatives from every section of the country present themselves—dealers, men who want some good repair experience before launching out into the business, and often experienced repairmen.

"We are furnishing a complete practical course," states Mr. Cain. "Beginning with fundamentals, we demonstrate every step in scientific repairing. Occasionally we get men with no idea whatever of how a tire is made—and some who have never examined a tire, but before these men leave our school they are master vulcanizers, competent to undertake any kind of repair, from a simple puncture to a retread.

"We start them all at the same point in the practical work—cutting down sections of tires. After the student becomes skillful in this, he is instructed in building them up. Then we take him through all the various divisions of the business.

"Individual instruction is given to each man. After two weeks' experience we require all students to submit to an examination, and issue the Goodyear Master Vulcanizer's diploma to those who pass. That almost without exception the men pass with high marks is indicative of the thoroughness of our instruction. Because of the great demand for admission, our classes are usually filled up weeks in advance.

"We use the working equipment of the average tire repair shop, and only methods that can be employed by any tire repairman with a modest capital. When you consider that nearly 4,000,000 cars are now in service offering opportunities for repairs on 20,000,000 tires, you may realize why so many men, desiring to become competent repairmen, are entering our repair school."

To Drill Oblique Holes in Iron.

To drill oblique holes in say, a hand rail A, with an ordinary drilling machine, the holes B, being intended to receive the railings C, as shown at Fig. 1, a block of the proper inclination or pitch, and provided with a hole or slot to receive the arm of the clamp E, must be prepared. A piece of elm will be suitable wood for the purpose. If the drilling machine is provided with a table, the block must be cut and secured to this table. But if the machine has a vise, as shown in Fig. 2, the block can be held by this. Next prepare a piece of iron F, one end of which should be vertical when fixed to the bar A, with the clamp A, as shown. This piece of iron will keep the drill in a vertical position; but the drill will have to cut unevenly, and as a precaution care should be taken to provide a slow feed.

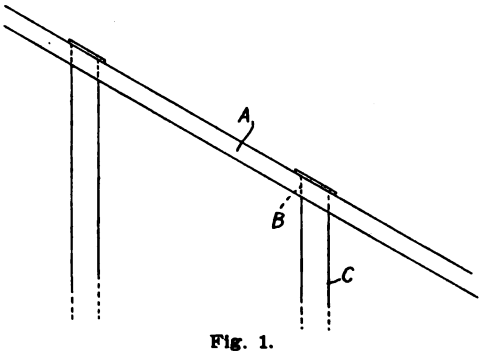


Fig. 1.

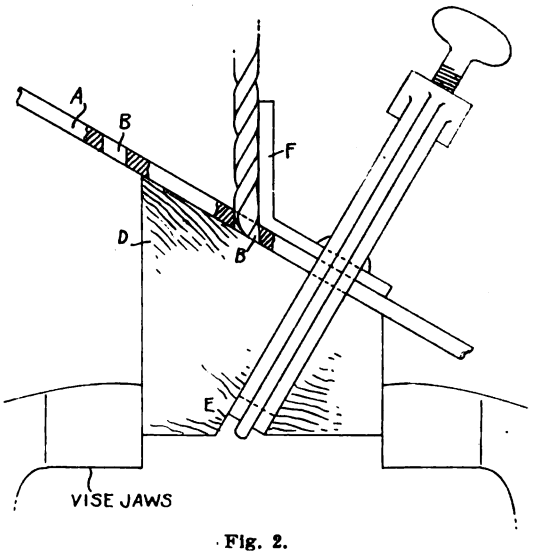


Fig. 2.

Illustrating how holes may be drilled in slanting objects.

Spark plug porcelains crack from a variety of causes. A chance blow from a wrench while tightening, pulling too hard on the ignition wire, dropping the plug or a defect in manufacture are frequent causes. But the usual trouble is from screwing them too hard into the cylinder. As the plug heats up and expands it cracks the porcelain.

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WHAT DEALERS WANT.

They Suggest How Manufacturers Might Better Co-operate for Better Business.

Our contemporary, The Horseless Age, publishes a consensus of the opinions of automobile and accessory dealers as to what manufacturers should do to further the sale of their products. It will be found unusually good reading for the manufacturers and will find a responsive echo among dealers everywhere who are not represented in the symposium:

Want More Co-operation.

The manufacturers and dealers should get together on a closer co-operative basis, price maintenance should be strictly insisted upon, a longer profit should be granted the dealer and the manufacturers and jobbers should conduct an educational campaign for the benefit of the dealer who does not conduct his business on a business basis. They should apply to the automobile business the same good principles that make success in other lines.—Davenport, Iowa.

We cannot compete with the mail order houses and give service which they do not give. The manufacturers should help us organize into some form of an association for the purpose of perfecting and promoting service to the tradesmen. Such an organization could keep its members informed as to changes in carburetor design, adjustment, weak points in different makes of cars as well as good and bad credits, etc.—Lyons, Michigan.

Co-operation between the manufacturer and the dealer would result in greater sales. A closer union of working and exchanging of ideas and suggestions or improvements on an article is needed. For example, I might do a certain line of advertising that would sell my goods to the best advantage and a dealer in another territory handling the same line would not obtain the same results with his advertising. An exchange of ideas would be beneficial in cases like this.—Hoagland, Indiana.

Ask for Better Service.

If the manufacturers would appoint agents who are willing to do what is right in giving service and maintaining prices it wouldn't be half as hard to do business as it is now. But as a rule they are offering service which they will not live up to and when an agent who in earnest offers a certain service the prospective buyer has his doubts. Some manufacturers will give you all kinds of help by sending experts and demonstrators, but when the real trouble commences later in the season you don't hear a thing from them—Garfield, Minnesota.

I think that the manufacturers, generally, would be better off if they would give more attention to service than to sales helps. Anybody can sell goods where a reputation for service is established.—Oelwein, Iowa.

Car manufacturers are not particular enough in regard to small details, cars come through unfinished and to a great extent out of adjustment. We feel that a little time spent on cars before leaving the factory would be better for dealer and consumer. Factory branches allow so much for old cars, that should the dealer try to compete for this business, his balance on the ledger would show in red figures. Manufacturers of cars and equipment should make it their business to know what the consumer should pay for their product.—Boston, Massachusetts.

Most of our prospects have an old car to trade, and as the city dealers get about 10 per cent. more commission than the country dealer, it gives him about that much advantage, with the result that the former gets the sale.—Medicine Lodge, Kansas.

The manufacturers could improve conditions if they would give a more liberal commission and at the same time put more restrictions on the sale of the goods they produce. I find that it is not the price so much that sells the goods as it is the quality. Good goods will sell and the dealer can make more by having a longer commission, if the manufacturers will stand back of the goods they put out to the dealer, so as not to encourage price cutting by some little fellow who is just starting out and who does not know what it costs to run a business. As a result of this the good dealer is hurt, as there is always some one else to start and lose money in the same way. Under these conditions the old dealer has to cut prices to stay in business.—Davenport, Iowa.

Manufacturers should try to find some solution for the catalogue or mail order house low price competition. It is rather hard to maintain standard prices when customers quote catalogue prices to the dealer in the smaller towns.—Peterson, Iowa.

Sell the dealer direct at a lower price than the jobbing houses. Material can be bought in New York for 50 per cent. of the local jobber's price. Why not standardize the prices and eliminate the discount.—Madison Lake, Minnesota.

For More Local Advertising.

We believe that the manufacturer should do more local advertising. When you see an advertisement in the local paper it brings home the idea that you can see the car or accessory in your own town. National advertising may be impressive, but when the reader knows that the article described can be found at a local dealer's store this impression may be more lasting, and any desire to see the article can be easily satisfied.—Sioux City, Iowa, and Leader, Minnesota.

Give us good cuts of articles, showing sectional and other views for our catalogue work.—Memphis, Michigan.

A little more co-operation in the service department, and I would suggest that they use more advertising and also help their agents by mailing a stock form letter to all live prospects that their agents may suggest.—Westpoint, Indiana.

The manufacturers could help the dealer by advertising locally as well as nationally. Many people of the country read weekly newspapers as well as magazines. Some never read the latter. Advertising one price only and not changing the styles so often also would be a great advantage to the dealer. Naturally prices are increased more or less with every change in model. The constant changing of models adds to the expense of the manufacturer and in the end comes down to the dealer. We are all out for profit and the appearance of an article determines to a great extent whether or not it is a profit getter. We dealers should insist upon quick sales and small profits, and the strict maintenance of prices.—Carrollton, Kentucky.

More Prompt Deliveries.

The manufacturer should ship repair parts with more dispatch than he does now. He should see to it that the parts are sent via express company that

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has an office in the town where the dealer is located. For instance, in Fort Madison, we have Adams and Wells-Fargo, but most of the time the manufacturers ignore our instructions and ship by American which means that it takes from three to five days longer for the material to reach us. Every day I see tires and auto supplies destined for Burlington and Keokuk shipped into Fort Madison through Wells-Fargo to be transferred the next day to Adams, which covers those cities. Through this arrangement valuable time is lost. When it comes to service, the manufacturer should certainly look to his shipping department, for there should be a service to dealers just as much as a service to the car owners; they are dependent upon each other.—Fort Madison, Iowa.

The manufacturers should be able to furnish a car at the time that the agent has the best opportunity to sell. They insist on our taking cars when we don't want them and when we do want them they are not to be had. Nothing discourages a dealer more than to sell a car and then find that he can't deliver it. After the customer has waited and waited until he is worn out, an agent for a different car comes along, takes the customer to the city and drives a car home the next day.—Greensburg, Indiana.

To my mind the ways in which a manufacturer can help sales are: (1) A well arranged systematic advertising campaign; (2) Bring out cars and body styles in time without excessive delays; (3) Give prompt and efficient service, and (4) Build an honest and conservative car for a fair list price.—Worcester, Massachusetts.

The manufacturers might have sufficient cars on hand when they announce a new model to be able to make deliveries at once. At present they announce a new model, and then it is two or three months before we dealers in the West get decent deliveries, and you can readily see that this cuts our selling down to ten or nine months. Still they say, "keep up your winter sales and repair business," and don't take into consideration that in order to sell cars we must have them on hand. I think that they should not announce a new model until they have sufficient cars on hand to take proper care of their agents. This is a very vital point with us dealers.—Wilson, Kansas.

Help of Experts.

If a manufacturer should send a real salesman to instruct our men we think it would be a big help. By real salesman, we mean a man who has had actual experience selling motor cars and has made good. There are too many factory representatives who evidently got their jobs by a pull or because of lack of men, and all that they are good for is to make a bill of expenses to be added to selling cost, which is really waste.—Waterville, Maine.

Have expert salesmen make regular visits to the dealers and instruct the local salesmen and car owners in the features and operation of the car they represent. Letters and pamphlets do not do much good, as few people give them serious consideration. An expert factory representative could help local salesmen to close deals that otherwise would be lost. —Brazil, Indiana.

Selling conditions would be improved if the manufacturer would refrain from placing too many agencies for his product in small towns where his goods are unknown and sales are few. Some dealers will stock up with a line and push it only to find that other dealers in his town are handling the same articles. The result is that all the dealers lose interest in the line. Overloading is another bad practice with some manufacturers. A marked improvement could be made if the factory would send one of its road men to dealers who find themselves in this position and have that man help in pushing the items among the local prospects. I find that people are sometimes more convinced with the selling talks of a stranger than with the efforts of the local merchant, provided a little tact is used.—Coleraine, Minnesota.

More Circulars Needed.

Manufacturers should send out letters and circulars with the dealers' imprint at least every three months. These letters should be written for local consumption. I find this a great help. Serial form letters have been very prominent factors in doubling my sales during the past year.—Fennville, Mich.

Better business might be developed if the manufacturers changed their window display material more frequently or arranged for an exchange of this material between dealers every month or so.—Russelville, Indiana.

The manufacturer should produce literature describing his product in such a manner that it would be really understood by the ordinary prospect.—Losantville, Indiana.

Catalogues and prices are distributed too freely among people not in the business.—Webster City, Iowa.

I should think that to furnish special "write-ups" for circular letters to prospects treating on their product, or, better still, supply these letters to dealers would give the dealer great help. Most of us are busy and find little time to properly construct such letters, and may not have the best information to draw from.—Portland, Maine.

Other Complaints.

Last year a number of manufacturers realized a net profit per car in excess of the retailers' net profit. This should not be so. Manufacturers in general, because of the volume, usually net a profit less per unit of manufacture than the retailer realizes. No assistance or suggestions are given as regards the arrangement of window displays, salesmen, etc. The average manufacturer's salesman works under the direction of a branch, usually on salary and commission basis, and he is keen only to load the dealer with cars, the latter to dispose of them as best he can. The direct mail advertising done by manufacturers is helpful when supplemented by periodical letters from the dealers who can instill some local color to the advertising. National advertising not connected by local newspaper or direct mail advertising does not materially assist in local sales. The combination of both is good. The manufacturer does not insist on price maintenance and has not protected the dealers on territory restrictions.

We believe that one step that might be taken by the manufacturers to improve price and territory restriction conditions would be to confine their sales efforts to men or companies engaged principally in the automobile business. In their effort to push their lines in territories already covered by their competitors the manufacturers will place agencies with every blacksmith, hardware or drug store that

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will handle them. The result is that these stores dump automobile accessories on the market at cut prices in order that they can get a quick return of their money.—Lyons, Michigan.

The manufacturers should study the different localities and give the help necessary for the needs of the various sections. They should not try to overload the dealer. They should help with local advertising and should see to it that all minor troubles in their product are rectified before goods are shipped to the dealer.—Haskins, Iowa.

Manufacturers could assist us in selling their goods by insisting that the dealer get a reasonable margin of profit. In connection with the maintenance of price, we believe that the manufacturers should even go as far as to take their goods from the dealers who do not sell at the list price. At least, they should not sell them any more goods when they know that prices are not being maintained.—Berlin, Iowa.

DEMONSTRATIONS VS. SALES.

How a Truck Salesman Failed to Get the Order and the Dealer Closed the Sale.

BY CHARLES L. FUNNELL.

Not long ago an up-state New York truck dealer woke up to the fact that the largest grocery in his town was using six horse-drawn wagons for delivery work. The dealer sent his salesman around to the store manager with a three-quarter ton truck to make a demonstration. The manager was taken up a few hills, and told about the gasoline used per week, operating costs, etc., but somehow he was not impressed.

A few days later the dealer went to see the store manager.

"What's the matter with the truck idea?" he inquired. "With our truck you can save time and money and cut down on your help."

"Your demonstrator didn't tell me anything about that," explained the store manager. "He kept saying that your truck was the best made and I didn't dispute it for a minute. But our horse deliveries get the goods to the customers all right. Why should we change?"

"I'll show you. Tomorrow morning you let me bring that truck around with a box body on it that will hold a string of those order baskets of yours. Then give me a delivery man and time me on any old route you have."

The grocer was agreeable. He couldn't lose, so the following morning the truck was backed up to the store to receive its load of routed orders. Promptly at ten o'clock they started out on a route that took the horses two and a half hours to complete. The country was hilly, and only a small part of it could be traveled by horses at more than a walk. The truck took most of the grades on second, and succeeded in cutting the running time in half without breaking an egg or spilling any kerosene on the potatoes.

Just to show that it was no accident the garage owner insisted on taking another route, beating its standard horse time by an even better margin than at first. The test resulted in the sale of one truck at once, and a second a month later.

The secret lay in showing the grocer just where the machine fitted in his every day business. It cut his delivery time in half and made possible the delivery of rush orders to accommodate customers. As a three-quarter ton truck, the machine had no interest for him, but as a modern, economical delivery system it proved to be an improvement he could not afford to be without.

The salesman profited by his lesson, and later he sold the ice man and the milkman on the basis of increasing the radius of delivery and in less time than required by the horses. The incident illustrates the difference between order taking and salesmanship.

The Magic Touch of the Wheel.

From C. L. Funnell, New York.—Many a dealer has located a prospect with plenty of money, demonstrated successfully, and then failed to close a sale at the last minute for no apparent reason. Perhaps the possible buyer even expressed pleasure in the performance of the car, and yet failed at the end to make up his mind to part with the necessary cash.

"Closing the sale," remarked a successful garage man the other day, "is not merely half of the job. It is more nearly seven-eighths of the work. Unless you actually make the sale you must charge your time to advertising, and that is the head under which you must also put the cost of gas, oil and depreciation on the demonstrating car. Of course it is an excellent thing to have an almost-owner going about telling friends what a nice ride he had in your machine, but it does not pay the freight.

"The big trick is to get the signature on the contract. Anyone can stir up interest on the part of the prospect. Our plan is to take a man out on a good straight road and let him get behind the wheel himself. If he has never driven before, so much the better. Work his clutch and gears for him, and help him a little with the steering, all the while explaining to him how simple it really is to drive a modern car. After he has steered a bit himself, and perhaps passed a few acquaintances, he begins to think of the car as a possible possession.

"When you do all the driving he feels that he is riding with you and looking at a piece of machinery that you have to sell. It's different when he sees the road sliding in under the fenders and knows that he is guiding the wheels himself. It gives him a mental picture of the long afternoons and evenings of fun ahead of him, and that mental picture is worth more than hours of talk on wrist-pin lubrication and factory methods. When we get a man pretty nearly ready to close we shut up and let the magic touch of the wheel do the rest. It nearly always works."

SOLVES ELECTRICAL PROBLEMS.

Official Auto Wiring Guide Should Be in Hands of Every Repairman.

The increasing use of electric lighting and motor starting as well as the pronounced tendency towards use of the battery system of ignition on pleasure automobiles has complicated matters for the repairman and garageman to say nothing of the owner. The time was when the repairman could handle any electrical equipment because of his practical experience and acquaintance with the devices, but this condition no longer obtains for the simple reason there are dozens and dozens of different types of motor starters and generators, to say nothing of the vari-

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ous wiring methods. It is, therefore, impossible for any one to commit the multitude of details to memory. Because of this one must consult the wiring diagram of the maker of the system. These diagrams are essential when trouble is experienced or when an old wire is to be replaced with new.

It would not be practical for the repairman to attempt to collect the various diagrams needed in his business as it would take months and be very costly. Then again he would have no assurance that the charts would be correct. All of this trouble has been avoided by the efforts of the International Motor Institute, whose corps of electrical experts have gathered and incorporated in a very comprehensive book diagrams for every system and car manufactured, including many makes now discontinued. There are over 500 pages and approximately as many guaranteed diagrams, and the charts are arranged in the form of blue prints which are very easily read. In addition the brochure gives complete information for the care, repair and maintenance of storage batteries. The book is well bound and is endorsed by leading authorities in the automobile industry. It is valuable if for no other reason than it saves an expensive repair bill for the customer when his electrical system develops a fault.

Care of the Motor Top.

Probably more harm is done to the tops of motor cars by careless folding than in any other way. It is well to dust off the top before folding, for dust between the folds tends to wear away the fabric when the car is in motion. Care should be taken that there are no sharp bends or creases in the top when it is folded.

It is important that the top bows be strapped tightly together, so that there will be no motion or chance for wear between the parts of the top. After the top has been folded for some time, it will be found that the straps have stretched and they should be tightened.

When the top lining has become faded and discolored, it can be blackened by the use of a can of Johnson's "Black-Lac."

If the celluloid windows are worn or scratched, they can be made more transparent by varnishing the rubbed surfaces with a thin coating of transparent varnish. A good varnish for this purpose can be made by dissolving a quantity of transparent celluloid in acetone, making the solution very thin and applying more than one coat, if needed.

To patch a celluloid window, moisten the surfaces with acetone and press together, holding until dry. This will hold securely and be just as transparent as before.

Good Advice Advanced.

With tires one of the largest items of expense the owners must meet, it seems but natural that the tire should receive more than ordinary care and attention. Especially during touring time they will require weekly inspection. If any small cuts less than three-quarters of an inch long are discovered in the tread they should be plugged with plastic rubber. If the cuts are deeper and longer than three-quarters of an inch it is advisable and will be found economical to have them vulcanized. It is not the tread cut itself which is so dangerous as the trouble which may come because of the cut. A tread cut allows water and dirt to enter and the dirt usually forms small lumps, which work their way deeper and deeper into the rubber, finally reaching the fabric. If the fabric should begin to rot at one point that spot becomes weak, and a slight bruise may cause a blowout. A weekly inspection of the tires, with a view of repairing all tread cuts, will result in more tire mileage. The cost of plugging or vulcanizing is not usually one-third that of the cost of the lost tire service.

Rocking Fifth Wheel for Trailer.

The illustrations show how easily a rocking fifth wheel can be made from an ordinary fifth wheel of a wagon, so that a wagon can be used as a trailer attached to an automobile. Fig. 1 shows a side view of the device and how it is attached to the bottom of the wagon and chassis frame. The upper circular part of the fifth wheel A, is bolted to three cross bars B, which are as long as the wagon body is

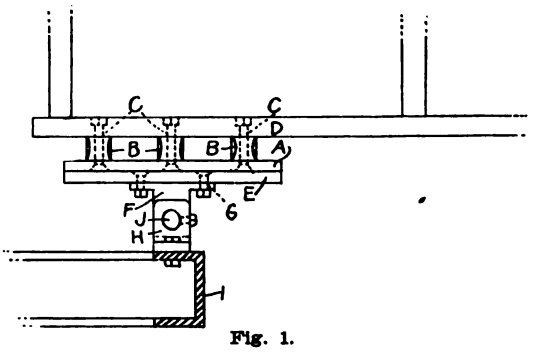


Fig. 1.

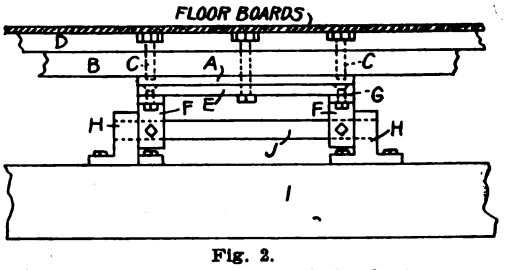


Fig. 2.
Showing application of rocking fifth wheel to wagon.

wide. The bolts C, extend up through the bottom cross bars D, of the wagon as shown clearly in Fig. 2, which is a rear view. The lower circular portion of the fifth wheel E, has two bearings F, bolted on each side, one end of bolt C, and G, being counter sunk in both circular portions of the fifth wheel. There are also two bearings H, of the same size as F, bolted to the rear of the chassis frame I. The bar or shaft J, placed through the four bearings gives a rocking movement to the entire fifth wheel. Bearing F, has a machine bolt to hold the shaft or bar from working out of the bearings H.

Do not fasten chains too tightly nor to a spoke. Many a tire has been ruined by disregarding this advice. If a chain can creep it will wear the tire evenly. If it is fastened so that it cannot creep the cross links wear in one place and the shoe is damaged.

If at any time you open the switch and the engine continues to run it is due to glowing carbon or overheated engine. Close throttle, put gears in low speed, apply foot brake gently, and let it clutch suddenly. This will stall motor.

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A MARVELLOUS INDUSTRY.

And the Importance It Bears to the Welfare of the Country.

The following article by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, was written for the information and use of the members, and some of the members of that organization might read it with a good deal of profit, but it is good general reading as well, giving as it does many important facts concerning a gigantic industry and the most useful vehicle ever used by man.

"We are all engaged in one of the greatest and most useful industries in the country. We are proud of the progress it has made, of its strength and stability and of the high character of the men engaged in it. Let us take it seriously and unite our efforts to convey this feeling to every one else.

"Don't call it a pleasure car—call it passenger car or automobile. Don't dwell on luxury—keep utility in the public mind. Don't advertise useless stunts —dwell on economy of consumption, saving of time of busy men, low upkeep; encourage fuel saving by contests and in other ways. Don't exaggerate sales, profits, production, etc.—be moderate, or say nothing along these lines. Don't send out extravagant stories about the vast sums of money spent for cars, equipment, supplies and touring. Don't dwell on speed and power—talk about durability, safety and convenience of use. Don't feel obliged to get a free advertisement into every publicity article—do some constructive work for the industry as a whole: the papers and the public will like it better. Don't take too seriously the talk about failure of the supply of gasoline and possible curtailment of use of passenger cars.

"Gasoline should be economized and waste avoided. However, processes for extraction of increased percentages of gasoline from crude oil are being put into extensive operation. Kerosene can be used successfully if necessary and there are a number of kerosene carburetors on the market. Government reports show almost unlimited deposits of oil-bearing shale in western states from which large quantities of gasoline can be extracted. Many oil wells in Mexico are still capped. Alcohol can be used as a gasoline substitute or in combination with it. Any farmer can distill alcohol from waste products at small expense if certain legal restrictions are removed. Distilleries that suspend manufacture of whiskey can make alcohol in large quantities from sawdust and other wastes.

"The automobile fills a real transportation need. It is estimated 40 per cent. of the motor cars in America are owned and used by farmers. There are three times as many automobiles in Iowa, Nebraska and California in proportion to population as in New York State, Massachusetts, Pennsylvania or Illinois. Increase in car sales has been several times larger in agricultural states during recent years than in manufacturing states. Doctors, traveling salesmen, highway officials, municipal department heads, contractors and builders, and men engaged in many other lines find the automobile indispensable in their work. By its use they save many valuable hours daily.

"Efficiency is increased by use of time-and-labor-saving machinery. The automobile is essentially time saving. To insure success in the war the farmer, manufacturer, miner, contractor—all are urged to increase efforts and production. The automobile used in business is an economy—not an extravagance. Wholesome recreation in the open air is a great revivifier and invigorator. It enables the hard-working business man to continue intense efforts without breaking down. The automobile affords such recreation. President Wilson takes his relaxation in an automobile every afternoon.

"Greater passenger-mile service is rendered by the passenger automobiles in the United States than by the entire railroad or street railway system of the country. The 3,700,000 passenger cars, averaging 5,000 miles a year and three persons each, give a total of 55½ billion passenger-miles. At a rate of 2 cents per mile, this is worth $1,110,000,000 a year.

"Five acres of tillable land are required to support one horse; three acres to support a man. If each automobile takes the place of only one span of horses, the 3,700,000 cars release 37 million acres of land for production of food-stuffs for more than 12 million men—the total force employed in the war by all the allies. Approximately one million wage earners are employed in the motor vehicle industry. The majority are skilled mechanics. The automobile factories and their organizations of mechanics are an invaluable asset to the nation in military activity. They can be used for production of aeroplane engines, parts and complete machines and for manufacture of ammunition.

"Efficient transportation is essential to military activity. The armies in Europe are almost entirely dependent upon motor transport of supplies and ammunition and on motor ambulances for removal of the wounded. The American Army will need thousands of passenger automobiles for officers and tens of thousands of motor trucks for the Quartermaster's department.

"The billions of dollars to be raised for war purposes by bond sales and taxation will return almost immediately into circulation through payments for purchases of supplies for the government of the U. S. and the allied governments.

"Farm crop reports show record production; manufacturing is booming, prices are high, good salaries and wages are being paid and profits are large. False economy destroys efficiency. Elimination of waste applies to waste of time and effort as much as to material things.

"The national emergency requires that money shall be kept in active circulation, that labor shall be employed fully and that production of necessaries shall be greater than ever before. Men must make good wages, salaries and profits in order to subscribe for war bonds and pay excess profits and consumption taxes. Therefore, wise buying must go on.

"Stability of the industry is shown by the fact that stocks of the leading English automobile companies were higher on July 4, 1917, than on July 27, 1914, just before the war, despite the commandeering of cars and trucks and restrictions against the use of gasoline. German automobile companies have earned large dividends during the war. All European automobile plants have been extended during the war. Even if the use of passenger cars should have to be curtailed in the U. S. for a period,

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the factories will be kept as busy as ever in the production of trucks, airplanes and munitions. After the war there will be a great world demand for cars and trucks. Exports during the last two fiscal years have amounted to nearly $100,000,000 yearly.

"Increased output of farm, factory, mine and forest products demands greater transportation facilities. Railroads are congested with freight as never before. Congestion is mainly at terminals. Trucks save manufacturer and merchant valuable time in making shipment to points within 100 miles.

"Retailers and the public are called upon to reduce local delivery service and release men for military and other work. Each motor truck and delivery wagon does the work of three or more horse-drawn vehicles, cutting down the cost and releasing two or more drivers and as many helpers. By use of motor trucks farmers can haul to market while keeping their horses working in the fields. They can make several trips with a truck in a day to one with a team or can haul two or three times as far. This brings into use good land formerly too far from market for profitable farming.

"One truck can do the work of five horses, on an average. This releases at least two drivers, and farm labor is very scarce and high-priced. It also releases 25 acres of land for the production of human foods. The 350,000 motor trucks in use in the U. S. release 7½ million acres—sufficient to support 2½ million persons. Averaging 50 miles a day with a load of only 2 tons for half this distance, the 350,000 trucks perform 5¼ billion ton-miles service yearly. At an average cost of 26 cents per ton-mile for haulage by road in city and country by horse-drawn and motor vehicle this service is worth more than a billion dollars. The War Department has definitely assured the N. A. C. C. that there is no intention of commandeering privately owned trucks or cars for army use. It is confident it can secure new machines from manufacturers as fast as needed and expects to award contracts so as to interfere as little as possible with sales and deliveries to business houses and individuals."

Tracing Electrical Troubles.

From Murray Fahnestock, Pennsylvania. — As electrical troubles are often more difficult to locate than to remedy, it is well to have a system for locating such troubles by elimination. Proceeding, as Sherlock Holmes hath it, by observation, knowledge and deduction.

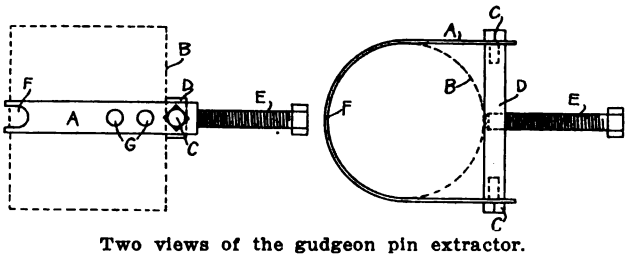
If the electric starter fails to work, observe whether the electric horn and the lights are still in good order. If the lights burn brightly, it is reasonably certain that the storage battery is sufficiently up to par, and the trouble has been localized in the starting circuit. Opening the fuse box, the fuse for the starting circuit should be examined. If it is blown,—Stop! Inserting another fuse is the natural thing to do, but deduction tells us that the short-circuit that caused the original fuse to blow is probably there still. Thus it is only wasting a second fuse to insert it before finding and removing the frayed wire, the jammed motor, or other cause of the trouble.

The ammeter can also be used to great advantage, at times, in locating electrical troubles. If the ammeter indicates ten amperes, when the head lamps are turned on, and it normally indicates only four amperes, it is evident at a glance that there is something wrong with that particular circuit. A lamp that goes out intermittently indicates a loose connection or a broken wire. If the wire feels unusually flexible beneath the insulation a broken wire is probable.

By the use of a system of this sort, one can either begin at the battery, as the source of current, or at the lamps as the point where the current is utilized. Thus the cute currents can be traced to their short-circuits and the trouble easily eliminated.

Gudgeon Pin Extractor.

From M., in the Autocar.—Having occasion to remove the gudgeon pins from my engine, I found it impossible, without special means at my disposal, to move them without very considerable risks in the way of breaking the pistons. I therefore devised and made the simple little tool shown in the accompanying illustration. This consists of a band of flat steel, A, which partially encircles the piston, B, its ends being secured by two set screws, C, to a solid steel cross piece, D, through which passes a stout bolt, E. When the tool is placed in position, the bolt, as it is screwed through the block, tends to force the gudgeon pin out of the piston, the pin



Two views of the gudgeon pin extractor.

passing through the slot, F, formed in the steel strap on the opposite side. The tip of the bolt is hardened, so that it shall not be blurred when turning and pushing against the end of the gudgeon pin.

If two or three holes, G, on each side be drilled in the steel strap, the tool becomes adjustable for use on pistons of various sizes. The same tool is extremely useful when gudgeon pins are being refitted, for, although the strap would have to be made considerably longer than shown if the tool were to be used immediately after the gudgeon pin had been entered into the piston, I have usually found that it is the last quarter of an inch that gives the trouble, and in such a case the steel strap need be only slightly longer than shown in the sketches.

Gasoline for Priming.

When in need of a small quantity of gasoline for priming purposes and no other available way of securing it is handy, it can be secured by tying a string on one of the tire valve dust caps and letting it down into the supply tank through the filler hole. Care should be used that all dirt is wiped from the cap first. The amount of gas thus secured is usually just enough to prime one cylinder.

It is pointed out that if commercial firms using slow moving trucks find it to their advantage to carry liability insurance it would follow that it would be a much greater advantage to the owners of pleasure cars, which are operated at a much higher rate of speed to do the same thing.

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WORLD TIRE STANDARDS.

English and French Manufacturers Desire to Co-operate with America.

In 1915 the Standards Committee of the S. A. E. tried hard to obtain some support from British and French tire makers for the setting up of international standards for solid tires. At that time the attention of the foreign manufacturers could not be obtained, but it now appears to be good reason to hope for an international standard within a reasonable time, according to the Automobile and Automotive Industries.

In 1915 W. H. Paull, of the Dunlop Company, the largest rubber company in Europe, and one of the largest in the world, visited America, and was in close touch with the international idea of the S. A. E. The British paper, Motor Traction, in a recent issue comments editorially on the subject of tire standards, and it is obvious that Mr. Paull is still anxious to see the work carried through, as the following will show:

"W. H. Paull, at a meeting of the Technical Committee of the motor industries, put forward a suggestion which was adopted by that committee to the effect that the time is ripe for an effort to be made to introduce an international standard of wheel and tire rims for solid rubber tires. The view is expressed that France, Italy, Russia and the United States will be willing to co-operate with Great Britain in the creation of standards, and this opinion has been forwarded to the Engineering Standards Committee.

Favor Army Standards.

"The subject is a very important one, which can be regarded either from the international or from the imperial point of view, or from both. If British manufacturers of vehicles and tires could unanimously agree to the adoption of certain standards the results should have a favorable influence upon manufacturing costs. Thus progress in this direction might be made advantageous to the British industry as compared with all others. If, on the other hand, it is thought to set up standards by agreement with the Allied countries, then the resulting effect upon cost of production would be beneficial to all those countries as against others not included in the group. The more comprehensive the scope of the movement the more advantageous it should be to motor users as regards both cost and convenience.

"Up to the present we in this country have allowed ourselves to drop rather behind in this matter of standardization of tires and rims. A good example has been set by the United States government, which, in placing huge contracts with American manufacturers of motor vehicles, has specified the provision of interchangeable rims on all road wheels, so that tires can be removed and replaced without difficulty by a mechanic and his assistant. In the specifications of the motor transport board of the United States army War Department for one and a half and three ton vehicles for the use of the army the following paragraphs appear, and we are certain they will interest our readers:

English Favor Plan.

"The wheels shall be of suitable size and design for the use of 36 inch by 4 inch single solid S. A. E. demountable rubber tires on front wheels and 36 inch by 7 inch single solid S. A. E. demountable tires on rear wheels.

" 'The steel fastenings for demountable tires shall be constructed in accordance with drawing Q. M. G. O., No. T-101. Trucks will positively not be accepted having tires or tire fastenings which differ from those herein specified.

" 'All tires shall be best quality solid rubber tires on hard rubber base with S. A. E. steel rims.'

"It is evidently incumbent upon us in this country to standardize either rims and tires exactly in line with those adopted by the United States, or else something decidedly more advantageous and better from the point of view of the user. The question, then, that deserves most serious consideration is whether we could not adopt as a standard a form of detachable tire and rim which would enable tires to be easily changed without the use of special machinery and without necessarily removing the vehicle wheel.

To Overcome Rust.

"From time to time various designs have been brought forward conforming to these requirements, but one of the difficulties that have stood in the way of their extended use has been the tendency for the joints, on which easy dismantling depends, to rust up fast during prolonged use upon the road. It ought to be possible to overcome this trouble by suitable research and experiment. We can imagine few subjects more deserving of the prompt attention of the technical committee of the motor industries than this question of tires and rims. The necessary reform can only be brought about by a body so influential and so certain of general support as to be able in effect to compel individual manufacturers either of tires or wheels to fall into line. The committee now existing should, particularly in view of its relations with the Engineering Standards Committee, be in a position to carry through against all opposition any program as to the desirability of which it is unanimously agreed.

"Some time ago notice was given of the formation of a joint technical committee of the Institution of Automobile Engineers and the Society of Motor Manufacturers and Traders, on which government departments were also to be represented. The committee has just held its third meeting, at which A. A. Remington, of the Wolseley Co., was elected chairman for the year and Lieutenant-Colonel R. K. Bagnall-Wild, vice-chairman. A resolution was adopted to the effect that the time is now ripe for a serious effort to introduce an international standard of wheel and tire rims for solid rubber tires. It is believed that France, the United States, Italy and Russia would be willing to co-operate with Great Britain in this matter. A copy of the resolution was ordered forwarded to the Engineering Standards Committee.

Aid to Engineers.

"It was decided to collect data on several subjects of proposed research, and a suggestion has been made to the committee that a Bureau of Technology be established, where technical information regarding all branches of the motor industry might be obtained and which might issue a periodic prècis of up-to-date information relating to late scientific advancement and its bearing on automobile engineering. Such a service would be of great value to automobile engineers, but it would require the finan-

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cial support of the manufacturers, though it is quite likely that the government would make a substantial contribution through the Department of Industrial Research.

"Another proposal is to the effect that the committee lend its aid for the better co-ordination of engineering training, and steps to this end have already been taken. The committee is represented on all the automobile sub-committees of the Engineering Standards Committee and is doing all in its power to help the work of standardization."

AMONG MASSACHUSETTS GARAGES.

A One-Legged Man Achieves Success in Repairing—Crossing Railroad Tracks.

BY JAMES F. HOBART, M. E.

This forenoon, I saw two one-legged men, each of whom were making their living under very different conditions and want to leave the matter to readers of this magazine as to which of the two men had the right spirit. One of the men was comfortably disposed under a railway bridge which crossed a well traveled road. He had a box of pencils into which some of the passers-by tossed a nickel or a dime, often without stopping to take a pencil—costing ten cents per dozen wholesale—in return.

The man must make a good thing of it for he is there day after day, comfortably seated upon a sack which was apparently well stuffed with some soft substance and there the man sits with his stump of a limb prominently displayed in a manner which no passer-by can help beholding.

The other man is doing repair work in a garage and a mighty lively proposition he is too. He uses a crutch, but for all of that he seems to get around and handle tools as well as the other man in the shop who has both feet. The single foot man can get under a car fully as quickly as a man with two feet.

The crutch seems almost to take care of itself and is almost entirely managed by the arm, above the elbow, of the side from which the foot is missing. This leaves both hands free for using tools and when working on a car, the crutch is usually discarded unless some stepping around must be done.

A steel hook permits the crutch to be hung up when not in use and the man will catch the crutch hook over a convenient part of an automobile, where the crutch is handy to the hand, and then go on with his work, standing on one foot, but able to catch up the crutch in an instant whenever it is necessary to step along to get tools or material.

The one-legged repair man passes the bridge beggar twice daily and never fails to berate him soundly for his manner of living. It is an open question, as yet, which man receives the greater income but there is no question whatever regarding which is the most respected in the neighborhood. Furthermore, the example may be a valuable one to some men who have had the misfortune to lose one of the lower limbs and are trying to select some method of earning a living where the great handicap will not put them out of the running altogether.

To be sure, a whole lot depends upon the individual, but there is a chance in the care and repair of automobiles which many a war veteran can avail himself of and thereby avoid the "pencil-begging" which the other man affected. And the garage worker obtained a whole lot more of pure sympathy than the pencil worker was able to get hold of, showing that the public, as usually is the case, was quick to put their business into hands which really deserved patronage.

Handle Fine Tools Carefully.

It always makes the writer feel badly to see good tools abused, and recently when a man tested out a tire he was filling and threw the tire gauge on the floor while more air was pumped in, it "went against the grain" to see a good tool thus abused, particularly by a man who was supposed to know better.

The workman was—and that makes the matter all the worse—a "cod-fish" Yankee (the writer is one, too) and therefore is supposed to know how to handle and take care of tools. But he threw the delicate gauge on the floor with wrenches and hammers with never a thought that the tube which contained the piston and spring might be slightly dented, thereby putting the gauge out of business. The incident calls to mind a circumstance which happened long ago between a mechanic and his son. It appears that someone wanted to borrow a tool from the son and the older man expressed his opinion of tool lending as follows: "Never lend a tool to a man who gets less than $2.50 per day, for he is not capable of taking care of tools. And never lend a tool to a man whose wages are more than $2.50 per day, because he is able to buy tools of his own!"

Safe advice, that, and it should be enforced by garage and repair shop men who lose dozens of tools annually through good lending and poor returning. There is another tool, besides the tire pressure gauge which receives many a hard knock which it is not entitled to, and that is the "battery-tester", that handy little watch-shaped tool which indicates at a touch whether a dry cell will yield 30 amperes or zero. Handle this tool carefully and it may be depended upon for a good many years, but let it knock around in a tool or a cigar box with a lot of screws and nuts and you never will know whether the gauge is to be depended upon or not.

Driving Across Railroad Tracks.

There is a railroad crossing almost under my window, as I write this story. It has caused many a broken spring and nobody knows how much damage to transmissions and gears by the sudden shocks due to incautious driving. To be sure, it is the driver, not the crossing, who is to blame for the many breakages which have been laid to this track crossing, and this crossing is no worse than dozens of other crossings; particularly those which happen to be located on a curve. And to make the matter worse, as is the case with this crossing, the highway crosses the railway track on a grade.

When the railroad track is straight, there is apt to be very little trouble at crossings, but where the crossing is laid down upon a heavy curve, there is sure to be trouble unless the car driver is wise to a few facts and looks out for the trap which may exist at the crossing. As stated, when the track is straight, all the rails are of the same height and the planking, together with the gravel filling between the two or more tracks, is smooth and level. But when the track curves, something happens as shown by the drawing. The rails of each track. A and C, are on the same level with each other and rails B and D are also level with each other; but

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rail B is not on the same level with A, and D is higher than C, thus making the crossing into a series of short inclined planes as shown.

When a car comes down the grade F, the inexperienced driver, seeing an apparently smooth railroad crossing before him, is pretty apt to let the car come down at a fair rate of speed, intending to go still faster when the lower pitch is reached at E. But all is not smooth coasting as it appears from the pitch F.

A railroad track is made up of "curves" and "tangents". On each and every curve, the outer rail must be elevated a certain amount, depending upon the sharpness of the curve, in order to prevent the locomotive and cars from toppling off the track should they undertake the curve at a high rate of speed.

Rails A and C are shown upon the same level, and it is also apparent how rails B and D have been raised to keep the trains on the tracks. This makes it "up-hill" from A to B, down-hill from B to C, up-hill again from C to D, and up-hill still more from D, up the pitch F. Therefore, when a car coasts down incline F, it finds itself in a bad "potato patch" upon the crossing and before the speed of the car can be checked, it has been bumped two or three times very badly, and limps off down the incline E with perhaps a broken spring or some worse trouble.

Thus a car driver cannot be too cautious when approaching a railroad track, particularly one upon



Illustrating how railroad tracks on curves create bumps and depressions.

a curve of the railroad and especially upon a pitch in the highway. It is a well established driving rule that a car should always be under good control when approaching a railroad crossing down a pitch of the highway.

Oiling a Leather Auto Top.

There are "store" preparations which may be bought in required quantity for treating automobile tops which chance to be made of real leather, but don't let the top go without dressing just because you can't get out to purchase liquid to fix the top with. Just procure some neat's-foot oil, and treat the leather with it.

If you cannot obtain the neat's-foot oil, then go to your butcher and have him save for you a dozen or more feet from the beef cattle he kills. Put the hoofs into boiling water until the horn covering can be pulled from the feet. A good strong hook is necessary for this purpose and one similar to that used by freight handlers will do the business nicely.

I am afraid that the makers of commercial neat's-foot oil have a habit of grinding or crushing the feet with hoofs and hair all on, but the best oil is made after the hair and horn have been removed. Place the cracked-up feet in a kettle of water and boil until the oil has worked out of the flesh and bones of the feet. In commercial work, a filter press is used to separate the oil from the scraps, but if you "try" out oil for yourself, you can make the separation by twisting the scraps in a bit of cloth and then squeezing through the fabric, as much of the oil as is possible.

When it comes to the actual oiling of the leather, don't be stingy with the oil or be afraid to put on a whole lot of it. In fact, just "slather" it on with a rag or sponge and put on all that can be made to stay without running off. There are usually corners where it is hard to make the oil penetrate. For such places, use a small brush and see that a flood of oil is driven into each and every corner or fold of the leather.

After the oil has remained for some time on the leather, wipe off all that will come and polish the top with the rag used for removing the surplus oil. An auto top treated occasionally in this manner will not wear out under many years of use, neither will it crack.

Wasting the Oil.

The writer was riding behind a Ford car recently when a large "six" passed and a cloud of smoke and gas almost completely enveloped us and our little "flivver". "There goes a lot of good oil to waste", said the other party in our car. "It is strange that people will not learn to use the proper amount of oil. That man is getting rid of twice as much oil as is necessary and not only is he wasting good oil and gasoline for which he has to pay big money, but he is also making himself trouble in several ways. Not only is he overheating the engine, but he is overworking the radiator, causing the water to boil out fast and over-loading the engine as well as over-heating it. And there is another trouble coming to him which is the worst of all. By using too much gas and oil, he is laying in a bad deposit of carbon on the pistons and the cylinder heads, which will cost money to remove. I tell you, son, too much gas and oil are mighty bad things to have in an automobile engine.

"Then there is another thing. When the average man is starting an automobile engine, he is very apt to use too much gasoline, too rich a mixture. When the mixture is too rich, there can be no explosion in the cylinder for a gasoline-air mixture does not become explosive until there are certain proportions of air and gasoline. Therefore, if the priming be too lavish, or the carburetor is set for too rich a mixture, the engine cannot be started any more than if it were filled with water and air instead of gasoline and air.

"More times than one, I have started a balky engine, which had been cranked time after time—with the oil jet wide open—by shutting off the gas completely and then spinning the engine a few times, after which the spark should be thrown on, a little gas turned on and away goes the engine, almost every time."

"Fording" the Hills.

I have recently been sojourning among the hills of northern Massachusetts where the valleys are so deep that they have to put more straps on the horses to prevent the animals from falling through the collar when going down hill! At least that dope is handed out free to visitors by the same old Yankee who tells you how much better the farming is in Massachusetts than in New Hampshire, where they have to hold sheep up by their tails so the muttons may get their noses down among the rocks where the grass grows!

But the old Yankee in question said that they don't have to ford the rivers any more, they have bridges, but they do have to Ford the hills and he

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did wish that "Henry" would just put one more speed in his machines. The above-mentioned Yankee had a Ford car, of the vintage of 1912, with which he did a whole lot of hill-fording and picked up a good bunch of change in hauling "S. V.'s" to and from the trolley line and the summer hotel at the lake.

"What is an 'S. V.'?" the old Yankee remarked as he stamped his rubber boots on the railway station platform. The old settlers of northern Massachusetts and New Hampshire always stamp their feet each and every chance they get. They forget themselves during the short red-hot summer months and really imagine they are stamping off snow as they climb upon the depot platform.

"Why do they wear rubber boots in summer? Why, stranger, how could a New England Yankee ever think of wearing anything else? Isn't the dew thick enough in the morning to float a Missouri river steamboat? And don't he have to wear boots of evenings to keep the 'skeeters from biting holes in his ankles? Sure he must wear rubber boots at plowing, hoeing and field work, therefore it isn't worth while to change foot wear just for two or three hot summer months, or while he is at church, or during the one day on which he goes to the beach. No, it doesn't pay to change foot wear for those few occasions, therefore the rubber boots are worn in New England Farmerville, all the time.

"My Ford is a crackerjack," said the old Yankee as he spat unerringly at the head of a chicken which ran under the automobile. "I sure will have the 'old boat' running fine by next month. I found a place this morning, where the gasket had blown out a little and all the 'compression' from one cylinder was sneaking out through that hole. But I got home all right on the other three cylinders. Say! I am going to take off the cylinders, clean up the joint with kerosene oil and sand paper, then I will make a new gasket from the top of one of my old rubber boots, and I'll bet you an ear of corn that my car will climb the meeting house hill better than Sile Haygrass can do it in his 'new' second-hand machine!"

The farmer was using his Ford for all it was worth, carrying passengers over the rock strewn trails which are called "roads" by the native born. The water all runs down hill right in the middle of the road because the sides are higher than the middle and the water can't get out of the road save at the bottoms of the hills. At every few feet will be found granite ledge rocks cropping up to try the temper of drivers, springs and shock-absorbers.

"I'm packing a stone hammer this trip," said the Old Farmer as he cut off the spark in front of the village store. "I have to knock the tops off of some of those rocks or I won't be able to get the car past them. They are fierce and get worse every year. I wish the Road Commissioners had to be pulled over those rocks by the heels until they would break them out of the roads.

"Say, mister," the Old Farmer continued, "I have to get some new pins in the pistons of my automobile engine for the last time I had the pistons out the little pins which go through the pistons and the connecting rods were loose and they make that funny rattling noise which you hear when the engine is running. Do you think I can put some pieces of tin in beside the pins in the rods and in the pistons, or how had it best be fixed? Sam Smith told me that the only way to fix it right was to have the pin holes reamed out and some new pins made larger than the old ones which would fit tight in both the piston and the rod.

"But I don't see why I can't file the holes out a little bit with a big rat-tail file. Then I have a broken crowbar and one end of it is just a little bigger than the pin-holes. After they have been filed out round, why can't I fit in pieces of the crowbar handle for new pins?"

The above is a fair sample of the ways and means of automobile repair in some parts of the country. Is it not almost a miracle that cars stand up under the rough usage and still rougher repairs? That they are able to meet the demands made upon them with too little breaking down of the mechanism? A car with a boot-leg gasket and crow-bar piston pins, certainly would be a rare object lesson in the great problem of getting there—and keeping there!

MOTOR CAR EXPORTS FALL.

Embargoes Affect Shipments but Loss in Trucks Is Offset by Passenger Cars.

Figures issued by the Department of Commerce show that during the twelve months ended June 30, 1917, the United States exported 80,811 automobiles and motor trucks, valued at $90,958,243, as compared with 77,499 cars valued at $97,465,811 during the preceding fiscal year.

The increase in number of cars exported is due to the larger shipments to most countries outside of Europe, which more than offset the decreases in exports to Great Britain, France and Russia due to import prohibitions and lack of shipping facilities.

The fact that the aggregate value of exports during the last fiscal year was less by $6,507,000 than in the preceding year, while the actual number of vehicles exported was greater by 3,312, is due to decreased shipments of trucks for war purposes, the average value of which is much higher than the average value of passenger cars exported to countries outside of Europe.

While the number of trucks exported fell off 5,288 in the year and their aggregate value was $14,468,-233 less, the shipments of passenger cars increased by 8,600 and their value by $7,960,665. Great Britain and France were still our largest markets, despite their heavy falling off in purchases. The former bought $18,508,442 worth last year, mostly trucks, as against $26,147,832 worth in the previous fiscal year. France's imports were nearly all trucks and amounted to $14,691,460 as compared with $19,137,904 in the twelve months ended June 30, 1916.

Owing to shipping difficulties and internal political troubles, Russia's imports fell from a value of $15,686,874 in 1916 to $6,371,982 in the last fiscal year. Aside from the European countries, Canada is America's best customer for motor cars, having increased her purchases by nearly $4,200,000—from $7,280,151 in 1916 to $12,088,787 in 1917. Next comes Asia and Oceania, with imports of 9,716 cars valued at $10,093,720 last year—an increase of $1,450,927. Australia follows. with 5,000 valued at $4,213,874. The British East Indies increased their purchases from $2,307,739 to $3,617,351. In the Americas. after Canada, the West Indies were our best market for automobiles, to the extent of

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$4,072,647, an increase of $1,248,735 over the year before.

The most remarkable increases, however, are shown by Mexico and the South American Republics. Mexico's commercial recovery is reflected by an increase from $409,700 to $1,833,975 in the year. Argentina's imports reached nearly 2½ million dollars. Brazil's trebled. Chile's prosperity from her nitrate mines resulted in an increase from $576,777 to $1,982,538. The rest of South America took automobiles to the value of $1,804,827 as against only $698,911 the year before. In addition to automobiles, the United States exported in the last fiscal year 23,435 automobile engines valued at $2,844,406; tires worth $12,330,201, and parts worth $27,284,932.

Takes the Place of the Railway.

A resident of this city, who spent the past several days in Everett, declares that there is enough freight passing over the Lincoln Highway daily to load a full-sized railroad train. The freight is hauled on giant tractors and motor trucks, running between Chicago and New York. It is claimed by those in charge of the work that the new method of transportation is more certain than railroads, owing to the overworking of the latter.

The tractors and trucks run in groups of six and eight in charge of a superintendent and carry all manner of freight, including meats and all sorts of food stuffs. The transportation of new automobiles by the highway route has also become a popular way of moving the machines from factory to purchaser.—Altoona (Pa.) Times.

Weights of Ford Cars.

When shipping Ford cars, or when making changes on the chassis or other parts, it is often desirable to know the exact weights of the different types of the Ford car.

Weight of runabout	1,380 lbs.
Weight of touring car	1,490 lbs.
Weight of coupelet	1,520 lbs.
Weight of sedan	1,700 lbs.
Weight of town car	1,700 lbs.
Weight of chassis complete less lamps and fenders	1,020 lbs.
Weight of motor and transmission	360 lbs.

To these weights add 20 pounds, if the motor is fitted with a cast iron transmission cover.

Runabout body	300 lbs.
Touring car body	400-415 lbs.
Coupelet body	450 lbs.
Sedan body	550-600 lbs.

Care of Tire Tubes.

It is difficult sometimes to determine just when a tube is unfit for further use. Porosity in a tube usually indicates that it has attained its three score and ten. At this stage very small cracks can be observed in the rubber if it is stretched and examined carefully. The next development is splitting when the air pressure becomes too great for the tube to bear.

If the rubber in a tube is "live" it may successfully bear as many patches as a beggar's coat. But due care must be exercised in the vulcanization of the patch to the tube, that too large a portion of the tube around the patch is not cured. If portions of the tube have been over-cured in patching operations, disaster is sure to follow.

Lack of proper care of the tube is responsible for most of the troubles tire users experience. Sufficient talc between casing and tube prevents the generation of heat which vulcanizes the tube to the fabric of the casing. Tube splitting is occasioned by the slipping of the tube between the casing and the rim, which soon results in a "pinch." The remedy is careful applying.

The protection of spare tubes is a matter that many tire users pass over too lightly. Usually spare tubes are folded and carried in the tool box, where they may come in contact with grease, oil and tools.

The grease and oil greatly reduce the quality of the rubber, while the tools many times cause the tubes to become chafed and worn and unfit for use.

Light Weight Cars.

At last the light-weight car is coming into its own. Not that it rides as easy on rough roads, but its saving of tires, fuel and general wear is of decided advantage. At the recent Memorial day race in Cincinnati the aluminum products of the Chevrolet brothers did not have to make a stop for tires, although there were three of them in the race. Two of the three, those which finished first and third did not have to make a stop for any purpose. The heavy Mercedes driven by Louis Fontaine had to make four tire stops out of the ten which were made. The Hudson which finished second did not stop. The 100 m. p. h. pace did not seem to trouble the light cars anywhere near to the extent that it did the heavier cars, either in tires or mechanical troubles. Where mechanical failures occurred they were due to trivial details rather than basic errors in design.

Denver to Hold Motor Car Show.

Denver, Colo., is to hold a motor car show. The event will be under the auspices of the Auto Trades Association and will be held the week of November 12-18. G. A. Wahlgreen is to have charge.

Pertinent Hints.

Do not neglect to take a few spark plug cores with you on your trip. The metal parts of a spark plug will last almost indefinitely, but the cores must break in time, and that usually means buying a new spark plug. As the cores can be bought for a fraction of the cost of a new plug, it means economy to carry a few with you. Also carry a few extra gaskets.

Large corporations employing many drivers have found it to their advantage to carry liability insurance as a safeguard against the carelessness of their employes and also as a means of stopping numerous claims for damages that might be brought against them.

When you get a letter that makes you hot under the collar, makes you clench your fist and pound your desk—call your stenographer and dictate a sassy reply. And then destroy both letters. The advantage of this plan is that it gives an outlet to the bile in your system.

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NEW AND INTERESTING THINGS IN MOTORDOM

Two Good Sedgley Specialties.

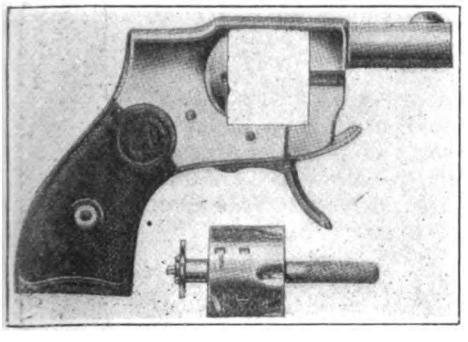
Many of our readers are already familiar with the line of ratchet socket wrenches for automobile use which are manufactured by R. F. Sedgley, 2311-13 No. 16th Street, Philadelphia. We illustrate herewith the Hexall ratchet



Sedgley Hexall Ratchet Socket Wrench No. 1.

socket wrench No. 1 made by Mr. Sedgley. This set contains a 7-inch steel forged ratchet handle, also two screwdriver bits; 7-inch extension bar; eight hexagon sockets, and four square sockets. These sockets are adapted to a wide range of A. L. A. M. and U. S. standard bolts and cap screws. The same manufacturer has a complete line of ratchet socket wrench sets covering every conceivable size of bolt or nut and every make of automobile.

We also illustrate the Sedgley Hammerless Ejector Revolver, an extremely handy pistol for any motorist. The new model here shown has the simplest possible method of removing the shells from the cylinder, yet it still retains the strength of the solid frame with all the conveniences of the swing out, without their disadvantages. This pistol is an accurate shooting piece and its length is overall 4 inches; weight, 6 ounces.



Sedgley Hammerless Ejector Revolver.

It is equipped with a hammerless folding trigger, interchangeable parts, and new one-piece main and trigger spring. It is no common thing for a motorist to be attacked and robbed, and some means of defense is only a sensible precaution.

The Consolidated Engine Heater.

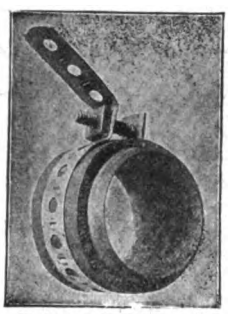
This is a device which makes starting a car easy in cold weather. It is a durable, safe, economical and convenient electric heater to keep the engine and carburetor warm. This heater may be attached to the electric light socket in your garage and start in a jiffy. The manufacturers contend that it is not necessary to go to the expense of heating your whole garage, and they state that this safe and efficient little electric heater applies the heat just where you want it, under the hood of the car. Readers who are interested should write for prices and full particulars direct to the manufacturers, The Consolidated Car-Heating Company, Albany, N. Y.

New Chief Engineer for Stanley.

Mr. C. E. Broad, who has lately rejoined the engineering staff of the Stanley Motor Carriage Company, Newton, Mass., after an absence of seven years, has just been made chief engineer of the company. The engineering board now includes Mr. Broad, S. C. Mussey and C. F. Stanley. In gas car circles, Mr. Broad is best known for his work in truck design for the Packard Company, but his specialty has always been steam, and he has been active in steam passenger car and truck design for twelve years.

The Universal Hose Clamp.

The Universal Hose Clamp illustrated herewith has several important advantages. If your experience is like that

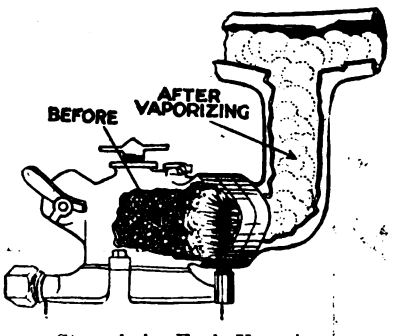


The Universal Hose Clamp.

of the majority of garage men you have been confronted with the unpleasantness of requiring a hose clamp to fit a certain size of clamp in stock. The Universal Hose Clamp is adjustable and will fit any size hose about an automobile. It is made from strong cold-rolled steel and comes in ribbon form with screw and nut attached and is pliable enough to easily wrap around and conform itself to the shape of a hose. The clamp ribbon has holes half inch apart along its middle portion, and in these holes lies the secret of its adjustment. Anybody with mechanical ingenuity will understand the method of adjustment by inspecting the cut which appears with this article. The Universal Hose Clamp is made by the Universal Industrial Corporation, Hackensack, N. J., to whom all inquiries should be addressed.

Stransky's Fuel Vaporizer.

This is a new device which is manufactured by the Stransky Mfg. Co. of Pukwana, S. Dak. The manufacturers of this invention state that while the average carburetor will only vaporize from 50 to 75 per cent. of the fuel, the Stransky Vaporizer will vaporize close to 100 per cent., thus giving 25 to 50 per cent. more mileage, also more power and speed with no carbon. This vaporizer works automatically, no spring, diaphragm, or shutters, and it has only one working part. the steel ball valve. It is made entirely of brass and steel and guaranteed to last a lifetime. It is also easily applied to the car. There are no holes to drill or tap and no special tools needed. Any farmer with an ordinary wrench can attach one in five minutes' time. This vaporizer sells for only $3.00 on an extremely money back guarantee. The car owner is to be the judge and jury,

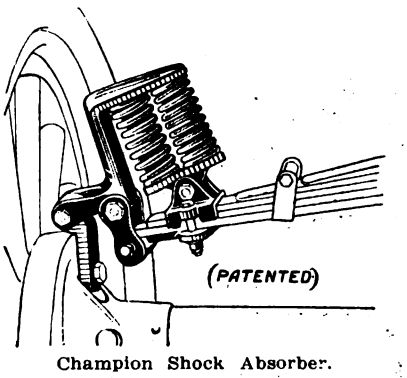


Stransky's Fuel Vaporizer.

and if not satisfactory, the vaporizer can be returned and your money will positively be refunded. Twenty thousand of these vaporizers have already been sold and there is open territory for good dealers in several sections of the country. One state agent has been making over $500 per month, selling this c'e. and proof will be submitted that this vaporizer is a wonderfully quick seller. Readers who are interested should write direct to the manufacturers as soon as possible, before all the good territory has been taken.

Champion Shock-Absorber.

We illustrate herewith the new shock absorber for Ford cars which has recently been placed on the market by the Champion Shock-Absorber Sales Company, Inc., Indianapolis, Indiana. A set of Champion Shock-Absorbers features eight-coil compression springs which absorb all road shocks and jars by their compression. "Champion" is different from all other Ford shock absorbers as you ride on eight large coil springs, making the Ford car as easy



Champion Shock Absorber.

riding as any high price luxurious machine. The manufacturers of this device are so confident as to its merit, that they will give any Ford owner a ten-day trial on a set of "Champion" Shock-Absorbers to prove their guarantee to make the Ford ride equal to any $5,000 car. Readers who are interested should write for prices and further particulars to the main office of the company at Indianapolis.

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JOHNSON'S CARBON REMOVER

Cures 80% of Engine Trouble

A dose of Johnson's Carbon Remover—The Engine Laxative—will make your motor run like it did the first 500 miles—quietly and full of "pep"—And your gasoline consumption will drop from 12% to 25%. You will save from $3.00 to $5.00 over any other method.





Takes out the Knock

You Can Take the Hills on High Without a Knock

if you will keep your motor free from carbon with

JOHNSON'S CARBON REMOVER

That knocking in your engine—difficulty you have climbing hills—poor pick-up—pre-ignition and lack of power will all be overcome.

You Can Do It Yourself

For 25c—five minutes' time—and with no labor, you, yourself, can remove all carbon deposits. Pour an ounce of Johnson's Guaranteed Carbon Remover into each cylinder—allow it to remain two to twelve hours, then drive your car 10 or 15 miles. Results will surprise you.

Use It Every 1,000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will eliminate most valve trouble and your engine will always be at its highest efficiency.

If your dealer cannot supply you with Johnson's Carbon Remover, use attached coupon.

Write for our folder "Keeping Your Car Young"—it's free.

---- *$1.00 Special Offer $1.00* ----

S. C. JOHNSON & SON, Dept. AL 9, Racine, Wis.

I enclose $1.00 for which please send me by prepaid express enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four-cylinder motor four times.

NAME.....

ADDRESS.....

CITY & STATE.....

MY DEALER IS.....

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JOHNSON'S PREPARED WAX

Now Made in Liquid Form

We are now making Johnson's Prepared Wax in ***Liquid Form*** as well as Paste—so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is exactly the same as our Paste Wax except that it is a liquid. Apply with cloth, brush or spray.

Is Your Car Dirty, Grimy and Unsightly?

DO you know that you, yourself, can make it look almost like new and save the cost of revarnishing? All you need is Johnson's Cleaner and Johnson's Prepared Wax ***Liquid.***

JOHNSON'S CLEANER

entirely removes all stains, scum, road-oil, tar and grease from body, hood and fenders. It doesn't injure or scratch the finest varnish—simply cleans and prepares it for the Wax polish.

Absolutely Dust-Proof

Johnson's Prepared Wax Liquid gives a hard, dry, glasslike polish which does not collect or hold the dust. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches—prevents checking and cracking—sheds water and makes a "wash" last twice as long.

Johnson's Prepared Wax Liquid is very easy to use—it polishes instantly with but very little rubbing. You can go over a good sized car in half-an-hour.

Quarts.....$1.40 Pints.....$ .75
East of the Rockies

If your dealer cannot furnish you with Johnson's Automobile Products, we will pay the expressage to any point in the United States east of the Rockies.

Write for our folder "Keeping Your Car Young"—it's free.

S. C. JOHNSON & SON, Dept. AD9 Racine, Wis.

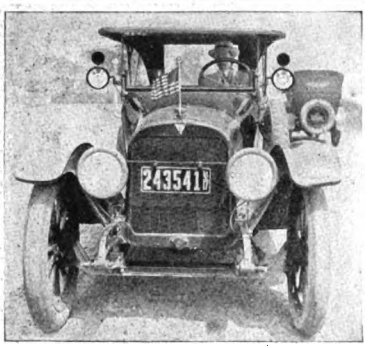


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Use of Two Spotlights Coming Into Vogue.

"Have you noticed how many cars are using two spotlights?" asks Mr. Bert G. Cochrane, sales manager of Howe Manufacturing Company, 1732 South Michigan Avenue, Chicago. The principal reason for this is the fact that so many motorists utilize the services of the spotlight entirely for a driving lamp and therefore feel the need of a second lamp for the many other needs which a spotlight fills.

The motorist who does considerable country driving has found that the spotlight makes the finest kind of a lamp for directing a strong light on the road



Car Equipped With Two Howe Spotlights and Howe Electric Lighted Flag Holder.

40 or 50 feet ahead of the car. This enables him to see the sink holes and bumps in time to slow down and avoid a shaking up.

Another reason for the growing popularity of the spotlight as a light for driving, is the growing sentiment against the use of glaring headlights which blind the driver of the approaching car. The spotlight casting its light down as it does, absolutely causes no glare.

The lamp used for driving when two lamps are on the car, is the one on the side away from the driver. This leaves the other spotlight ready for the driver to turn in any direction where he wants light for the purpose of reading a passing sign, to watch the side of the road where it is narrow and dangerous, to explore the road several hundred feet ahead, or for any of the many other purposes where a movable light is desired.

The Fremont Demonstration.

Debarred from participation in the authorized demonstration of tractors at Fremont, Neb., because the Smith Form-a-Tractor Company does not build a standard type tractor, the company was determined, nevertheless, to be present and to show the thousands of farmers and dealers who attended the event what the Smith Form-a-Tractor could do. A tract of land, therefore, has been rented between the city of Fremont and the regular demonstration grounds, on which the Smith Form-a-Tractor, under the efficient direction of Jas. A. King, will establish its right to consideration in the tractor world.

The Smith Form-a-Tractor does not enter the field as a competitor of the standard type tractor. It is in a class by itself. It comes to the farmer as the cheapest and most effective solution of his power and help problem. It offers to utilize the power he already has upon the farm in the most effective and economical way for him. At the cost of a single good horse it offers to do the work of four horses in all essential farm operations and to do the work at one-fourth the cost of maintaining the four horses it will displace.

The Smith Form-a-Tractor talks in terms of power, proficiency and profit to the man who farms 40 acres as well as the man who farms 400. The work it will do for the farmer entitles it to his consideration, and this is why the Smith Form-a-Tractor Company will make an independent demonstration at Fremont where the intelligent and discriminating farmer may compare the work of a tractor which can be nothing but a sure economy on his farm with the work of tractors which can be only of doubtful economy unless he be an extensive farmer. The Smith Form-a-Tractor is made by the Smith Motor Truck Corporation, Michigan avenue and Sixteenth street, Chicago, Ill.

New Foundry for Adamson.

The Adamson Manufacturing Company, East Palestine, Ohio, makers of the well known Adamson tire vulcanizers, have erected a large addition to their foundry building, and are now manufacturing Ford brake shoes, lined and unlined, light gray iron castings for automobile parts and other automobile specialties, to be announced later.

Cork Inserts Stop the Slip.

The postage stamp has won fame because of its faithfulness in sticking to its appointed work. It has a worthy rival in cork, in its ability to hold its grip. Almost every other substance known to man becomes polished under constant friction and wear. Not so with cork. It avoids becoming slick and slippery as naturally as a duck sheds water. Ordinary transmission fabric becomes polished and slippery from its service in the Ford car. So does the usual fan belt. And then what happens? They slip. They don't do their work as good as when new. There is grabbing and slipping which causes chattering and vibration in the transmission action. The fan belt cannot revolve as fast as it



Cork Insert Fan Belt and Brake Band Lining.

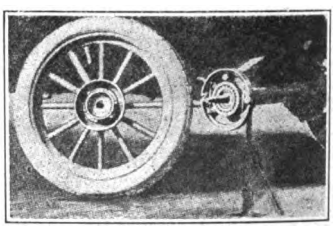
ought when the belt slips. That means the motor isn't cooled as it should be. Cork inserts are a perfect and permanent antidote for slipping. The buttons of cork never become polished or hard. They never lose their ability to grip. That's why Cork Insert Transmission Linings make the Ford brake brake, and Cork Insert Fan Belts keep the Ford fan fanning. These belts are made by the Advance Automobile Accessories Co., Chicago, Ill.

Hercules Auxiliary Bearings.

The Hercules Auxiliary Bearings were designed for use, in combination with a bell sprocket housing where the Ford rear axle is used as a jackshaft on Ford chassis converters, for converting the Ford car into a one or a one and one-half ton truck. No changes of any kind are necessary in the regular Ford construction, to install the Hercules Auxiliary Bearings.

The Hercules Auxiliary Bearings consist of two special high duty type, combined radial and thrust bearings, capable of carrying a load of 3,000 pounds and are dust proof.

These bearings are mounted on the outer ends of the Ford rear axle hous-



Hercules Auxiliary Bearings.

ing and engage an offset sprocket bracket which is fitted in place of the wheel on the axle shafts.

When the sprocket brackets are in place on the axle shafts, they engage the outer race of the Hercules Auxiliary Bearings, thus carrying the entire driving load on the axle housing, removing all strains and jars from the axle shafts, caused by the slap and drive of the chains.

When the Hercules Auxiliary Bearings are installed, the axle shafts do the driving and the load is carried on the axle housing. These bearings are made by the Hercules Auxiliary Bearing Works, 327 So. La Salle Street, Chicago, Ill.

Stewart-Warner Clock in New Hands.

The Waverly Novelty Company, Bessemer Building, Pittsburgh, Pa., has purchased from the Stewart-Warner Speedometer Corporation their electric clock business, and all old contracts will be filled hereafter by the Waverly concern. We understand that improvements will also be made on the original model of this clock which will now be put out under the name of "Waverly."

Wire Wheel Corporation of America.

The Wire Wheel Corporation of America has established a patent department at their general offices in Buffalo, N. Y. Mr. B. M. Kent of Washington, D. C., has been retained as Patent Counsel for the company and will have charge of the work of the department.

What One Chalmers Dealer Says.

We take great pleasure in reproducing a letter which was recently received by the Chalmers Motor Company, Detroit, Mich. This letter is from the L. H. Rose-Chalmers Company of San Francisco, California, and it reads as follows:

"Give me the Chalmers line on its remarkable sound basis of today for the rest of my years, and I shall, indeed, be contented."

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$3

per set of three



Outwear three sets of ordinary linings

They Make the Ford Brake BRAKE!



ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

TRANSMISSION LININGS FOR FORDS

Uncertain, jerky brake action is replaced by positive, sure-action and velvety smooth braking, the minute you equip a Ford with Cork Insert Transmission Linings. When you go into low, there is a quiet, gliding getaway, like high priced cars, instead of a lurch. In addition, Cork Inserts wear three times as long as the ordinary transmission lining. That, in a few words, is the story of what Cork Insert Transmission Linings do for a Ford—

They Give the Ford Owner a Better Driving, Better Braking Car and Save Him Money

Ordinary transmission linings become hard and polished from service. Then they slip when the brake, low or reverse, is applied—they grab and slip—causing the noisy chattering, the rattle and the jerking which Cork Inserts eliminate.

The corks in Cork Insert Linings never get hard or slippery. They retain their ability to grip, throughout the long life of the lining. That's why they put velvety smooth, positive transmission action in the Ford and make it a better, safer, more economical car to drive.

Nearly all jobbers stock **Cork Inserts.** If yours can't supply at once, fill out the coupon below and we will see that you are supplied at once.

Advance Automobile Accessories Corporation
Dept. 15-1, 56 E. Randolph Street CHICAGO, ILLINOIS

Dealers

Order *From Your Jobber.*

Cork Inserts are advertised in full page space in The Saturday Evening Post and 14 other leading magazines that are read by Ford owners. The most efficient ever produced. Big sales and profits in them for you. Send the coupon if your jobber can't supply you at once.

Check and Mail Today

Advance Automobile Accessories Corp.
Dept. 15-1 56 East Randolph St., Chicago

[ ] Send one dozen sets of Advance Cork Insert Transmission Linings for Fords.

[ ] Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.

[ ] Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford.
[Regular dealer discounts to apply.]

Name.....

City..... State.....

Jobber's Name.....

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

FAN BELT FOR FORDS

They keep the fan fanning —keep the motor cool —they don't slip

Most motor trouble is caused by overheating. Overheating would largely be avoided if the fan were kept fanning, by a belt that didn't slip. The slippage of the ordinary fan belt runs as high as 25% to 50%.

Cork Insert Fan Belts make the fan turn with the engine, because the slip is reduced to the minimum. The corks are not affected by water or oil, grease or dirt. They retain their gripping qualities throughout the exceedingly long life of the belt. They outwear several ordinary fan belts. Nothing else to equal it ever has been produced. Order direct if your jobber hasn't **Cork Insert Fan Belts,** mentioning his name, and we will see that you are supplied.



$1
for 1917 Ford—1916 and earlier models, 85c.

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A Year Ago—

A Trade Mark and an Idea

BEARINGS SERVICE COMPANY



HYATT





NEW DEPARTURE



TIMKEN

A year ago the Bearing Service Company was represented by a trademark. Today it is represented by twenty-two branches.

The idea itself was one of "service"—a specialized service to automobile dealers, garagemen and motorists.

At each of our branches are maintained complete stocks of the leading types of anti-friction bearings—Timken, Hyatt and New Departure—bearings of every size and description.

In addition to these stocks, there is maintained at each of these branches a detailed system of records—supplied by the bearing manufacturers—which enable us to tell the exact size of bearing needed for any location in any make of motor vehicle.

All we need to know is the make, year and model of the car, and the location for which the bearing is required.

You get the bearing you want at the time you want it—without the delay incident to sending to the factory—and with the assurance that it will fit the location for which it is required.

And remember—when you deal with us, you are practically dealing with the bearing manufacturers themselves. We are the exclusive national representative of the Timken Roller Bearing Company, the Hyatt Roller Bearing Company and the New Departure Manufacturing Company—chosen to render you service in everything that pertains to these leading types of anti-friction bearings.

General Offices: DETROIT, MICHIGAN

See opposite page for list of branches



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To-day-

Twenty-Two Branches

New York
Detroit
Chicago
Boston
San Francisco
Los Angeles
Seattle
Atlanta
Minneapolis
Kansas City
Dallas

Cleveland
Denver
Indianapolis
Rochester
Philadelphia
St. Louis
New Orleans

Omaha
Pittsburg
Portland, Ore.
Toronto, Can.


BEARINGS SERVICE COMPANY
BEARINGS SERVICE COMPANY
BEARINGS SERVICE COMPANY



THAT'S SUPREME AND

FULL LENGTH

FOR years manufacturers have been striving to overcome center spring breakage. The hole for bolts had to go. It was a weak spot. Numerous methods have been devised—but at best they simply shifted the breaking point to another place. Take, for example, the hump construction. It *does* eliminate *exact center* breakage. But at the same time causes as great breakage *outside* of the malleable which holds the leaves together. So in correcting one evil it has invented *another*.

Higgins Quality Springs

FOR REPLACEMENT

really accomplish what others have merely attempted. Through a new form of *nib* center construction center breakage has actually been reduced to an amazing minimum and this without expense of strength at any section of the spring. It has been done, too, without sacrifice of flexibility. There is *no* center bolt—no hole—no metal dug out to lessen resistance. No hump to stiffen resiliency or transfer breakage to other parts. But strength that's *supreme and full length*—a "give" and "come back" which resists and absorbs shocks, promoting utmost riding comfort and guaranteeing spring dependability. Strongest where greatest stress is brought to bear—and sufficiently sturdy at *every* point to withstand hardest service.

A special high grade leaf lubricant is inserted between each leaf before spring is assembled for shipping—preventing squeaks and giving free, easy play that lengthens tire life. No extra clips required—use those taken from old springs. Our confidence—our *certainty* that Higgins Quality Springs will make good in the *extreme* is shown in the fact that

The Same Guarantee Covers Every Point

The most liberal guarantee—simply because there is less likelihood of breakage. You want spring safety—you want riding ease with it. Be sure to get *both* by demanding Higgins.

Ask Your Dealer

He can supply Higgins Quality Springs designed especially for your car. If he refuses write us direct.

Higgins Spring & Axle Co., Dept. 414, Racine, Wis.

Dealers: ***Investigate our proposition. It is a hundred-per-center as a trade developer—because it affords motorists means of obtaining spring service and satisfaction they've always wanted. Write for Discounts and Big Catalog C-1917, listing 500 different designs.***

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Educational Data and Free.

To aid motorists in cutting down tire costs, The Goodyear Tire & Rubber Company, Akron, Ohio, announces the publication of an entirely new and complete set of tire service bulletins, in which are set forth the various ways of obtaining more satisfactory tire service.

A noticeable departure from a custom which has too largely prevailed in literature advancing tire information, of enumerating an array of "don'ts" for the tire user, is the positive viewpoint employed. The new Goodyear bulletins, instead of outlining the usual "don'ts," tell the motorist just what to "do" to get real tire service. Valuable hints telling how to add hundreds and even thousands of miles to the life of tires are the keynotes throughout the series.

Naturally the more common tire ills are treated—individually and specifically—with full descriptions of just why and how they occur. More emphasis, however, is laid upon the remedy, and what is more practical—the means of prevention.

The new series of bulletins reflects a knowledge of tires and tire conditions gained only through years of experience in the tire business. Obviously, the information imparted cannot help rendering assistance of great value to motorists.

As a convenience to automobile owners, who wished to obtain big mileage from their tires, all Goodyear service stations have been supplied with these bulletins for free distribution. They will also be mailed free of charge from the main office at Akron, Ohio, upon request.

The bulletins come in a series of eleven and bear the following captions: "How to Increase Tire Mileage," "Proper Inflation Pays," "What to Do for Tread Cuts," "Fabric Breaks," "How to Avoid Scraped Treads," "Premature Tread Wear," "How to Use Chains," "How to Make Inner Tubes Last Longer," "Rim Cutting," "Chafed Side-Walls," and "The Way to Maximum Mileage."

Motor Spirit from Mahua.

The Mysore Economic Journal for June contained the following on the production of motor spirit from the mahua:

Great progress has been made in Hyderabad (Deccan) in making motor spirit from the mahua. The tree abounds in the State, and the authorities gather about 25,000 tons of its flowers every year. Some 10,000 tons are used for liquor, leaving a balance of 15,000 tons, which are at present on the market. Mr. G. E. C. Wakefield, the director general of revenue, says: "We have run several kinds of motor cars successfully for some time on a spirit prepared from mahua at half the cost of gasoline. The annual consumption of gasoline in Hyderabad and Secunderabad is about 100,000 gallons, and we require only about 1,500 tons of mahua to make that quantity." Mr. Wakefield adds: "A cheap motor spirit means a great reduction in the working charges of railways, water pumps, motor cars—in fact every description of power engine."

In order to make the average New Yorker feel more at home, the higher priced cars are equipped with commodious two-inch aisles, iron seats, a stupid conductor, 627 straps and no place to put your elbows.

No More Spring Fixing

when you ride on

Tuthill Titanic Lubricated Springs

Guaranteed forever against center breakage—guaranteed at all points and in every respect for one year

WHEN a spring breaks it must be fixed or replaced. And in seven out of ten cases it breaks at the center. Why? Because it has been weakened by a center bolt hole or center nib.

Tuthill Titanic Springs have no center bolts or center nibs. Instead they are strongest at the center. A patented arch makes them practically break-proof.

Tuthill Titanics can be easily adapted to practically any type of axle construction without extra expense. A special Tuthill Titanic Front Spring for Fords is now made by us. It carries the same broad guarantee of other Tuthill Titanics.

Our proposition to dealers is very attractive. Send for it. Also our 1917 Price List—the most complete price list of spring replacements ever published—and name of nearest distributor.

Tuthill Spring Company

Established 1880

760 Polk St., Chicago

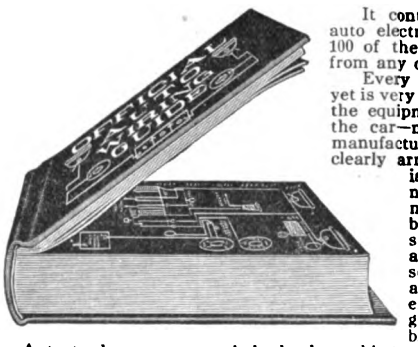


No weakening center bolt

No center nib

OFFICIAL AUTO WIRING GUIDE

The Most Valuable Publication Ever Offered to the Automobile World



It contains 463 guaranteed auto electrical diagrams. Over 100 of these are not available from any other source.

Every diagram is in detail, yet is very clear and is shown as the equipment is assembled on the car—not as the equipment manufacturers show it. It is so clearly arranged and the order is so simple that the newest and youngest men in the auto repair business easily understand it. It is endorsed and used by leading service stations for automobiles, batteries, electrical equipment; in garages and by automobile agencies.

Auto trade papers say it is the best thing ever given to the auto repair men. It took two long years to prepare the guaranteed drawings and diagrams, together with the expenditure of thousands of dollars. Neither time nor expense was spared. Over one hundred diagrams were taken directly from the cars, as no other means was available to obtain them. Many "orphan" car diagrams are shown that were also measured up from the cars. No garage or auto mechanic should be without it. One garage says: "It pays for itself three times daily." It saves the owner's time, allows a garage to turn out more work, makes more and bigger profits.

Increases Efficiency of Every Man

The best electrical auto mechanics become better. Young men and men new in the auto business become fast and accurate. Every man in your shop "speeds up." This Guide gives absolute and positive knowledge you cannot find any place else. Think of it—463 complete comprehensive guaranteed diagrams that any man can easily understand. Every one indexed and easily found.

This Book Comprises 500 Pages, and the Price, Prepaid, is $7.50

Any person sending money and not being satisfied with it, can return the book and have his money refunded.

ADDRESS ALL ORDERS TO

The Motor Vehicle Publishing Co., 71-73 Murray Street, New York

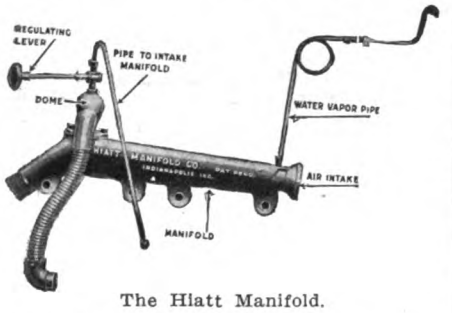
Remittances can be made by Check, Draft, or Money-Order, safely.

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The Hiatt Manifold.

The Hiatt Manifold Company, of Indianapolis, Ind., are placing on the market a manifold bearing their name, for which they expect to guarantee more mileage to the gallon of gasoline than can be obtained from any device offered heretofore. The manifold and its position on Ford car are shown by the illustrations. It is being sold for Fords only.

It consists of a manifold fitted to take the place of the regular manifold of a Ford, differing from the Ford manifold in that it has a hollow pipe on the in-



The Hiatt Manifold.

side of the body. This hollow pipe takes through it air from the outside, which combines with a water vapor coming from the radiator through the small copper pipe. This mixture passing through the pipe is superheated, due to the exhaust gases passing around the internal pipe, and upon collecting in the dome, this superheated vapor-laden air becomes a gas which, when passed to the intake manifold and becoming mixed with the gas from the carburetor is ready to ignite on the smallest spark.

Tests have been carried on for over a year—averaging from 26.7 miles to 32 miles on Ford touring car, carrying four people. In comparison with tests made on the same car without manifold the average was 17.1 miles per gallon of gasoline. Tests made in zero weather have produced 25 miles per gallon with the Hiatt Manifold. Probably the most interesting tests are those made with Fords of the Smith Form-A-Truck type, loaded with 1500 lbs. of dead weight, and carrying two passengers. One of these tests showed that the Hiatt Manifold increased the mileage 95 per cent. Many of these tests will be reproduced in printed form.

There are many excellent points of advantage resulting from the use of the Hiatt Manifold,—it makes a smoother-running engine; puts more "pep" into the motor—the principle of using superheated vapor-laden air gas results in the reduction and almost elimination of carbon.

The Hiatt Manifold is sold complete with all minor attachments needed for quickly fitting to a Ford engine, complete directions, etc. It is manufactured by the Hiatt Manifold Company, of Indianapolis. Dealers and those desiring further information, please address the Company at P. O. Box No. 971, Indianapolis. Price $15.00 complete.

Detroit Starter Co. Products.

Every Ford owner has felt that all that separated him from the high-priced car class, so far as the pleasure of driving is concerned, lay in the fact that he did not have independent lighting. Lighting from the Magneto gave him too much light on some occasions and at others no light at all. To install a practical electric lighting system has generally cost him more than he cared to pay.

But now comes the introduction, by the Detroit Starter Co., Detroit, Mich., manufacturers of the famous Versal Products, for Ford cars, of a complete generator and battery electric lighting system, efficient in every respect, at the remarkable low price of $38.85. Ford owners are able to equip their cars with the system and form in every respect to that used on cars costing as much as $5,000.

This system, known as Genolite (six volt) Type H, consists of a Generator, Storage Battery, all wires and installing equipment to light the head lamps and tail lamp with the control switch on the steering post; everything complete, no extras needed. All units are designed according to accepted automobile practice, and contain the latest features of lighting systems as employed on the highest priced cars.

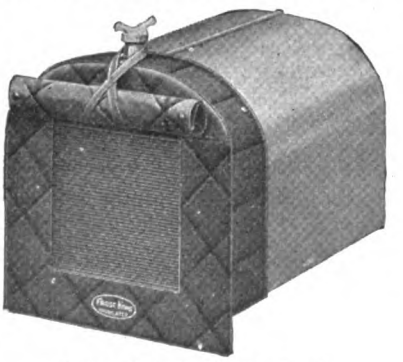
The same company also manufactures what they call a "Speederator," a device which it is claimed gives the Ford car the same flexibility in motor operation as is found in the high-priced six and eight-cylinder cars, and yet its simplicity and low price make it distinctly within reach of all. The price complete, ready for installation, is only $2.85 f. o. b. Detroit.

A Free Counter Card for Dealers.

An easel display card showing Easy-on Chains has just been brought out by the Woodworth Manufacturing Corporation of Niagara Falls, New York, which they are sending to dealers. These cards are printed in colors and illustrate a wheel fitted with Easyon Chains. Easyon Chains attach to the spoke and can be put on in a moment even after one gets stuck in the mud. They appeal strongly to a large class of automobile users who wish for something not too bulky to carry in the car to prevent danger of getting stuck on the road. Dealers handling Easyon Chains can get these cards free by writing to the factory or asking for them from their jobbers.

The Frost King Radiator Cover.

This is the time of year when car owners should think about specialties for winter motoring and a very important

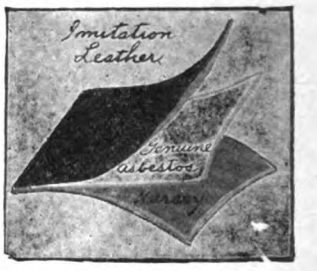


Frost King Radiator Cover.

accessory for the cold weather is a good radiator cover, as this will save gasoline and protect your engine and radiator from freezing. The Frost King Asbestos Insulated Radiator Cover, which is illustrated herewith, is made of the best insulating material known, genuine asbestos, re-enforced with heavy Kersey and waterproof imitation leather. This radiator cover is manufactured by the Cincinnati Auto Specialty Company, Dept. R-107, Cincinnati, Ohio, to whom all inquiries should be addressed.

An Important Contract.

The Pierce Governor Company, Anderson, Ind., has been informed by R. A. Rothermel, manager of their London office, that the Minerva Motors Company, Ltd., of Amsterdam, has formally adopted Pierce Governors as standard



Material From Which Frost King Radiator Cover Is Made.

equipment on their motor trucks and lorries. This is the most important foreign contract closed by the Pierce Govnor Company, as the Minerva Motors Company, Ltd., is among the largest and best known motor manufacturers in Europe. They will require approximately 5,000 governors during the ensuing twelve months.

High-Tension Windings and Condensers.

A fully guaranteed line of high-tension windings and condensers for the trade is manufactured by the Magneto Winding Company, 1723 8th Avenue, Brooklyn, N. Y. This concern makes a specialty of rewinding armatures and coils for all makes of magnetos. Special attention is paid to orders from dealers and magneto repair men, and those who are interested should write direct to the Brooklyn office of this company at the above address.

Vesta Twelve-Eighty a New House Organ.

We have received from the Vesta Accumulator Company of Chicago, Ill., a new house organ called Vesta Twelve-Eighty. This magazine will be distributed only to the large number of service stations which is maintained throughout the country by the Vesta Accumulator Company, for the sale and recharge of Vesta storage batteries, Vesta magneto generators and Vesta automobile electric head lights. The contents of the house organ consists of educational material for the assistance of the service stations in charging Vesta batteries and in general connection with the technical details of the Vesta products.

Death of Edward H. Hill.

It is with great regret that we note the death of Edward H. Hill, secretary and treasurer of the McQuay-Norris Manufacturing Company, St. Louis, Missouri, well known manufacturers of piston rings. Mr. Hill died August 11 after an illness of several weeks. He was widely known among the jobbers of automobile accessories.

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Service by Bearings Service Company.

An interesting use to which the word service has been put is in the name of the Bearings Service Company, Detroit, an organization formed during the past year for the purpose of extending to the automobile dealer and motorist a specialized service for bearings.

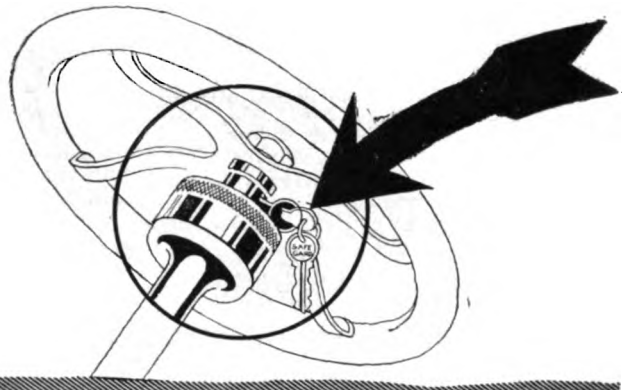
"Some people have the idea that we operate a garage and do repair work on bearings," says Mr. Hebner, general manager. "The function of our service, however, is quite different. We do no work on cars whatever, nor do we renew or regrind bearings. We act as a source of supply where garagemen, automobile dealers and motorists may secure any type or size of bearing which they may need in making bearing replacements in motor cars, motor trucks or other motor vehicles. The bearings we sell are a strictly new product, shipped to us direct from the factories where they are made, and we sell them under a factory guarantee.

"This service is of a more technical nature than at first glance appears, due to the fact that there are no two makes of motor cars in which the bearings are exactly alike. This necessitates our having on hand complete data covering the bearing specifications in motor cars of every make and model, as well as keeping in stock at each of our twenty-two branches thousands of different kinds and sizes of bearings so that we can supply every possible demand without a moment's delay. When a garageman or motorist wants a bearing, all he has to tell us is the name, year and model of the car for which it is required, and the bearing location. Our detailed records then enable us to furnish the proper bearing for the installation with absolute accuracy. These records are being added to daily.

"We maintain branches at the present time in twenty-two of the principal cities of the country. At each of these branches we carry in stock complete assortments of the three leading types of automobile bearings, Timken, Hyatt and New Departure. Our stocks include not only bearings of the type used in automobiles of present day manufacture, but of antiquated models and orphan cars as well. Our company being the sole service representative of the manufacturers mentioned above, is naturally working in close co-operation with these manufacturers all of the time. In dealing with us, therefore, the dealer, garageman or motorist is practically dealing with the manufacturers themselves."

Safegard Lock Secures Car.

A lock said to defy the efforts of the most expert thief in that it cannot be smashed with a hammer or broken with a heavy wrench, has been brought out by the Reliance Co., 428, 430 West 38th Street, Chicago, Ill. The Safegard lock is applied to the mechanism of the Ford steering wheel and when the device is locked the wheel is free but has no control over the car. The car cannot be driven or towed away. The Safegard lock has been indorsed by the Underwriters' Laboratories, and each lock bears their label of inspection. The use of suitable and practical locking devices is recommended by the insurance companies, who allow a reduction on theft policies when the machines are properly safeguarded. The Safegard lock is constructed of bronze and steel, and each part is thoroughly tested before assembly. The retail price is $5.00. The manufacturer has a liberal proposition for dealers, details of which will be supplied upon request.



YOUR CAR IS SAFE

IF EQUIPPED WITH A

SAFEGARD LOCK

The best $5.00 investment any Ford owner ever made.

When locked with a Safegard, the steering wheel is free and has no control over the car. Nor can the car be driven or towed away.

Safegard Locks are radically different from any lock made although they resemble some in appearance.

No Hammer Can Smash It

All Safegard Locks are constructed of fine tempered steel and bronze. Each part thoroughly tested before assembling and each lock mechanically perfect before it is placed in your hands. No hammer can smash a Safegard, neither can a wrench loosen it. Safegards are built to endure—and to protect your car.

Reduced Insurance

Safegard Locks have been passed by the Underwriters Laboratories and each lock bears their label of inspection.

Insurance Companies recommend Safegards and allow a reduction on theft policies for cars equipped with them.

You are doubly protected when buying a Safegard—we guarantee the mechanism of Safegards to be right in every degree—and further, a refund certificate is furnished to every purchaser to insure him against loss. Safegards **must** make good.

See Our Exhibit

at the National Exposition for Ford Accessories in Chicago Coliseum, Sept. 22nd to 29th—Booth 193—also exhibit of steering wheel locks for other cars, and the Reliance One-Piece Steel Cable Towline.

JOBBERS! DEALERS!

Liberal Proposition Write Us for Details

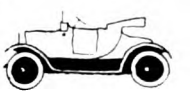
THE RELIANCE COMPANY

428-430 West 38th St.

CHICAGO,

ILL.





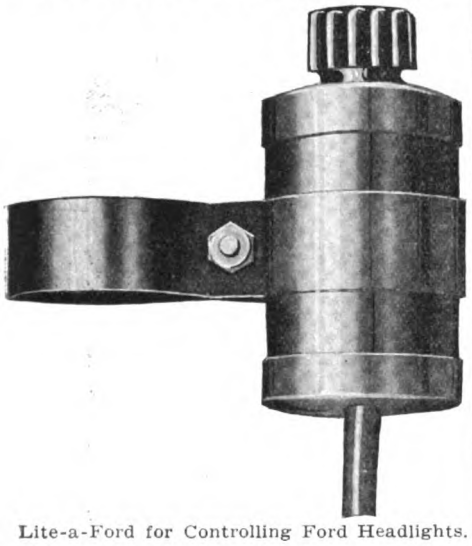
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Lite-a-Ford.

The Lite-a-Ford is one of the most simply constructed yet efficient light controllers so far designed for use on the Ford Car.

It is so constructed that at low speed the current is intensified, insuring a brilliant driving light whenever such may be required on bad roads.

It is also a most efficient dimmer, absolutely controlling the volume of light at any speed to meet any traffic regulations.



Lite-a-Ford for Controlling Ford Headlights.

Its range of action is great, there being seven distinct degrees of brilliance, ranging from an intense white light to a mere glow, using an infinitesimal amount of current—whenever you wish to leave the car standing and operate the lights on the batteries.

A big feature of the device is its compact form and its simplicity of operation. The entire device is contained in a cylinder 1⅝ inches in diameter and 3 inches long, which is clamped to the steering post at any point below the steering wheel which may be convenient to the driver.

The control is by means of a knurled knob at the top of the cylinder of a size convenient for grasping between the thumb and fingers of either hand and the Lite-a-Ford may be attached on either side of the steering post for the convenience of right or left-handed drivers.

A simple turning of the knob gives any of the seven degrees of light provided by the Lite-a-Ford.

As the question of meeting traffic regulations is of utmost importance with plenty of light when such is needed the Hastings Company submitted their device to the authorities of a number of States where such regulations are in force and not only has the device been invariably approved, but in many cases the authorities have applied them to their own machines and in many instances have officially approved the Lite-a-Ford.

The device sells at two-fifty and is distributed to the trade through the regular channels.

Kimball Tires.

The Kimball Tire and Rubber Company, Dept. 18, 1473 Michigan Avenue, Chicago, Ill., is offering a tire agency proposition, which ought to interest a great many of our readers. The best territories on this tire are being snapped up rapidly because the Kimball tires are exceedingly popular. The line includes the Kimball Bar-Grip tire, the Kimball Button-Grip tire and the Kimball Cord Type tires. This is a line of non-skids, which will sell rapidly. Send your inquiries and orders direct to the main office of the company at Chicago.

Motor Parts Company Deal with Westinghouse.

The Motor Parts Company, 818 N. Broad Street, Philadelphia, Pa., has recently concluded a contract with the Westinghouse Electric and Manufacturing Company of Pittsburgh, Pa., by which the Motor Parts Company acquires the sole selling rights of the Westinghouse Ford starting and lighting equipment. The Motor Parts Company are redistributing the country, appointing agents and distributors, and are well under way with a heavy campaign.

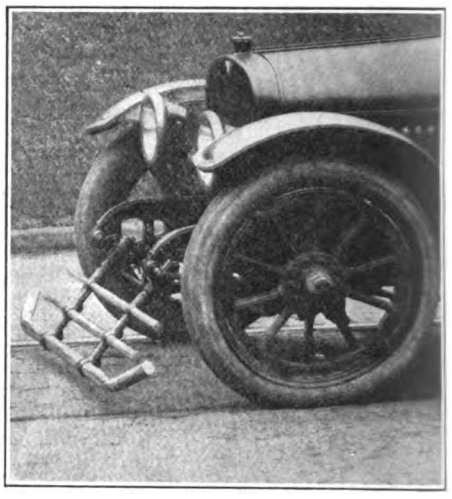
The Simplex Tire Company.

Paul Stanton, who was formerly with Bergen & Zaager, has branched out for himself and is now one of the proprietors of the Simplex Tire Company, 30 West 55th Street. This company handles all standard makes of automobile tires and tubes.

The Sav-a-Life Fender.

The International Sav-a-Life Fender Co., 539 Guardian Building, Cleveland, Ohio, have brought out an appliance which promises to prevent many of the automobile accidents caused by people, especially children, being struck and run over by heavy machines, resulting in permanent injuries or loss of life. The Sav-a-Life Fender, as the appliance is known, is similar to the ordinary bumper in appearance and is adjustable to the height of any chassis.

When the car brings this fender against a person or any flexible object, it automatically releases the fender so it drops within three inches of the road, absolutely preventing objects, especially people, from being run over by any part of the car. While it is constructed to leave nothing to chance, it can also be operated by the driver speedily and easily from his seat. It also takes the place of the ordinary bumper in protecting the car. Should the car hit a stationary object, then the force drives the supporting rods past the release catches, so that it stays in the carrying position as an ordinary bumper. The International Sav-a-Life Fender Company is now operating on a heavy production basis. Thousands of orders are booked. This shows that this fender is meeting the needs and approval of the motoring public. In fact, many sections have approved it by passing laws favoring its use.

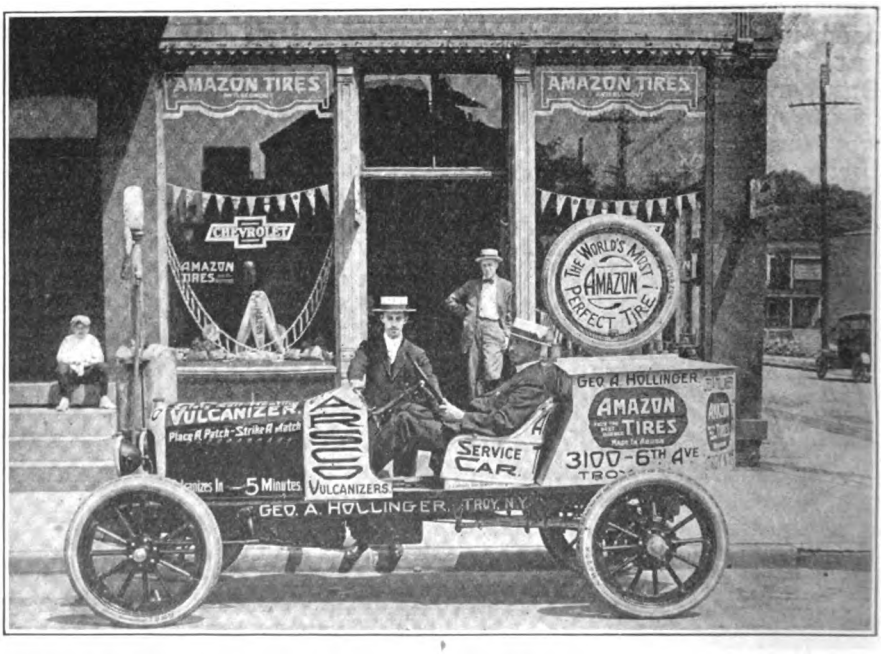


The Sav-A-Life Fender.

Novel Advertising Car.

A unique advertising and service car designed by The Amazon Rubber Company for their Troy, N. Y., dealer is shown here.

The car is painted a bright yellow with black hood and running gear.



This Advertising Car Tells Its Own Story.

An inflated tire on a rim is bolted upright on the box.

Besides being a practical service car, it is noticed by everyone on the streets and has great local advertising value.

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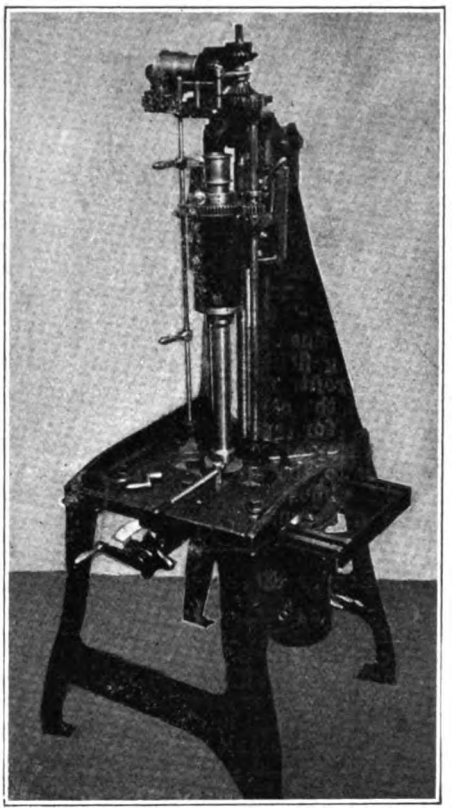
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A New Cylinder-Grinding Machine.

To meet the requirements of garages, repair shops, automobile manufacturers, etc., which are called upon to handle grinding of automobile, aeroplane and motorboat cylinders, the Hy-Grade Machine Company, 5606 Curtis Avenue, Cleveland, O., is now building cylinder-grinding machines. The upright frame and lower surface table are cast integral, and the vertical ways and bottom surface are carefully machined and scraped perfectly square to insure accurate alignment. The cylinder to be ground is mounted on a plate which may be adjusted to bring the different bores into the grinding position, this plate being carried on ways that extend the full length of the machine. The spindle is carried in a movable head and may be eccentrically adjusted to travel around the bore of the cylinder, while rotating on its own axis. This spindle is driven by a belt extending back through the ways, upon which the head is traversed, by a screw that is driven in forward and reverse directions by bevel gears. Up and down feed is controlled by a rod with adjustable stops that govern the clutch between the two bevel gears. Revolution of the spindle is controlled by a clutch on a splined shaft driven by spur gears. The fine eccentric feed is operated by a worm or screw furnished with a graduated dial. All operating levers are located at the front of the machine, where they are convenient for the operator. Counterweights relieve the machine of all strain and tendency toward excessive wear. All sizes of automobile, aeroplane and motorboat cylinders may be ground, and it is claimed that the machine is capable of attaining a high rate of production and



Hy-Grade Cylinder Grinding Machine.

doing accurate work. The spindle head is equipped with adjustable bronze bearings, and the spindle is carried by double-row ball bearings and adjustable bronze bearings which are furnished with leak-proof oil retainers. The principal dimensions of the machine are as follows: Height, 6 feet; total travel of spindle head, 22 inches; length of grinding spindle, 16 inches; size of movable plate that supports the work, 16 by 22 inches by 2½ inches thick; working space under machine, 18 by 22 inches, and floor space occupied, 28 by 32 inches.

The cut gives a fair idea of the appearance of the grinder. Readers who are interested should write direct to the manufacturers for prices and more complete particulars.

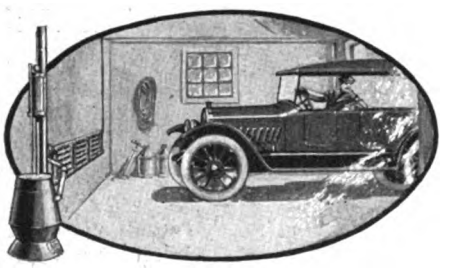
Election of Officers.

At a special meeting of the board of directors of the Adams-Williams Mfg. Corp., New York City, Francis C. Schwab was elected president. C. D. Williams was re-elected vice-president, and L. W. Schwab was chosen secretary and treasurer. The company is manufacturing and marketing a line of convertible tops or glass enclosures for several makes of well known automobiles.

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The Wasco Garage Heating System.

Another product that is being brought to the accessory dealer's attention is the Wasco Garage Heating System. This is a coal-burning, self-regulating hot water system, designed to heat private garages holding from one to ten cars. It is manufactured by the W. A. Schleit Mfg. Co., Inc., Syracuse, N. Y. This should be a fine line for the accessory sales-



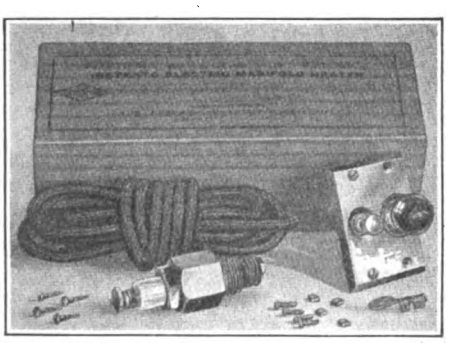
Wasco Garage Heating System.

man to feature in a dull season. And its simplicity is a great feature. It is shipped ready to be set up, and any handy man can install the equipment in a few hours' time.

So in this constantly growing and developing field there are great chances for a profit building in the accessory line. In the case of the Wasco Heating System, for example, the distributor's profits range from $19.50 to $61.25, according to the size, on each sale. And in the almost innumerable other lines there are equally alluring profits.

The Lepper Electric Manifold Heater.

This is a small electric furnace that is inserted in the intake pipe just above the carburetor. As soon as the "juice" is turned on, it heats up the inside of the intake thoroughly, some of the hot air going directly into the cylinders. As soon as you crank the motor it pulls the gasoline and hot air into the cylinders at the same time, and as a result the motor starts as nearly under summer conditions as modern science can make it. It saves gasoline, batteries, time, patience, cussing and temper. No tea kettle or hot water needed—use hot



Lepper Electric Manifold Heater.

air instead. Let your car stand as long as you like. When you are ready your motor will be ready in a jiffy. Easily installed, any auto mechanic can do it in one hour. Nothing to disfigure your car; the switch is neat, high class and an ornament to any car. Nothing to wear out and will last as long as your car will and then some. It is scientifically correct in principle, safe and is giving 100 per cent. satisfaction to those using it. This is a great seller for dealers. Write for price and full particulars direct to the manufacturers, The Lepper Manufacturing Co., 101 North Federal Avenue, Mason City, Iowa.

Light in the Right Place.

In nearly every state now, there are laws regulating the use of automobile head lights, and some device is required to control the glare which has caused a great many accidents. One of the most practical inventions on the market for this purpose, is the Lennon Light Protection, which is sold by J. H. Faw, Inc., 43 Warren Street, New York City. This light protector, it is claimed, will take the light out of the air and put it on the road where it belongs. Readers who are interested should write to Mr. Faw for full particulars.

Attractive Dixon Display Rack.

The above shows the new counter display rack the Joseph Dixon Crucible Company is sending out to dealers to help them sell more Dixon's Graphite Automobile Lubricants.

The rack is of metal and enamelled in red and black. On the back, for use by the dealer's salesmen, is a chart



Dixon Display Rack for Dealers.

showing the uses of the various lubricants. On the front are spaces for displaying booklets and glass jars containing samples of the lubricants.

Dealers interested in obtaining one of these racks should write to the Joseph Dixon Crucible Company, Jersey City, N. J., Dept. H.

Rowe Calk Co. Acquires Diamond Chain.

The Rowe Calk Company of Plantsville, Conn., has acquired by purchase the Diamond Chain Company of York, Pa., and the new officers of the Diamond Chain Company are: President and factory manager, Samuel M. Horn, York, Pa.; vice-president, William H. McLaughlin, Hartford, Conn.; secretary, treasurer and general manager, Warren D. Chase, Hartford, Conn.; assistant secretary, S. Ralph Horn; assistant treasurer, E. S. Bestor, Hartford, Conn.

The Rowe Calk Company manufactures the widely and well-known Prest-O-Grip Anti-Skid Chains for trucks with solid tires. Prest-O-Grips, after three years of experimenting and of merchandising in a small way, were perfected and given to the motor truck market a year ago. After a while the Rowe Calk Company found it necessary to greatly increase the Prest-O-Grip manufacturing facilities, and the business has now expanded to a point where it has become necessary for the Rowe Calk Company to have some certain supply of chain to protect the dealer and consumer.

The Diamond Chain plant manufac



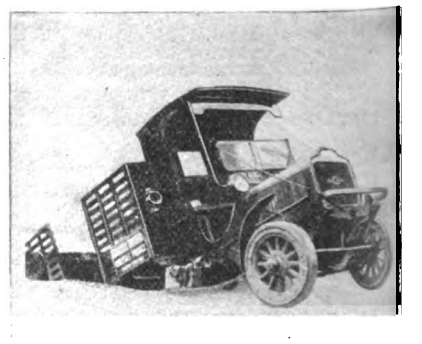
Prest-O-Grip Anti-Skid Chain.

tures a high-quality fire welded chain and at present has a capacity of over one million feet of chain. It is to be enlarged immediately to take care of the growing demand for Prest-O-Grips. The chain company will continue to sell its product in the general market.

Drop of Big Truck Does Not Phase Titanic Springs.

En route to Chicago with a load of over three tons of potatoes, the truck in the picture struck a piece of pavement which had been completely undermined by a defective sewer. Without warning, the heavy truck broke through the pavement and dropped with a crash to a point several feet below the level of the street.

Not only did the springs stand this terrific test without a break, but have given thousands of miles of service since



Bad Accident, But Titanic Springs Did Not Break.

the accident, proof that they were not harmed in the slightest.

Tuthill Titanic Springs, made by Tuthill Spring Co., Chicago, Ill., are unique in that they have no center bolt or center nib but instead a patented arch at the center which is held in a vise-like grip by a yoke and plate fastened to the outside of the spring.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

REPAIR PARTS
For All Makes of
HORNS AND SPEEDOMETERS
Official Klaxon Horn Station
Send for price list
GENERAL SPEEDOMETER REPAIR COMPANY
51 West 63d Street NEW YORK CITY

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Inner Tubes, any size, $1.75 Each
INTER STATE RUBBER CO.
259 N. 15th Street Philadelphia, Pa.

AFFA SPECIALTIES
For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.
AFFA SPECIALTY COMPANY
34 SOUTHBRIDGE ST. WORCESTER, MASS.

We Still Have a Few 100-lb. Box Assortments
Bolts, Nuts, Set Screws, Rivets, Filister Head Screws, Key Stock, Etc., Etc.
$5.00 per 100 lbs.
Westchester Accessories Co., Inc., 1777 B'way, New York

Magnetos and Batteries

Hecht's Magneto Exchange
Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.
Expert Repairing of All Makes.
Express your Magneto, Starter and Generator to us Same will be repaired and returned same day as received.
Distributors and Service Station for
BERLING SWISS, NATIONAL and MICHIGAN MAGNETOS
— Also —
Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos
230 WEST 49th STREET NEW YORK CITY

USED MAGNETOS
Bosch High Tension, $15 up
Save 50% to 75%
Herbert Aucock, 222 Columbus Ave., Boston, Mass.

Cylinders Reground

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

Tires

DOUBLE TREAD TIRES
—GUARANTEED—

Size	Plain	Tubes	Size	Plain	Tubes
28x3	$5.00	$1.75	35x4	$9.00	$3.00
30x3	5.00	1.85	36x4	9.00	3.00
30x3½	6.50	2.15	34x4½	9.50	3.15
32x3½	7.00	2.25	35x4½	9.50	3.25
34x3½	7.50	2.50	36x4½	10.00	3.60
30x4	7.00	2.75	37x4½	10.50	3.60
32x4	8.00	2.75	35x5	11.00	4.50
33x4	8.50	2.90	36x5	11.50	4.25
34x4	8.50	2.90	37x5	12.00	4.75

For (Non-Skid sizes) up to 30x4, 50c Extra.

All other sizes $1.00 Extra.

Examine your worn tires when taking them off, and if the bead is not cut, ship them to us. We will remake them into a GOOD Double Tread Tire at 60% of the above prices.

When ordering, be sure to state what bead tire is required. Whether Q. D. Clincher or Straight Side.

10% Deposit required on C. O. D. orders.

SPECIAL Offer to Agents
Write for Catalogue
Get our special price on new tires.
M. Liben & Co.
205-A West 48th St. New York City

Double Tread Tires
Notice Our Prices Before Going Elsewhere
PRICE LIST

Size	Plain	Size	Plain
30x3	$4.50	35x4	$8.50
30x3½	5.00	36x4	9.00
32x3½	6.00	36x4½	9.50
32x4	6.50	36x5	9.50
33x4	7.00	37x4½	9.50
34x4	7.50	37x5	10.00
34x4½	8.00		

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes
GINSBERG & BERKOWITZ, Inc.
236 WEST 48th STREET, NEW YORK

Tires

CUT PRICES
On Seconds and Factory Blemished Tires of Standard Makes
Prices You Won't Find Equalled Anywhere
Our Business is Done on Straight, Clean Cut Methods
OUR TIRE VALUES STAND RIGID COMPARISON
You May Return Any Tires Bought from Us if Not Sold within Thirty Days.
We Are Sole U. S. Agents for Mastic Strain Proof Red Inner Tubes. Guaranteed for One Year.
Write for Prices. We Sell Only to Dealers.
MANUFACTURERS SURPLUS TIRE CO.
789 Seventh Avenue, New York

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth
Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
37x5	5.00	9.00	12.00

Ship Your Old Tires by Prepaid Express
McDANIEL RUBBER CO.
613 Ohio Street Cairo, Ill.

SPECIAL
Goodrich Safety New Factory Treads. 30x3—$8.50. 30x3½—$12.50.
STAR RUBBER COMPANY
1781 Broadway Tel. 123 Columbus New York City

CHEAP DOUBLE TREAD
NEW AND SECOND HAND
Tires and Tubes
Write for Prices
JAFFE BROTHERS
260 West 54th Street NEW YORK CITY

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Tires

FORD SIZE TIRES
New 30x3½ Non-Skid
$7.50
Jandorf Automobile Co.
1763 Broadway New York

Tires

DOUBLE TREAD TIRES AND TUBES
Write for prices, stating sizes.
I. JAFFESS
1319 FIFTH AVENUE NEW YORK
Branch Store: 241 W. 54th St. (near Broadway), New York

Gears and Parts

STODDARD DAYTON PARTS
and
GEARS FOR ALL MAKES OF CARS
SEND IN YOUR OLD ONES
These parts are new parts.
THE DAYTON AUTO PARTS CO.
351 West 52nd Street New York City
1623A McGee Street Kansas City, Mo.

COIL AND MAGNETO PARTS
Platinum - Tungsten
H. & L. MFG. CO., 33-35 Liberty St., NEW YORK

PARTS MARION PULLMAN ELCAR ABBOTT-DETROIT
All kinds of Repairing, such as Motor Work Overhauling, Painting, Trimming, Body Fitting, Slip Covers, etc.
Automobile Mechanics Corporation
223 W. 53d St. Tel. Circle 3575 New York

SAVE 50% TO 75% ON PARTS—Parts for Pope-Hartford, Columbia, Reo, Buick, Overland, Chalmers, Mitchell, Thomas, Oldsmobile, Maxwell, Stoddard-Dayton, Stevens-Duryea, Corbin, Cadillac and all others. Eiseman, Splitdorf and Remy magnetos, $5.00 to $10.00. Bosch high tension magnetos, $15.00 to $25.00. Also the Mea, Connecticut, National, U. & H. and K. & W. magnetos in stock. Springs, wheels, axles, etc., for all cars. Connecticut Auto Parts Co., Inc., 195 Main St., Hartford, Conn.

SPRING REDUCTION ON
DOUBLE TREAD TIRES AND TUBES
GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90	30x4	7.00	2.50	37x4½	9.00	3.10
30x3	5.00	1.75	32x4½	9.00	2.75	32x4	8.00	2.75	34x5	9.50	3.25
30x3½	6.00	2.10	34x4½	9.00	3.00	33x4	8.00	2.75	35x5	10.00	3.25
32x3½	6.50	2.15	35x4½	9.00	3.00	34x4	8.00	2.75	36x5	11.00	4.00
34x3½	7.50	2.25	36x4½	9.00	3.10	35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY
261-A West 54th Street NEW YORK CITY 112-A East 100 Street
THE HOME OF DOUBLE TREAD TIRES

For Sale

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

FOR SALE—Gasoline tank and pump, 2" retreading moulds and cash register. Vanderpool Co., Springfield, O.

FOR SALE—Make money easy. White business is good. Vulcanize tires. Our book tells you how. $1.00. Vanderpool Co., Springfield, Ohio.

DIMMERS FOR FORD HEADLIGHTS
35 Cents Pair, Prepaid - - Worth $1.00
AMERICAN MANTLE CO., ANDERSON, INDIANA

FOR SALE—A Kreig Stitcher for Double Tread Automobile Tires; in first-class condition. Price, $115.00 at my store at 819½ Bedford Ave., Brooklyn, N. Y. John Albanese.

FOR SALE—14 in. x 6 ft. Plain Turning Lathe, weight, carriage good condition, $100.00; 20 in. x 10 ft. Lathe and Morse Screw Cutting Lathe, weight, carriage good order, $175.00; Back geared manufacturing milling machine complete, with vise, arbor and counter, $90.00. Send for photo. Lucas & Son, Bridgeport, Conn.

FOR SALE OR EXCHANGE—For Wilfley Knight Engine. Oakland Model 35, Touring body. Northway Four Cylinder 35 H.P. 3.5 x 5 in. stroke. Forrest S. Gehman, 3[illegible] W. Broad St., Souderton, Pa.

TIRES Fresh Stock ALL NON-SKID

Our Guarantee—4,000 Miles

30x3½	$11.00	34x4½	$23.65
32x3½	12.50	35x4½	24.75
33x4	17.18	36x4½	25.25
34x4	19.00	37x5	29.75

All Standard make Firsts at fair prices.

10% deposit required, 2% off if cash accompanies order.

Proposition to Dealers

LEON JAFFESS, Inc.
252 West 55th St., New York City
6106 Euclid Ave., Cleveland, O.

ADVANCE TIRES
Most Mileage Per Dollar

FULLY GUARANTEED HONEST ADJUSTMENTS

Write for Prices. Wonderful Opportunity for Dealers. Just what you have been looking for.

ELY AUTO EQUIPMENT CO.
1902 BROADWAY NEW YORK

Wanted

WANTED—To sell a Haywood Vulcanizing Plant just used 90 days, a big bargain. Also want to correspond with any parties who have some Hupmobile 20 cars out of commission. Address Box 285, Blacksburg, S. C.

RADIATOR WANTED—Mitchell S 1911 model 12. State condition and price. F. M. Prescott, Riverdale, N. J.

We make liberal allowances for old tires
—— TO APPLY ——
On Purchasing Tyrian Tires

Guaranteed 4000 Miles.

Any 3 in. tire, regardless of condition, we allow $3.50
Any 3½ in., $4.00 4 in., $6.00
" 4½ in., 7.50 5 in., 10.00

Write us for price and full particulars

General Automobile Supply Company
1671-1673 Broadway New York City

Patents

IMPROVEMENTS WANTED—Send for free bulletins and advice. Book "INVENTIONS—PATENTING and PROMOTING" Free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

Tire Repairing

TIRE SPECIALTY CO.
EXPERT TIRE REPAIRING
Guaranteed Work Moderate Price
757 Seventh Ave. 'Phone, 528 Circle. New York City

Miscellaneous

COUPON Books for gasoline and supplies. Samples free. J. P. Forbes, Coshocton, Ohio.

INSYDE TYRES,
inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.
AMERICAN ACCESSORIES CO., Dept. AD3, Cincinnati, Ohio

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Bearings

DISCS

(CLUTCHES)

TO FIT

ABBOTT

Model	Net Each
44 H.P. Disc complete	$3.00
44 H.P. Facing (Raybestos)	.90
44 H.P. Facing (Cortex)	.60
44 H.P. Plain	1.00

BERGDOLL

30 H.P. Disc complete	2.00
30 H.P. Facing (Raybestos)	.90
30 H.P. Facing (Cortex)	.50
30 H.P. Plain	.90

CHALMERS

30 H.P. Copper	.30
30 H.P. Steel	.15
36 H.P. Steel	.15
36 H.P. Copper	.30

GRABOWSKY

Two Cylinder complete	3.50
Two cylinder facing (Raybestos)	1.00
Two cylinder facing (Cortex)	.60

HUDSON

1911—33 H.P. Plain	1.00
1912—33 H.P. Plain	.50
1913—37 H.P. Plain	1.00
1911—33 H.P. Corked	3.00
1912—33 H.P. Corked	1.25
1913—37 H.P. Corked	1.25

We Also Carry Discs in Stock To Fit:

Alco	Velie
Case	Ewing
Speedwell	Lozier
Maxwell	Jordan
Mercer	

Diamond T Truck and others

(Cortex) linings listed above are a special chemically treated cork compressed into linen. Contains no wire, and will eventually supplant the Raybestos type which causes the clutch to slip after very little use. **(Note low cost of same.)**

We also maintain in stock complete clutches to fit these cars.

All parts are brand new and can be furnished at once, as we maintain a complete service for over 40 makes of cars at discount.

Bulletin No. 9

J. C. Gorey & Co.

Pioneer Parts Experts

354 West 50th St., New York

Telephone 9489 Columbus

Rectifiers

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Piston Rings

CYLINDER GRINDING PISTONS —AND— RINGS

Largest Because Best.

Send for Price List.

Houpert Machine Co.

355 West 52nd Street

New York, N. Y.

Cylinders Reground

CYLINDER GRINDING

GREATER EFFICIENCY
QUICKER WORK
LOWER PRICES

are the result of specializing in a single line By taking advantage of our service, you can have cylinders reground or rebored and fitted with new cast iron pistons and individually cast rings, at the finest equipped plant, *specializing exclusively* in this line. We guarantee absolutely every piece against poor workmanship. 20 years' practical experience is back of us. Write for prices.

BRIDGEPORT PISTON RING CO.
Connecticut Ave. and 3rd Street
BRIDGEPORT, CONN.

WORLD'S LARGEST CYLINDER REPAIRING COMPANY
Over Sixteen Thousand Satisfied Customers

SCORED CYLINDERS

(Porous and sand hole)

Repaired with Silver-Nickel Alloy

Fused Electrically by the "Lawrence Patent Process."
BEWARE OF IMITATION WORK

No Warping or Enlarging of Bore

Same Pistons and Rings Used—All Work Guaranteed for Life of Car

Reshipped 24 hours after received. Tested and approved by most motor manufacturers.
Write for Pamphlet.

L. LAWRENCE & COMPANY

(Established 1862)

—PLANTS AT—

Detroit, Mich.	1244 East Jefferson
Chicago, Ill.	1520 Michigan Avenue
New York	546 West 45th Street
Cincinnati, O.	410 Richmond Street
Newark, N. J.	290 Halsey Street
Cleveland, O.	1810 Prospect Avenue

CYLINDERS REBORED AND REGROUND. Fitted with light grey iron pistons and leakless rings. High grade quality. McCadden Machine Works, Inc., St. Cloud, Minn.

Cylinders Reground

CYLINDER REGRINDING PISTONS, RINGS and PINS

Quality work. Get our prices.

BUTLER MANUFACTURING CO.

ESTABLISHED 1897.

1121 EAST GEORGIA INDIANAPOLIS

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

TIRE REPAIRING TAUGHT — Full course two weeks. Call or write. N. Y. Tire & Vulcanizing School, 148 W. 67th St., N. Y. C.

Radiators and Lamps

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.

HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
BRANCH: 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATORS REPAIRED
We also make and repair
FENDERS, HOODS and TANKS of all kinds.
DAVIS & SCHEGG CO., 2124 Broadway, New York

Welding

ACETYLENE WELDING
New Process—Brazing of Aluminum Crank and Gear Cases
GIVE US A TRIAL
DAVIS & SCHEGG CO., 2124 Broadway, New York

Carburetors

SHIP THAT TROUBLESOME CARBURETOR

By Parcel Post. We rebuild and install new parts. Largest and most fully equipped carburetor testing plant in the East. Factory appointed service station for all the leading companies. Also a stock of used rebuilt carburetors, $5.00 up. All work guaranteed.

JOHN WILLS, Carburetor Specialist,
284 Halsey St., Newark, N. J.

Help Wanted

WANTED—For New York City and vicinity, experienced Service Station men on Electric Starters, capable of developing into foremen and branch managers. State full experience and qualifications. P. J. Durham Company, 244 West 49th St.,, New York City.

It Pays to Advertise

IN THE

Automobile Dealer and Repairer

Write for Advertising Rates

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A Novel Tire Tool.

A certain tire dealer, whose name is purposely withheld, has patented and devised a tool that should be of great interest to men engaged in the tire repair business. It fills a long felt want,



A New Tire Tool.

and a description of this tool will undoubtedly interest a great many of our readers. The purpose of this tool is to hold the tread flap out of the way of the operator while making repairs in the internal carcass of the tire.

Repairs on pneumatic carcasses (necessitated by blow-outs) are accomplished in substantially the following manner: An incision is made through the tire extending from near the bead to the opposite side of the carcass and through the tread of the tire to the first layer of canvas. Then lateral incisions are made through the first layer of canvas parallel to the beads of the tread to form a flap. This flap ranges from six inches to a foot in length, according to the size of the injury to be repaired. The canvas carcass is thus exposed and the repair is made in the usual manner. In the meantime the flap, because of its tough and resilient nature, and its tendency to return to its normal position, is a serious handicap to the operator, interfering constantly with the work of repairing. Many expedients have been resorted to to overcome this difficulty, but so far all devices for this purpose have been unsuccessful up to this time. We believe that the tire repair tool here described will perform its function very successfully.

Tokheim Oil and Gasoline Outfits.

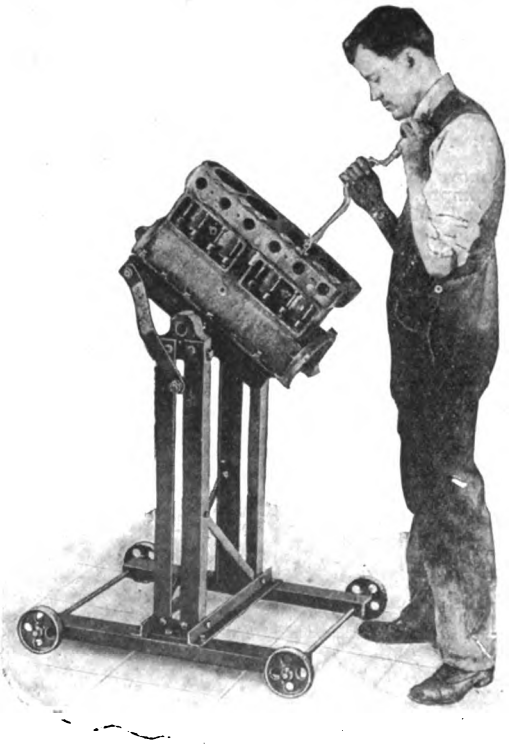
We wish to call the special attention of our readers to the meritorious line of gasoline and oil outfits for garages and dealers which is manufactured by the Tokheim Manufacturing Company, 830 N. 1st Street, W., Cedar Rapids, Iowa. This line includes the Tokheim curb post gasoline outfit. This is a self-measuring outfit, which is adapted to use on the sidewalk near the curb, and it enables the motorist to obtain a new supply of gasoline for his car quickly and conveniently. This apparatus is electric lighted at night, making it a continuous advertisement and reminder of service, to attract trade. The Tokheim Oil Wagon, made by the same manufacturer, will save time both for the dealer and his cutomers. This wagon handles both light and heavy oils, so that it may be moved out from the garage to the side of the car. This oil wagon contains two tanks of 20 gallons capacity each, and it is an excellent money getter for any garage owner. Readers who are interested should write direct to the manufacturers for prices and full particulars.

The Lite-a-Ford.

In the August issue of this magazine, we illustrated the products of the Hastings Manufacturing Company, 209 Michigan Avenue, Hastings, Michigan, but in this issue an interesting announcement will be found from this company in regard to their Lite-a-Ford. This is a device for controlling the glare of headlights on the Ford car. By means of this invention a brilliant illuminating radiance is furnished on low engine speed for country driving when most needed, and a variable dimmer for city streets to avoid arrest for non-compliance with city ordinances. The Lite-a-Ford retails for only $2.50 and thousands of Ford owners are already using this very useful specialty.

Engine Stand for Ford Motors.

We illustrate herewith the Every-Way Engine stand, especially made for handling Ford motors in repair shops. This device will save much time and labor on Ford repairs. The stand is so constructed that it can be turned to any position and securely locked in that position, thus placing the engine at exactly the angle best suited to the particular work you want to do. This engine stand is quick, simple, safe and sure in its operation. The stand can be furnished in stationary type, or mounted on four wheels so as to be easily moved around. Repair men who are interested should write for full description and prices to the manufacturers, The United Engine & Mfg. Company, Hanover, Pa.



Every-Way Engine Stand for Ford Motors.

Good Opportunity for Dealers.

A good tire is an excellent selling proposition for any dealer, and in this issue of our magazine, the International Rubber Company, 98 West Tennessee Street, Denver, Colorado, makes a proposition which should interest every dealer in the country. Within the next thirty days, this tire manufacturer will appoint about twenty men or firms in both Eastern and Western territory as exclusive factory dealers in the sale and distribution of Gates Half-Sole tires. The sale of these tires is to be promoted by a very exclusive advertising campaign, including the use of local daily newspapers, and every man who secures an exclusive dealership for these tires is to be given the benefit of all inquiries and sales resulting from this advertising in his territory. Gates Half-Sole tires are guaranteed to run 3,500 miles without puncture and this guarantee is backed by a concern having a million-dollar capital. This is a live opportunity for the right man, and we advise any of our readers to communicate at once either by special delivery mail or wire with the main office of the International Rubber Company, 98 West Tennessee Street, Denver, Colorado.

The Wizard Spark.

This is a new spark plug appliance which has been recently placed on the market by the Modern Tool & Stamping Company, 313 South Clinton Street, Chicago, Ill. The manufacturers claim that this device will put an end to spark plug trouble by increasing the voltage and decreasing the amperage, thus insuring a big fat spark under any condition. The device retails for only $1.00, and readers who are interested should write for terms and particulars direct to the manufacturers.

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"What Happened to Brown's Car."

The man who knows what it is to be relieved of his car when he left it standing in the street "just for a moment" will particularly appreciate that little tragedy, "What Happened to Brown's Car," issued in folder form by the Walker Ke-Les Lock Company of Chicago, manufacturers of the Walker Ke-Les Lock. The man, who so far has escaped the game of the auto-thief will get a tip or two from the story as to how to insure his good fortune.

In four brief scenes the car owner witnesses how a band of auto thieves work in stealing and disposing of cars. Mr. James H. Cumming, sales manager of the Walker Ke-Les Lock Company, who has made quite a study of the auto thief problem states that the little sketch is more typical and true to life than the average car owner would suspect.

"There has been such a demand for the little story," says Mr. Cumming, "that we are issuing a more elaborate work on the subject of the auto thief in his various species and modi operandi. The title of the new book will be "The Port of Missing Cars." This more general title will enable us to take up more fully the various reasons back of car stealing and the various ways by which the cars all come to "The Port of Missing Cars."

In the present booklet the story, "What Happened to Brown's Car," occupies two pages of a total of six. The remaining four pages are devoted to description of the Walker Ke-Les Auto Lock. These pages explain how the Walker Ke-Les works on a simplified combination principle. No key of any kind is used. To lock his car the motorist simply gives the operating handle (mounted just below the combination knob) a half turn to the "OFF" position and ignition is instantly disconnected and the gasoline cut off. To unlock the car, the driver simply turns the combination knob to the three number combination he has set and all the ignition is connected and the gasoline valve opened. The lock is capable of more than 87,000 changes in the combination. It can be installed on all cars, gasoline, electric and steam. An important feature of the lock is that it conforms with police and fire department requirements regarding cars standing in the streets.

L. Markle Goes to Republic Truck Co.

Lafayette Markle, a man well known in the automobile trade, has resigned the active management of his office as president of L. Markle Company, Chicago, Studebaker dealers, to become vice-president and assistant general manager of the Republic Motor Truck Company, Inc., at Alma, Michigan. Mr. Markle has been in the automobile business since 1890. His career includes five years in New York with the Central Automobile Company, handling imported cars. In 1905, he became mechanical engineer of the Corbin Motor Vehicle Company, a subsidiary of the American Hardware Company. After that he entered the selling field of the Olds Motor Works in the Mississippi Valley. He opened the Oldsmobile branch in Chicago in 1908, and was Chicago branch manager for the Buick Motor Company, in 1910 and 1911. In the latter part of 1911 he became Chicago branch manager of the Studebaker Corporation, and two years later he organized and financed the L. Markle Company, taking over the Chicago Studebaker business. In all these interests it is admitted that Mr. Markle developed a genius as an organizer, which has figured prominently in the success which has made the name of L. Markle Company familiar to the motoring world. The business of that organization is now over two million dollars a year. It was for his organizing quality that Mr. Markle was selected by President Frank W. Ruggles of the Republic Motor Truck Company. This truck concern has made marvelous progress and is turning out trucks at the rate of 2,000 per month. The gross business of the Republic Motor Truck Company, Inc., is expected to amount to more than two million dollars during the coming year.

Mason Tire Enlarging Plant.

The Mason Tire and Rubber Company of Kent, Ohio, is greatly enlarging the present commodity plant on account of increased demand for its product. The improvements include a new warehouse of very large dimensions, also a new cement house, boiler house and mill room. A large restaurant for the employees is now completed and in full operation. The experimental laboratory has been refitted with a complete and extensive scientific laboratory outfit. The experimental, chemical laboratory contains a small calendar and mill, a testing machine, and a press vulcanizer as well as an open steam vulcanizer. A new office building will immediately be constructed, and in the basement of this building an entire printing plant will be installed to be used in connection with advertising Mason tires.

Mosler Plugs at the Front.

J. W. Fischer, sales manager of A. R. Mosler & Company, the well known manufacturers of spark plugs at Mt. Vernon, N. Y., has just returned from Washington with an order for the Quartermasters' Department, for the American Expeditionary Forces in France, for spark plugs, which takes in all the requirements for plugs to be used in all the trucks, pleasure cars, motorcycles and tractors, which are with the American Army at the front. The business was placed entirely on Mica core plugs, and it is needless to say that the quality and not the price controlled the purchases.

DREADNAUGHT TIRES
In two famous treads—DREADNAUGHT Red "Silent" Vacuum, anti-skid, and DREADNAUGHT Red Ribbed.
5,000 Miles Guaranteed
DREADNAUGHT TIRE & RUBBER CO., BALTIMORE, MD.
Charles F. U. Kelly, Inc., Sales Dept., 1834 Broadway, New York

YANKEE Pump $5
A woman can work it with one hand. Clamps on running board in a jiffy—folds to fit any tool box—never dries out and loses compression.
Apex Electric Mfg. Co., 1411 W. 59th St., Chicago, Ill.

MASON
MASON TIRE & RUBBER CO.
Kent, Ohio—Akron Suburb
Distribut'g Branches in Cleveland, Kansas City, New York
MEANS MORE MILEAGE

WITTE
"Kero-Oil" Engines
Immediate Shipment—All Styles—
2 to 22 H-P.—No Waiting—Big Factory—Big Output—Prices most favorable. Write for my terms and prices—Cash, Payments or No Money Down.—ED. H. WITTE, Pres.
WITTE ENGINE WORKS
2499 Oakland Ave., Kansas City, Mo.
2199 Empire Bldg., Pittsburg, Pa.
I Save You $15 to $200

IMPERIAL WELDING CUTTING EQUIPMENT
OXY-ACETYLENE PROCESS
Catalog and prices on request.
IMPERIAL BRASS MFG. COMPANY
520 So. Racine Avenue Chicago

Forty Thousand Dealers
are selling
BENFORD'S
GOLDEN GIANT SPARK PLUGS
Get Your Stock Ready!

"BRAINS IN THE REAR AXLE"
BAILEY
Non-Stall
DIFFERENTIAL
Bailey Non-Stall Differential Corp.
1124 Michigan Avenue Chicago, Ill.

Smith Form-a-Truck $350 AND A FORD Chevrolet or Maxwell
SMITH MOTOR TRUCK CORPORATION
Manufacturers of Smith Form-a-Truck
Executive Offices and Salesroom: Smith Form-a-Truck Bldg.
Michigan Avenue at 16th Street, CHICAGO

LEGALITE LENS
gives better light and all of it on the ground, where needed. You too, should use Legalite Headlight Lens.
LEGALITE CORPORATION
120 Boylston St., BOSTON, MASS.

"IDEAL" Lawnmower Grinder
Grinds all makes of mowers perfectly in 15 minutes, without removing reel knives. Best money maker you can have in your shop. Nearly 10,000 in use.
Write for Catalog and Price
THE ROOT-HEATH MFG. CO., Plymouth, O.



Motorists' Surest Fire Protection
Fyr-Fyter, the fire extinguisher, always works, killing fire instantly. See your accessory dealer.
THE FYR-FYTER CO.
103 Patterson Bldg., Dayton, Ohio
Fyr-Fyter NEVER FAILS

"SUPERIOR PRODUCTS" FOR FORD CARS
SUPERIOR AUTOMOBILE PRODUCTS
RADIATORS, LAMPS, STREAM-LINE HOODS, CROWN FENDERS, VENTILATOR WINDSHIELDS, ETC.
WRITE FOR BULLETIN No 5
SUPERIOR LAMP MFG. CO.
136 WEST 52ND ST. - NEW YORK

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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$6

F. O. B. Newburgh $8 and $10 for other than Ford or Metz

SUNDERMAN

Vacuum Carburetor

$6

F. O. B. Newburgh $8 and $10 for other than Ford or Metz

Recent Successful Installations of Sunderman Carburetors

BUICK
Mesa Garage
Pueblo, Colo.

"I would not take the Sunderman Carburetor off for $25.00. In my experience of sixteen years as a mechanic I have never seen anything that equals it. It certainly does all that you claim for it and more too." (June 8, 1917.)

CHALMERS SIX
J. W. Hughes,
Stoneco, Wappinger Falls, N. Y.

"Took quite a long trip yesterday and will say the car ran beautifully with the Sunderman Carburetor. While I do not know exactly what mileage I got, I do know it was more than 50% better than the old carburetor." (July 9, 1917.)

GLIDE 30
G. C. Blackwood, Colfax, Ia.

"Have installed the Sunderman on my Glide 30 and I think it is great. It has developed power that I didn't know the car possessed." (May 23, 1917.)

MAXWELL 1916
Chas. C. Kneeland, Groveland, Mass.

"I installed the Sunderman on my Maxwell Roadster and find it is the best thing in the line of a carburetor that I have ever seen. In fact, I am doing stunts with my car that seem impossible to the average car owner. Gave a demonstration to a friend and on the strength of it I am ordering one for him." (May 20, 1917.)

OVERLAND
D. G. Douglass, Washington Mills, N. Y.

"My Overland never ran better since I had it than since I have installed the Sunderland Carburetor." (July 2, 1917.)

REO
Autoparts Supply Co., Portland, Ore.

"Received the Sunderman Carburetor and same was absolutely satisfactory in every way and made the car run as it never ran before. Our customer has praised us several times regarding it." (July 11, 1917.)

F. E. Howard, Faribault, Minn.

"Have a Sunderman on a Reo Four and it works O. K. Will run on kerosene when the motor is hot." (July 12, 1917.)

STUDEBAKER
Humphrey Auto Co., Lancaster, O.

"Just installed the Sunderman Carburetor on a Studebaker and it is certainly surprising the owner." (June 6, 1917.)

SAXON SIX
Lew T. Wall,
Nev. Consolidated Copper Co.,
McGill, Nev.

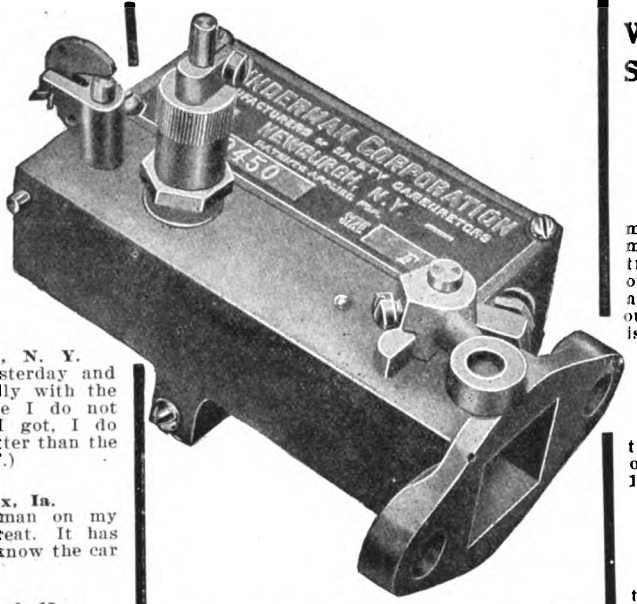
"About three weeks ago I installed a Sunderman Carburetor on my Saxon Six and I am much pleased with the performance of same." (July 5, 1917.)

FORD TRUCK
Bourne Bros., Painters, Milton, Mass.

"Have just had the Sunderman Carburetor put on a Ford truck and am much pleased with it." (July 16, 1917.)

FORD TOURING
Thos. F. Jefferies, Makoti, N. Dak.

"Purchased a Sunderman Carburetor for my Ford, and it is so much better than anything I have operated that I would like to obtain the agency for them. Took my machine dealer out for a ride and he said he had never seen a car pick up as that one did. I made a trailer out of my old buggy and took four suit cases, three trunks that weighed 335 pounds and three passengers 47 miles on 2½ gallons of gasoline that tested only 48." (July 19, 1917.)



Read These Proofs of Sunderman Success

In the columns adjoining this we give you, Dealers and Car Owners, absolutely indisputable evidence of the success of the Sunderman Vacuum Carburetor. These letters all bear recent dates.

In the left column we print unsolicited testimonials from owners who have installed Sunderman Carburetors on the most popular cars. We submit them to you without editing them. They speak for us more boldly than we have ever tried to speak for ourselves. Read these indorsements, and then send your order in at once. By all means, READ THEM. Every one has a message for you, whether you own or sell cars.

In the column to the right Dealers from various States, East, West, North and South, speak of their success with the Sunderman Carburetor. When a carburetor makes good so uniformly in localities which vary so widely in altitude and climate, it must be all we claim for it. READ THESE LETTERS, and prove the statements yourself. Send us a trial order, Mr. Dealer, and join the ranks of the Sunderman Boosters.

Help the motoring fraternity to save gasoline. You can DO YOUR BIT by stocking and selling the Sunderman Carburetor, which will save from 30 to 50 per cent of gasoline on any car.

If these dealers find it worth while to sell the Sunderman Carburetor, wouldn't it be good business for you? Write at once for terms.

Sunderman Corporation
13 Chambers Street, Newburgh, N. Y.
Western Office: 403 Kresge Bldg., Detroit

What Dealers Think of the SUNDERMAN VACUUM CARBURETOR

MINNESOTA
Electric Manufacturing Co.,
St. Paul

"The writer is satisfied that the Sunderman Carburetor is a winner, as we have made sufficient demonstrations in the country as well as in the city to convince anyone who cared to observe their workings at all that they are right. We have not, to our knowledge at the present time, a dissatisfied customer." (Aug. 3, 1917.)

MASSACHUSETTS
Herrick's Garage,
Plymouth, Mass.

"I have the towns around me crazy about the Sunderman Carburetor by putting one on cars in the different towns." (May 4, 1917.)

OKLAHOMA
Carroll, Brough, Robinson & Humphrey, Jobbers,
Clinton.

"We are having an exceptionally nice trade on the Sunderman Carburetor, and believe that we will be able to make a cleanup, as they are giving the best of satisfaction. Our salesmen driving cars assist in advertising them extensively." (May 10, 1917.)

MISSOURI
M. & N. Equipment Co.,
1423 Locust St., St. Louis.

"We have a fixed policy that we will not sell or recommend any device until we have tried it for ourselves. In the case of the Sunderman Carburetor we are enthusiastic, and for that reason would like to do something with it." (April 9 1917.)

TEXAS
J. F. Caldwell,
Amarillo.

"Would like agency for several counties. Am using one myself on a Ford and it works fine. Have orders for five." (April 12, 1917.)

NEBRASKA
T. J. E. Pinson,
Platte Center

"I now have 43 here working in good shape. They fire the engine all right, pull all right and have plenty of power." (July 20, 1917.)

VIRGINIA
Bittner Motor Car Shop,
Richmond.

"Have installed Sunderman Carburetors on Peerless 31, Hudson Six and on Fords and cars are doing fine and running excellently." (April 12, 1917.)

NEW YORK
The New Adirondack Garage,
Warrensburg.

"I have used four or five of them and can place at least a hundred more. Ship me two more for Saxon runabouts." May 24, 1917.)

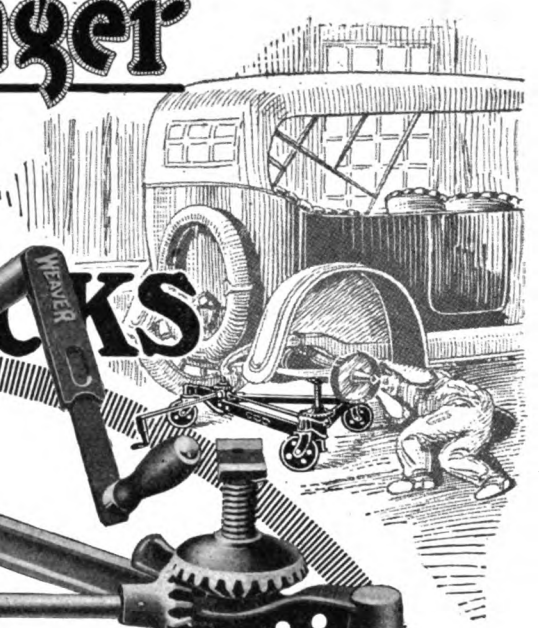
OHIO
Humphrey Auto Co.,
Lancaster

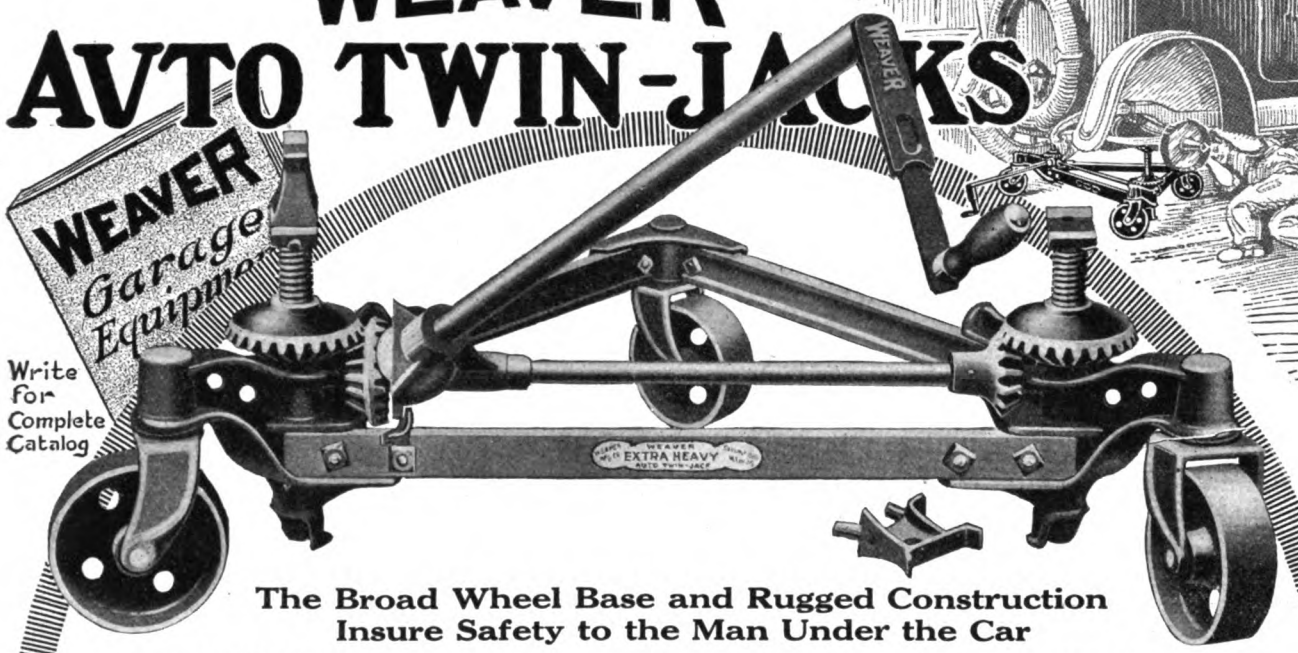
"We have some Sunderman Carburetors installed on cars here and they are working so well the owners could not be persuaded to change under any conditions. What kind of an agency proposition can you submit to us?" (April 30, 1917.)

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There's No Danger

in "overhauling" with WEAVER AUTO TWIN-JACKS





Write for Complete Catalog

The Broad Wheel Base and Rugged Construction Insure Safety to the Man Under the Car

THE feeling of absolute security inspired by the broad, massive construction of the Weaver Auto Twin-Jack enables the machanic to work to the best possible advantage. There is no fear of the dismantled car falling upon him, and he is enabled to move the car at will to facilitate operations.

The dependable crank hoist has no ratchets to be accidentally "tripped" or to jar loose while transporting the load. Every part is properly machined and fitted to insure the maximum of strength and durability.

Always in Service

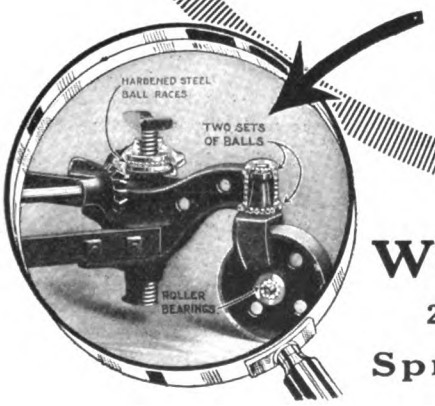
Every phase of the handling of automobiles demands Weaver Auto Twin-Jacks:—Unloading cars from freight cars—placing them in position on the sample floor—getting out the "buried" car in the garage—placing in closer formation to economize floor space in the storage room—handling dismantled cars in the repair shop—facllitating operations in the wash room and paint shop.

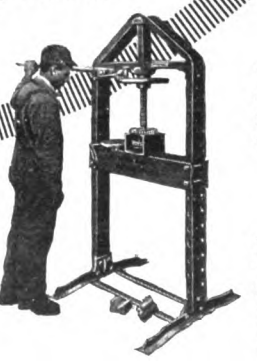
A few turns of the crank handle raises one entire end of the car and supports it firmly and securely upon the large ball and roller bearing casters. With one of these Jacks under each axle, the car can be turned completely around within its own length, pushed sideways, or manipulated upon the floor in any other desired manner. One man can handle the heaviest pleasure cars with ease.

WEAVER Auto Twin-Jacks are scientifically constructed and designed by SPECIALISTS who manufacture nothing but Garage Equipment. * * * Built in two sizes, to meet all requirements.
* * * Will fit either axle of the car.

Ball and Roller Bearings Throughout

High grade ball and roller bearings relieve the friction in the casters and lifting mechanism. Excessively heavy loads can be handled with extreme ease.







Weaver Auto Ambulance

Will handle your "tow in" jobs safely, quickly and economically. Will fit either axle.

Weaver 20-Ton Press

Discard the sledge hammer and do your work in a mechanical manner. This press will soon save its cost, besides increasing your patronage.

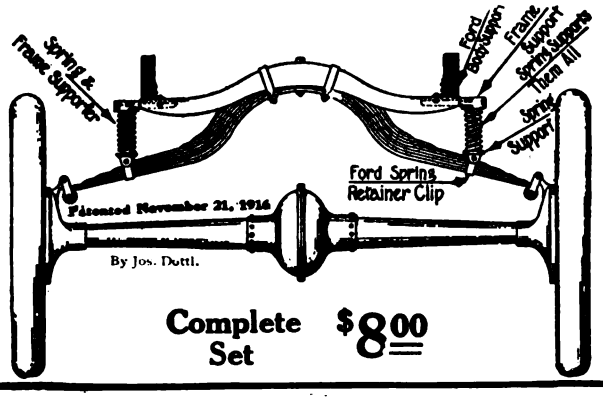
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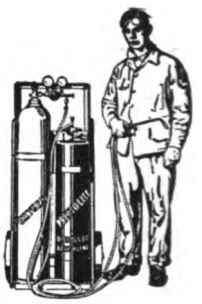
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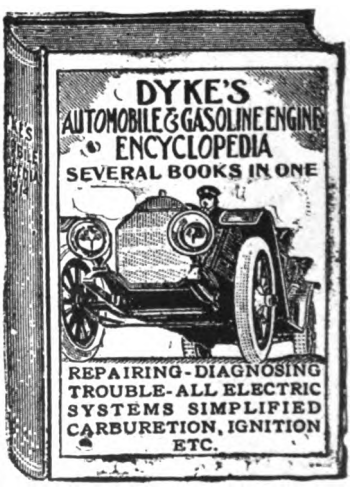
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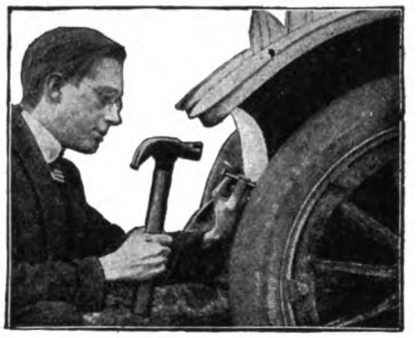
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We *guarantee* it *will not injure,* but, on the contrary, *give them longer life.* Motorists have tried Kor-Ker out and found it's *made good* under the *most severe tests.*

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These states are largely patronized in the Summer by tourists from all over the country, who like to visit the Catskills, the Adirondacks, and the White Mountains. The "RED ROAD BOOK" also gives maps of that portion of Canada reached by routes from Northern New York, Northern New England and Northern Maine.

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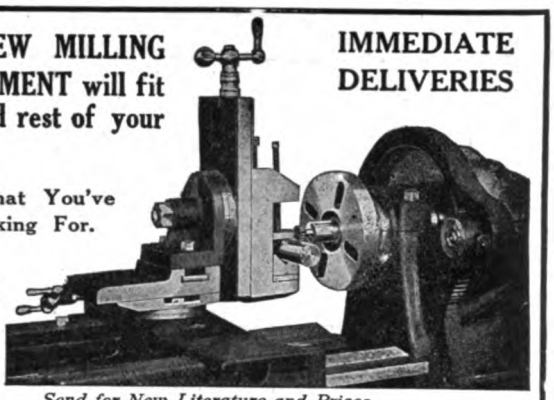
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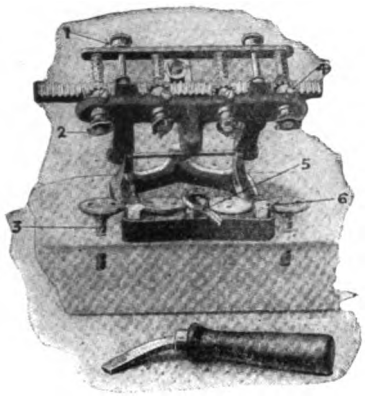
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IT MAY SOUND TOO GOOD—BUT! NEVERTHELESS IT'S TRUE

Think of it: A "Multiple" valve grinder—grinding Four (4) Valves of a Ford motor at One Time by a single back and forth movement, Saving 50% in time. Satisfying your customer more at less expense and More Profit to yourself.

Yes sirie, it's wonderful—so it has been proclaimed by thousands of satisfied users, who claim it to be the greatest labor saving device on the market.

1. Because it will grind—Two (2) intake and two (2) exhaust valves at one time.
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DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



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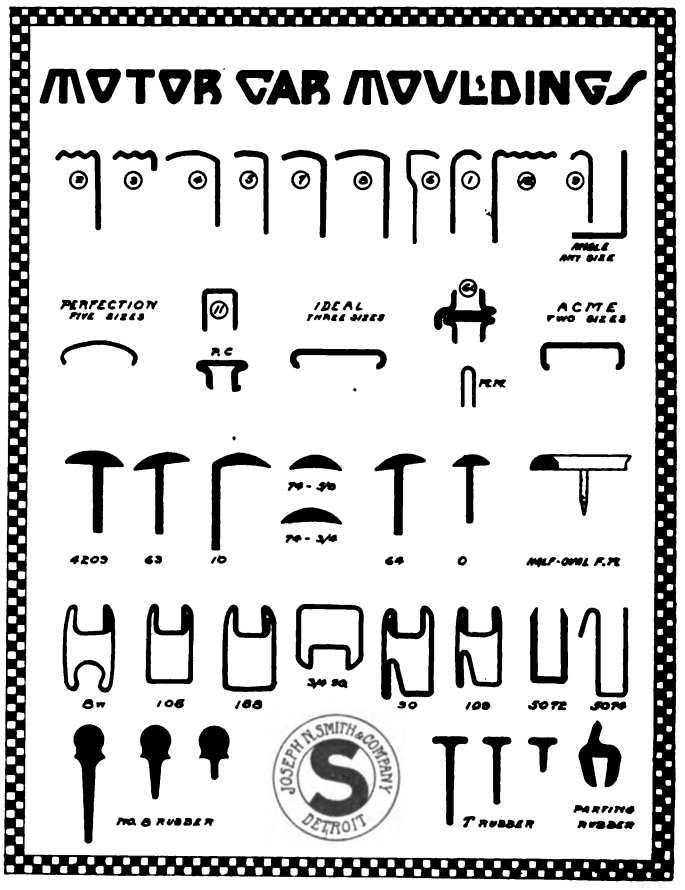
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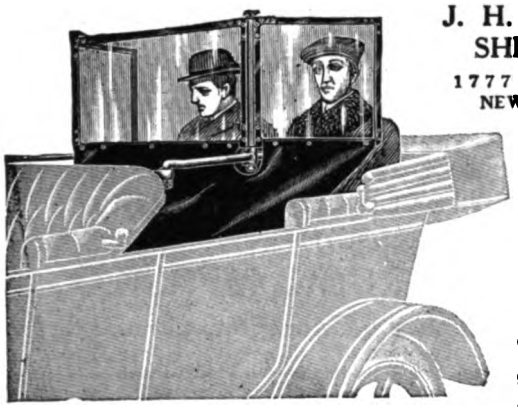
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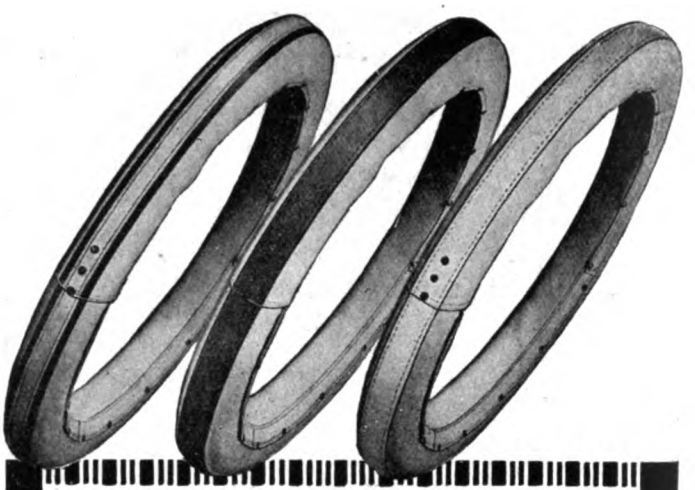
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Factory Rebuilt Like New at $65.

THE LIGHT RUNNING FOX TYPEWRITER

The word "rebuilt" has been abused and misused until it has become a meaningless trade term. When we rebuild a Fox Typewriter we take it all to pieces, re-nickel the nickel parts, re-enamel the frame and replace all worn parts with new ones. The same men who originally built the typewriter do this rebuilding **and do the work just as good.**

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We offer a rebuilt Fox Typewriter, Model No. 24—*just like new*—for $65.00. These have standard carriages taking paper 10½ inches wide, any kind of keyboard, any kind of type, rubber covers, tabulators, back spacers, two-color ribbons, and are complete with instruction books and cleaning outfits.

Send us any amount you can spare, **from $1.00 up,** as a first payment, and pay the balance $5.00 monthly. Or, send $61.75 all cash. If $10.00 or more is sent with order we will include Free our $4.50 Solid Oak Typewriter Table. Transportation must be paid by the purchaser.

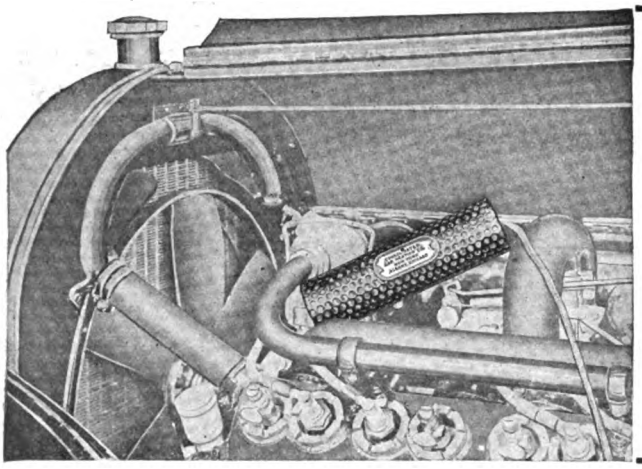


Please order direct from this offer, mentioning Automobile Dealer and Repairer for January. State price you wish to pay and enclose any amount of cash you can spare.

FOX TYPEWRITER CO., 6201-6211 Front Ave., GRAND RAPIDS, MICH.

Pay $5.00 Monthly

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Makes starting easy in cold weather. You need this rugged, safe, economical and convenient electric heater to keep your engine and carburetor warm. Attach it to electric light socket in garage and start in a jiffy. Don't heat your whole garage. This safe and efficient little heater applies heat just where you want it, under the hood of the car.

CONSOLIDATED CAR-HEATING COMPANY

NEW YORK Singer Bldg. · ALBANY · CHICAGO Fisher Bldg.

(Largest manufacturers of Electric Heaters for Railway Cars in the World.)

EACH ONE SPECIALLY CAST

The one-piece tight ring with the wonderfully planned joint.

No leakage of gas or oil — more power — less expense.



Don't just try a set — get a set — put them on and feel the "pep" in your motor.

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FOR THREADING PIPE OR RODS

HINGED PIPE VISES PIPE CUTTERS

Manufactured by

THE ARMSTRONG MFG. CO.,

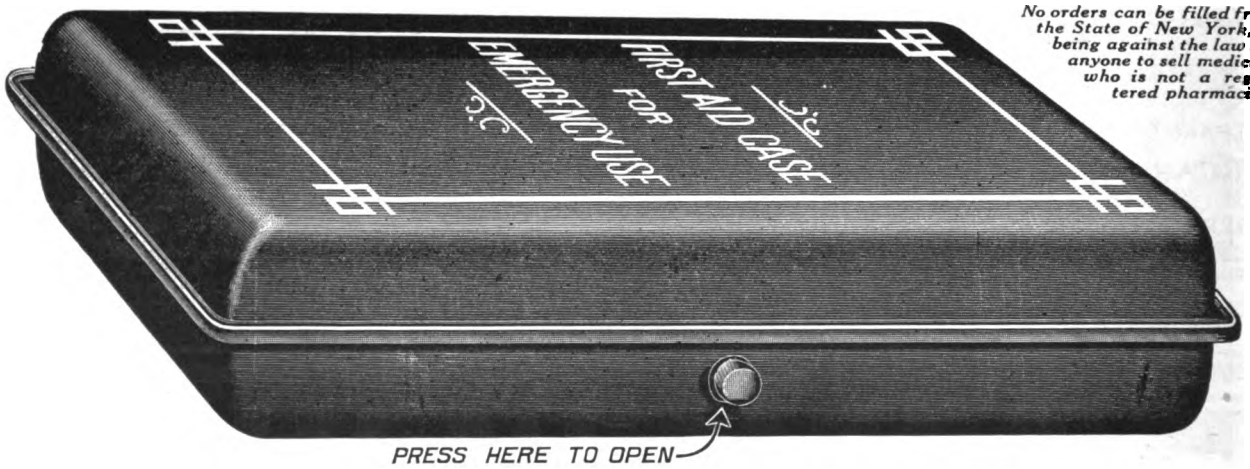
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IT MAY BE YOUR TURN NEXT

TO MEET WITH AN ACCIDENT ON THE ROAD.

It may also be a case of life and death to have the materials at hand for prompt treatment. We have recently made arrangements for a First Aid Case for emergencies especially for the readers of the AUTOMOBILE DEALER AND REPAIRER.

No orders can be filled from the State of New York, it being against the law for anyone to sell medicine who is not a registered pharmacist.



This case is made of heavy Bessemer Steel, size 11½x5½ and 2¼ inches deep, finished in Black Baked Japan and fitted with a strong instantaneous snap. It is strong enough to resist injury to the contents through accident or dampness.

The contents have been carefully selected to supply the needs in an emergency, before the doctor comes. All gauze, bandages and cotton have been prepared in aseptic laboratories under the same rigid inspection as those supplied to the United States Army and Navy.

The contents of this case consists of:—1 "First Aid to the Injured" Instructions. 1 Yard plain Sterilized Gauze for dressing large wounds. 10 Yards 2-inch Sterilized Gauze Bandages for dressing cuts and bruises. 10 Yards 2½-inch Sterilized Guaze Bandages for dressing cuts and bruises. 1 Package Sterilized Absorbent Cotton for pads and dressings. 1 Box Carbolic Salve for burns, sores, insect bites, etc. 1 Yard 1 inch Zinc Oxide Adhesive Plaster for retaining dressings and covering small wounds. ½ Ounce Tincture of Iodine, an antiseptic for immediate use on all wounds and abrasions. ¼ Ounce Spirits of Ammonia for use in case of shock, heart failure and faintness. ½ Dozen Safety Pins.

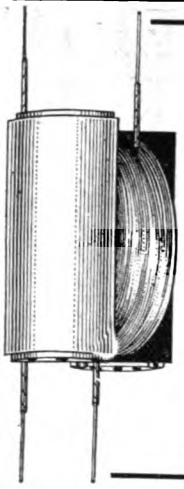
The retail price of this outfit is $2.50. We have made an arrangement with the manufacturers of such a liberal character that we can supply this outfit with a subscription to the AUTOMOBILE DEALER AND REPAIRER for a year, for the regular price of the outfit, $2.50.

In case you have already subscribed for this year, we will send you one of these outfits, postage prepaid, on receipt of $1.60, which may be remitted by check, money order, or in any convenient way.

Every subscriber to the AUTOMOBILE DEALER AND REPAIRER should have one of these outfits. It may mean the saving of your own life or the life of some friend. *ORDER AT ONCE AND THEN YOU WON'T FORGET ABOUT IT.*

Address, **MOTOR VEHICLE PUBLISHING COMPANY,**
Publishers of the AUTOMOBILE DEALER AND REPAIRER, **71-73 MURRAY STREET, NEW YORK**

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are fully guaranteed and equal if not superior in every detail to those of the orginal manufacture, as we make a specialty of rewinding Armatures and Coils for all makes of Magnetos.

These departments we have greatly enlarged—which is the best proof that we satisfy our customers.



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SEE THAT GROOVE CONTROLLING THE OIL?



LISTEN!

The groove full of oil forms a dam. Gas cannot get down, oil cannot get up. That's why motor has more power, no carbon.

ISN'T THAT A REASON?



"NO-LEAK-O" RINGS GUARANTEED SATISFACTORY, OR MONEY BACK

Don't rebore cylinders.

"NO-LEAK-O" restores power when others fail.

Write for booklet A2. Ford size or under, 50c. Discount to the trade.

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Represented by: AUTO APPLIANCE CO., 110 W. 34th St., New York; H. G. PAGO, 1414 S. Michigan Blvd., Chicago; J. W. VAN DE GRIFT, 627 Charles Bldg., Denver; J. E. CHAMBERLEY & CO., Nashville, Tenn.

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$15 Puts This Money-Maker In Your Garage

Balance in ten monthly payments of $15 each, which earnings should easily meet and give good profit besides. Send initial payment of $15 with trial order, or tear out this ad. and mail with name for full particulars. You run no risk, as under our guarantee you can return machine if not absolutely satisfactory.

One Garage Made $139.50 Profit in One Month

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IRON CEMENTS

No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight. Expands and contracts with the metal to which it is applied and not affected by heat, cold, water, gasoline or oil.

For Sale by Supply Houses.

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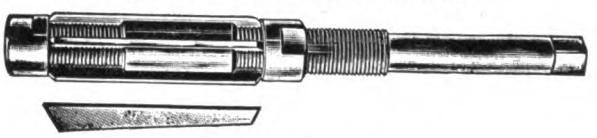
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The best made for repair work

The Critchley Expanding Reamer

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Try One and You Will Want More.



Reams odd size holes

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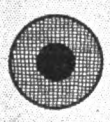
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WITH COUPON



FOR THE BUSY DEALER

Stevens Auto Repair Tags keep a record of your work, and prevent mistakes and "kicks" on repair bills.

Made large size, tough stock. One side printed for instructions, other for record of time and material. Numbered serially with detachable card and space for dealer's imprint.

GET YOUR ORDER IN TODAY.

1000 for $5.00.

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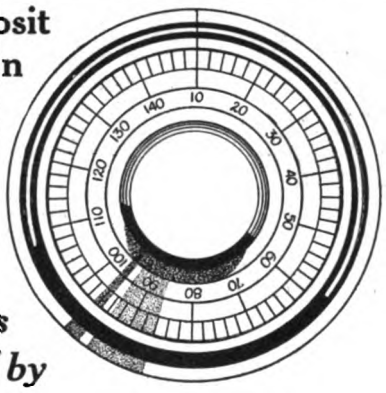
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Safety-Vault-like combination, with safety vault security. A simple twist of the wrist—turn the knob to three numbers—and your car is locked or unlocked in a couple of seconds. No complicated mechanism—just smoothly operating noiseless discs—the ONE auto lock thieves can't beat.

Watch out for substitutes! Tell your accessory dealer, garage, repair shop or supply store that you want a "WALKER" and see that you get it.

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Sales Dept. G: 2015 MICHIGAN AVE. CHICAGO, U. S. A.



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USED *Everywhere*

PARRY MANUFACTURING CO.

INDIANAPOLIS U. S. A.

PERFECTION PISTON RINGS

The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. **Try them and prove it.**

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Manufactured by AMERICAN PISTON RING CO., 1925 S. Charles Street BALTIMORE, MD.

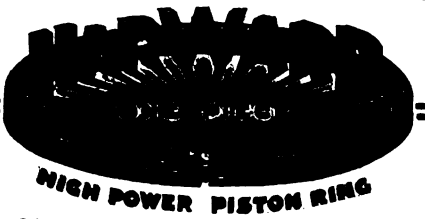
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At Maxwelton, August 9th, Barney Oldfield lowered all circular dirt track records from one to fifty miles, averaging for the entire distance 73 6 miles per hour. His car was equipped with Harward One-Piece Piston Rings. The most accurate piston ring in the world. The one ring that is scientifically correct. That is made by a secret process on specially built machinery and that cannot be duplicated by any other manufacturer.

If you want the greatest efficiency, power and speed you must use HARWARD S

HARWARD MFG CO., 3939 Magnolia Ave., ST LOUS, MO.

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2718

HARDENED SPINDLE CONNECTING BOLT FOR FORD CARS

IMMEDIATE DELIVERY.

OSBORNE & STEPHENSON MFG. CO.,
Plainville, Conn.

KNOWLSON'S Spring Spreader

Gives 100 per cent easier riding

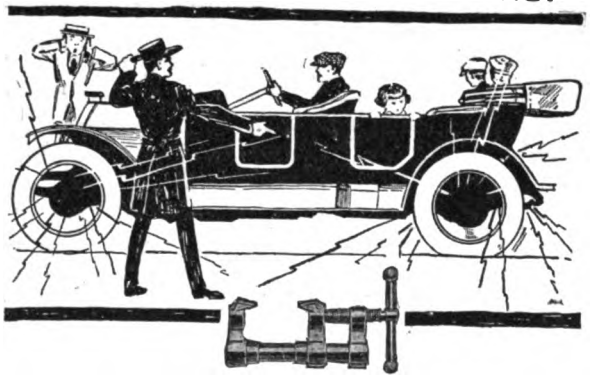
Securely clamps a broken spring.

A durable tool made of drop forgings, nickel-plated and polished.

At all Best Dealers, or sent prepaid for

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KNOWLSON'S Spring Spreader

STOPS THE SQUEAK

Adjustable to any size spring.

Protected by Basic Patents and Guaranteed.

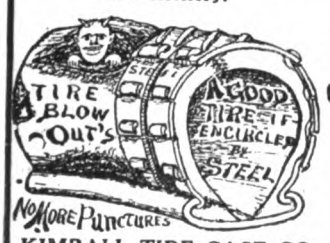
Money Refunded if Not Satisfactory.

One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

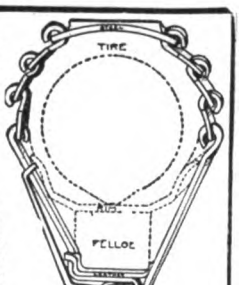
SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., Ann Arbor, Mich.

Hang on to your old tires. They will last as long as you live if covered with steel. **The Kimball Steel Protector** makes **Blowouts, Punctures** and **Rim Cuts** impossible. A few sections will hold any old blowout. Tires as flexible as ever.

Special inducements to those in new territory.







MUD CHAIN can be put on in a jiffy with one hand while standing on the run board. If you get in a mud hole you will laugh out loud. Hook the ends together and pull the little lever and they are on tight. Good for blowouts.

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We stated in our advertisement earlier this Spring and Summer, "It will be advisable to place your order early, as we are in position now to sell this outfit for $125, but cannot tell how long we can maintain this price, as raw material is going up so fast."

We said it would have to come, but-

that in the meanwhile tire repairmen would be getting the benefit of phenomenally low prices

NOW it has become necessary to advance the price of our

TYPE F

BIG CAPACITY VULCANIZER

SELF-CONTAINED OUTFIT

from $125 to $150. The steadily increasing cost of raw materials has made this absolutely unavoidable, AND NOW WE SAY this is better value equipment by far than is offered elsewhere at anywhere near this price.

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Regardless of whether people do or do not buy pleasure cars, they will drive the cars they already have—this fact, together with high prices of tires, will greatly increase the demand for tire repairing over what it has ever been before.

WE MAKE A COMPLETE LINE OF TIRE REPAIR EQUIPMENT. Catalogue on Application.

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Please send me your Free Booklet.

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That can be relied upon to be accurately machined, and of the highest grade material, to fit all makes of cars,

Write for prices and terms to

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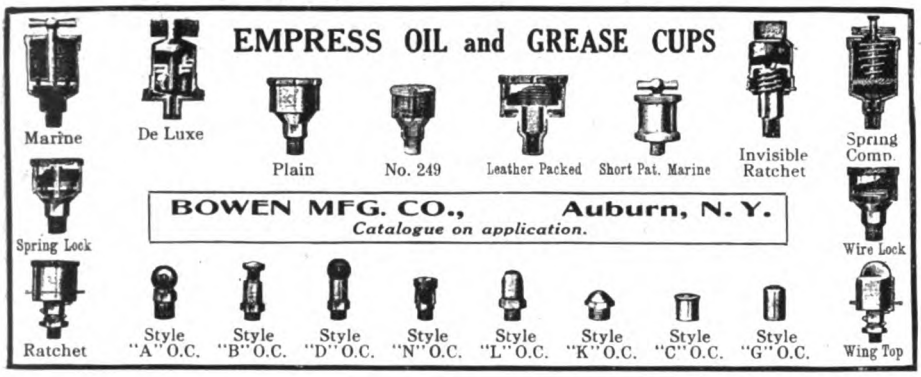
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We positively guarantee them to hold air indefinitely without loss of pressure.

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Catalogue on application.

"LAKEWOOD" QUICK ATTACHABLE FAN BELT FASTENERS



(Actual size 1 inch Fastener. We supply necessary split rivets)



Take the "jinx" off Fan Belt Repair troubles.

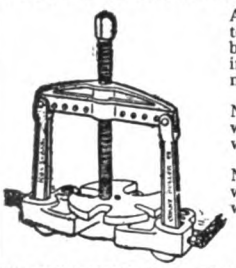
On or off in a jiffy—makes Fan Belt Repair profitable to you and enables you to quickly handle "special" fan belts to order. Outlast belts.

Car Drivers will buy them separate also.

Write us direct or ask your Jobber to get them for you.

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All that is necessary is to bolt the base to a bench, insert the legs into it, the 2 set screws make a fine Arbor Press.

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Shows how we give a *free* course of instruction in *Practical Battery Work* to our own Service Stations—how we help them get business—the Portfolio is jammed and packed full of profit bearing points—get it today.

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are sold wherever Ford Cars are found; each sale makes additional sales automatically. Orders are easily closed.

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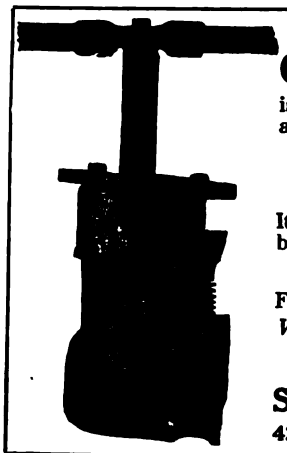
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is adjustable and will rebore practically all makes of

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It is simple, speedy and accurate and can be used by anyone familiar with tools.

Indispensable in any repair shop.

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We furnish oversize pistons for all makes of Motors.

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YOUR OPPORTUNITY

TO INCREASE YOUR PROFITS FROM FORD OWNERS

THE BILL AUTOMATIC SPARK RETARDER

Positively Prevents Pre-ignition and consequent back-firing when starting the motor, thus saving the pain and inconvenience of a broken or badly sprained arm or wrist.

Instantly advances the spark upon the first power stroke of the motor, insuring continued running without the necessity of sprinting back to your spark control.

Is absolutely automatic in its action and requires no attention whatever from the driver.

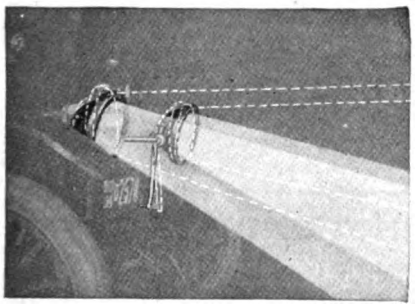
The long felt want and enormous demand for a device of this kind makes it a rapid seller.

Quick turnover and a generous profit makes it a splendid dealer proposition. Write for details.

RETAIL PRICE, $3.50

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The Pennock Headlight Tilter



Operated from the seat, best covers all the conditions of city and country driving with 40 to 300% more light than other devices.

Don't cover up your light with lenses, you need it all. **Don't turn out your light with dimmers,** when you need it most.

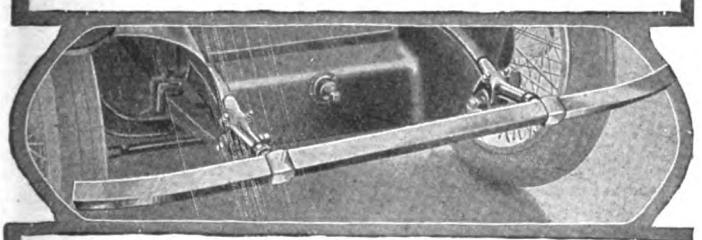
Tilting **increases** the light in proportion to the decreased distance lighted, **absolutely eliminates glare** and is legal everywhere. Fits electrically lighted, gas lighted or Ford cars. Retails at $5.00 the set. *Write*

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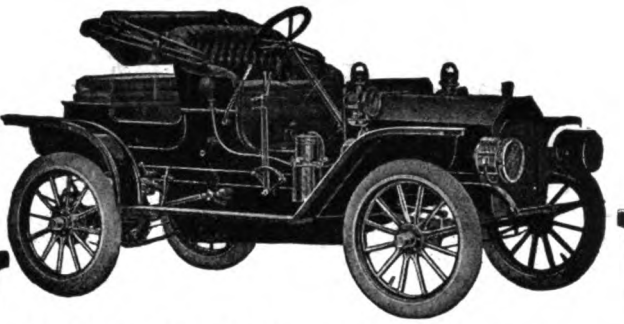
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Make more money selling Gemco Bumpers for front and rear. Built on correct end-thrust principle. Diamond or channel bars—extra heavy, can't rust.

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The **Auto Repairers' Guide & Price Maker** is issued in the interest of automobile repairers, dealers and garage men—**it's free to the trade** and sent to them only.

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THE Fisher PATENTED "RIM-GRIP" SUB-CASING

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THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

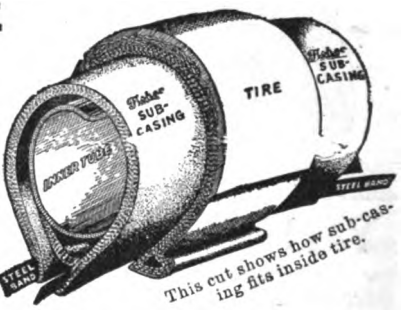
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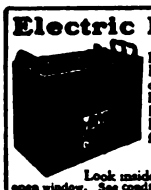
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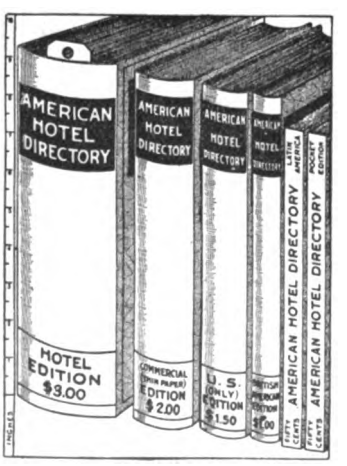
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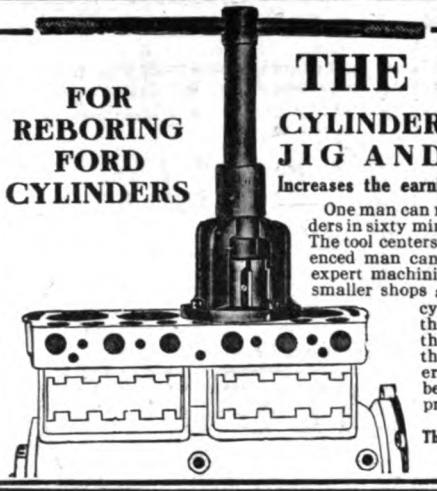
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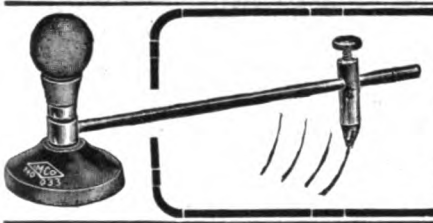
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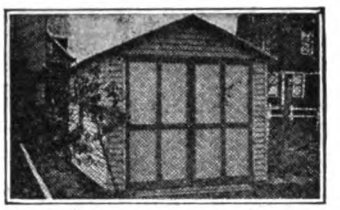


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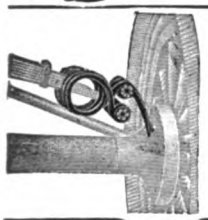
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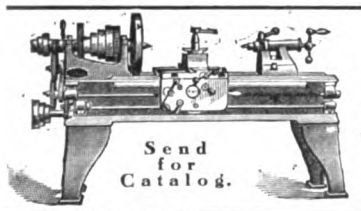
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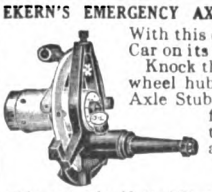
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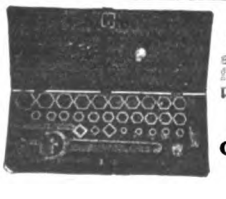
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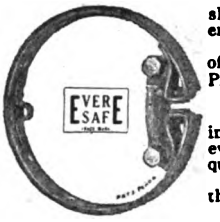
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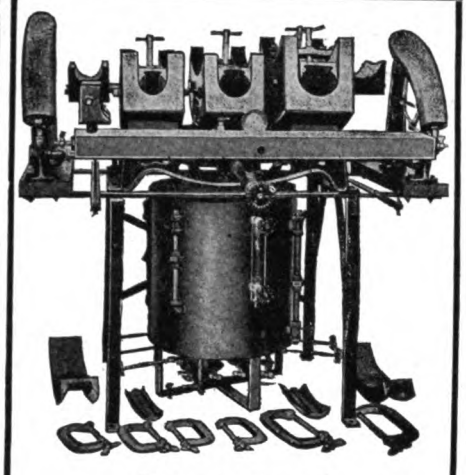


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Mitchell Dealers now have these models on show. Go see them.

Mitchell Motors Company, Inc., Racine, Wis., U. S. A.

STA-TITE PISTON RINGS

"Eternally Tight"

When you equip with Sta-Tite Rings you get all the power you pay for—all the time, as long as the car runs. They save the oil, gasoline and compression, and reduce carbon deposits. That is because they are made by Piston Ring specialists.

THE PISTON RING CO. Dept. 132 MUSKEGON, MICH.

EXCESS POWER

in **The New Disco Starting and Lighting System** for Ford cars, assures easy starting under all conditions. The motor is equipped with the famous Bendix-drive used on the highest priced cars—why not get *full* information—write to-day.

New Price, $95.00

DISCO ELECTRIC STARTER CO., Detroit, Mich.

Electric Trouble Shooter

AMBU

Detects and locates, quickly and accurately, trouble in any American made starting and lighting system used as standard on any American made car

AMERICAN BUREAU OF ENGINEERING, Inc.
1028 So. Wabash Ave. Chicago, Ill.

POWER



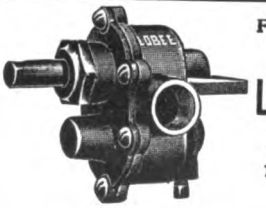
The two-horse-power Benninghofen Engine offers even economical power for every purpose. Many new, exclusive features, including "auto throttle governor," not hit and miss governed. Surprisingly low cost. Burns kerosene or gasoline. Runs machinery, pumps water, saws wood, runs separator, churns, etc. Catalogue and details free.

C. BENNINGHOFEN & SONS, Dept. 1140, Hamilton, O.

AMAZON SUPERTIRES

ANTI-BLOWOUT

THE AMAZON RUBBER CO., Akron.



For good circulation on Automobile or Motor Boat, use a

LOBEE PUMP

LOBEE PUMP & MACHINERY CO.
1790 Niagara Street
Buffalo, N. Y.

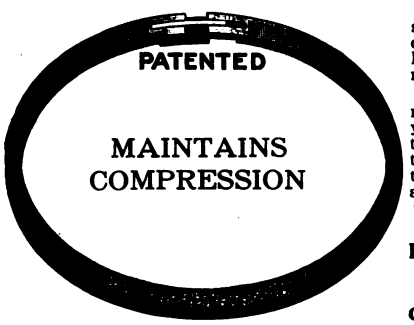
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PEERLESS PISTON RINGS

ARE THE BEST



PEERLESS RINGS are similar to the standard type of rings in every respect EXCEPT—that they will not leak.

Selling them means more money to you — improves your standing with your trade and makes you a better purchasing agent for those depending on your ability and judgment.

Write today for prices and descriptive matter.

LARSON & HILKER,
Distributors,
19 S. La Salle Street,
CHICAGO, U. S. A.

1917 AUTOMOBILE MAILING LISTS.

36,931 Automobile Dealers, all kinds, U. S., price $50.00 or $2.50 per thousand by states.
8,884 Ford Dealers, U. S. and Canada, price $18.50 or $2.50 per thousand by states.
38,453 Auto Garages, price $50.00 or $2.50 per thousand by states.
36,431 Auto Repairs, price $50.00 or $2.50 per thousand by states.
45,298 Auto Supplies, price $60.00 or $2.50 per thousand by states.
57,703 Dealers, Garages, Supplies and Repairs combined without duplication, $80.00 or $2.50 per thousand by states.
1,136 Auto Supply Jobbers, price $4.00 for the list.
2,780 Auto Tire Dealer, price $10.00 for the list.
3,099,575 Auto Owners, $2.00 per thousand.
1,041,975 Ford Owners, $2.00 per thousand.

All commercial lists are typewritten, show financial rating in dollars and are 1917 compliation, and guaranteed 98% correct. Ask for Price List No. 82, showing 2,500 other classifications of dependable mailing lists.

TRADE CIRCULAR ADDRESSING CO.
Phone, Franklin 1182. 166 W. Adams St., CHICAGO



BRAENDER
TIRES and TUBES
Are Cheapest on Mileage

They are strictly high grade—built to outlast all others, and they do it. Ask any user.

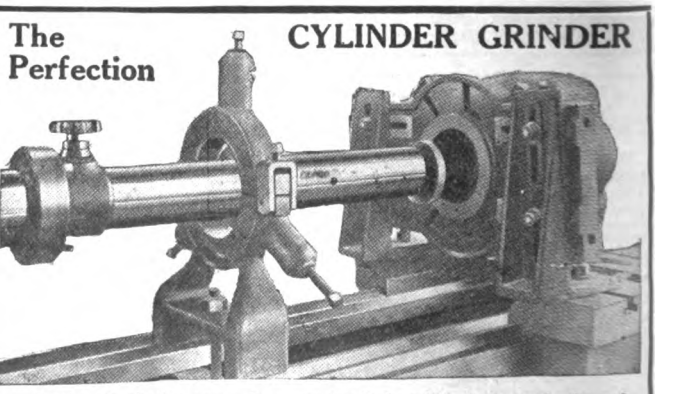
Send for particulars about BRAENDER Bull Dog Non-Skid—the Fastest, Safest, Smoothest-Riding Tire Made.

Braender Rubber & Tire Co.,
Factory: Rutherford, N. J., U. S. A.
Branches: 250 W. 54th St., New York, N. Y.
675 N. Broad St., Philadelphia, Pa.
1350-54 So. Michigan Ave., Chicago, Ill.

BRAENDER
Bull Dog
Non-Skid

Trade Mark

The Perfection CYLINDER GRINDER



Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. Descriptive literature on request.

WOOD & SAFFORD MACHINE WORKS, GREAT FALLS, MONTANA

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FAIR LIST PRICES FAIR TREATMENT

GOODRICH TRADE MARK TIRES

Start Your Customers Right With

GOODRICH Tubes

A TIRE is no better *than the tube* in it. For after all a *shoe* is but an armor to *protect* the vital part within it—the *tube* that holds the LIFE BREATH of the tire.

It is the duty of dealers to fix this fact in the minds of their customers together with the intense importance of getting the *best tube* to be had.

To help you determine the best tube, we ask you to take in your fingers a GOODRICH BROWN TUBE, and compare it with any other tube.

The very feel of it—its texture, its elasticity, as flexible as a big rubber band for all its tough thickness—tells you the striking difference.

Goodrich Brown Tubes cost more than other tubes, but a dealer should impress upon a customer that *cheapness* in a tube at the *beginning* means *costliness* in the *end*.



Goodrich also has an excellent standard tube at a lower price—THE GRAY TUBE.

Assure your trade that Goodrich tubes—another triumph of Goodrich's forty-eight years experience in rubber compounding—are the best "tubes for him in any case."

The B. F. Goodrich Company

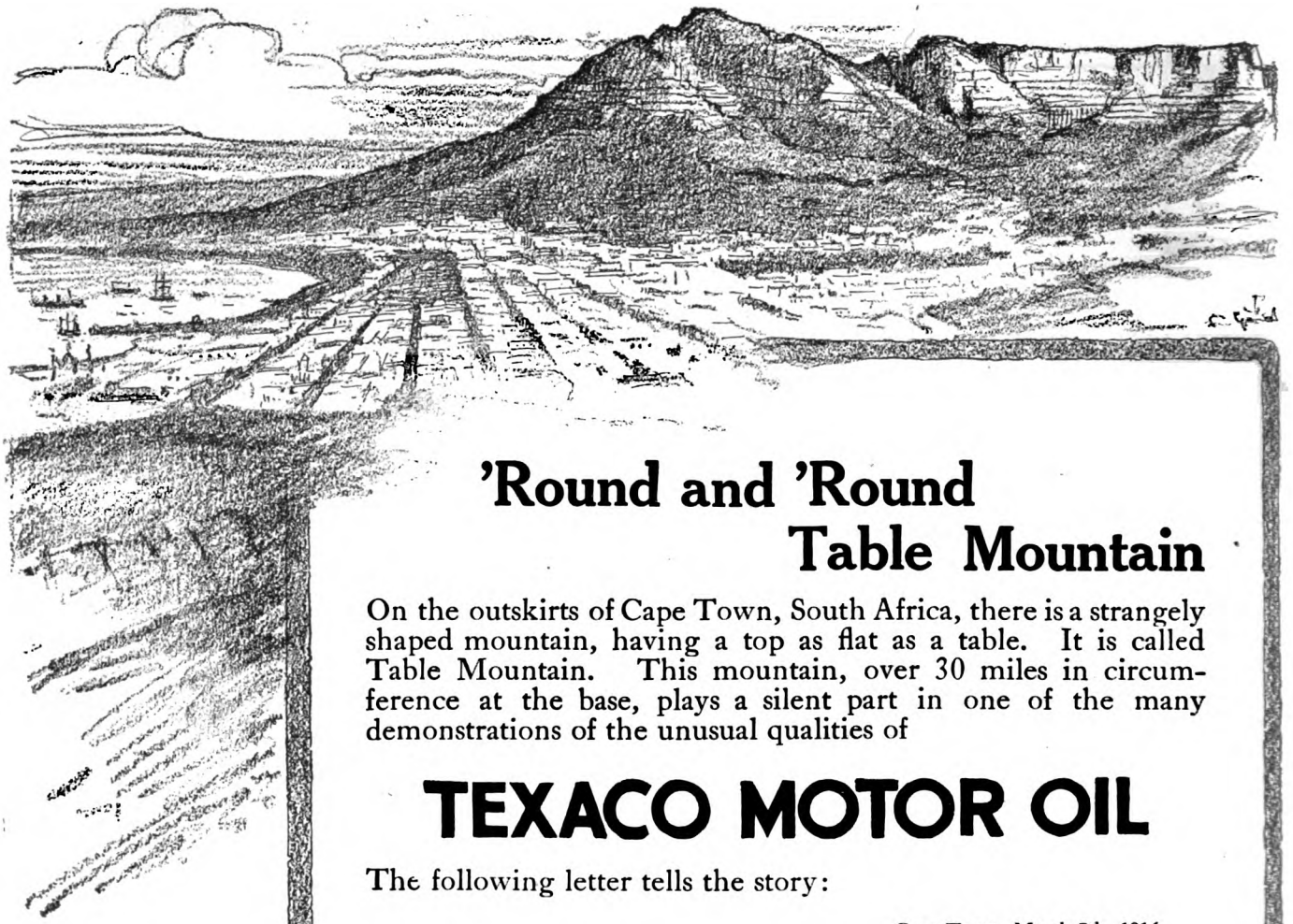
AKRON, OHIO

Maker of the Famous Silvertown Cord and Black Safety Tread Tires

BEST IN THE LONG RUN

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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'Round and 'Round Table Mountain

On the outskirts of Cape Town, South Africa, there is a strangely shaped mountain, having a top as flat as a table. It is called Table Mountain. This mountain, over 30 miles in circumference at the base, plays a silent part in one of the many demonstrations of the unusual qualities of

TEXACO MOTOR OIL

The following letter tells the story:

Cape Town, March 7th, 1916

The Texas Company
(Export Dept.)
17 Battery Place, New York.

Dear Sir:

We have just had the pleasure of having a conversation with the Superintendent of the City Tramways of Cape Town, who, as you are aware, operate a large bus service around Table Mountain (a distance of 32 miles).

It became recently necessary to do some slight repairs to a truck, and while it was being held the Superintendent decided to take a look at the engine. The carbon was removed after a run of two years and two months, the truck doing a total of 11,000 miles, and in the service required of this vehicle the engine is kept running all the time on account of having to get out of the way of the different trams.

The average amount of carbon found on each of the Pistons was 4.519 grams, a total of 18.076 grams for the four pistons. All bearings were found to be in a most satisfacfory condition and an examination of the cylinder walls, piston and rings denoted their condition to be perfect.

Yours very truly

(signed) D. E. IRWIN.

Texaco Motor Oil will give just as good service in your car as it did in this Cape Town truck.

The next time you buy motor oil buy Texaco. The best way, the safest way, to buy is in one or five gallons cans. You can identify Texaco by its clear, clean color.

THE TEXAS COMPANY
New York Chicago Houston
DISTRIBUTING OFFICES IN MOST CITIES

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No Cranking—Just Riding!

Motoring loses its lure when a woman has to perform the hard labor of cranking.

Where the powerful, invisible, obedient sinews of electricity attend to the cranking, the joys of motoring are multiplied and driving becomes all pleasure.

Electric-cranking of Ford cars attains its highest perfection in the new, but already famous,

STARTING & LIGHTING TWO-UNIT A·B·C SIX-VOLT SYSTEM FOR FORD CARS

Experienced Ford dealers no longer experiment with incompetent Ford starters. They concede, and thousands of A. B. C. owners concede, that this greatest of all Ford accessories conforms more closely to Ford engineering and construction than any other starter in the field.

All over the world, in all weathers and all climates, the A. B. C. starts any Ford and lights any road at pressure of button.

Simple, compact, easiest to install, longest lived. Puts Ford starting in the same class with the highest priced cars.

Weight evenly distributed on both sides of engine by units. No drag or strain on motor from starting or generating. Noiseless in operation. A fibre, leather, and metal belt, moving in a V-type pulley, gives the highest pulling contact. Guaranteed efficient and mechanically correct.

Ford dealers, who have not yet brought to their customers the overwhelming advantages of the A. B. C., should at once fill out and mail the attached coupon, and learn the terms of our generous 1917-1918 dealer proposition. Once an A. B. C. dealer, always one.

A. B. C. Starter Co., Detroit, Mich.

A. B. C. STARTER CO., Dept. H Detroit, Mich.
Gentlemen:

☐ * Please send me complete details of your terms to dealers.

☐ * Please send me A. B. C. booklets for Ford owners.

* Please check the request you wish us to fill.

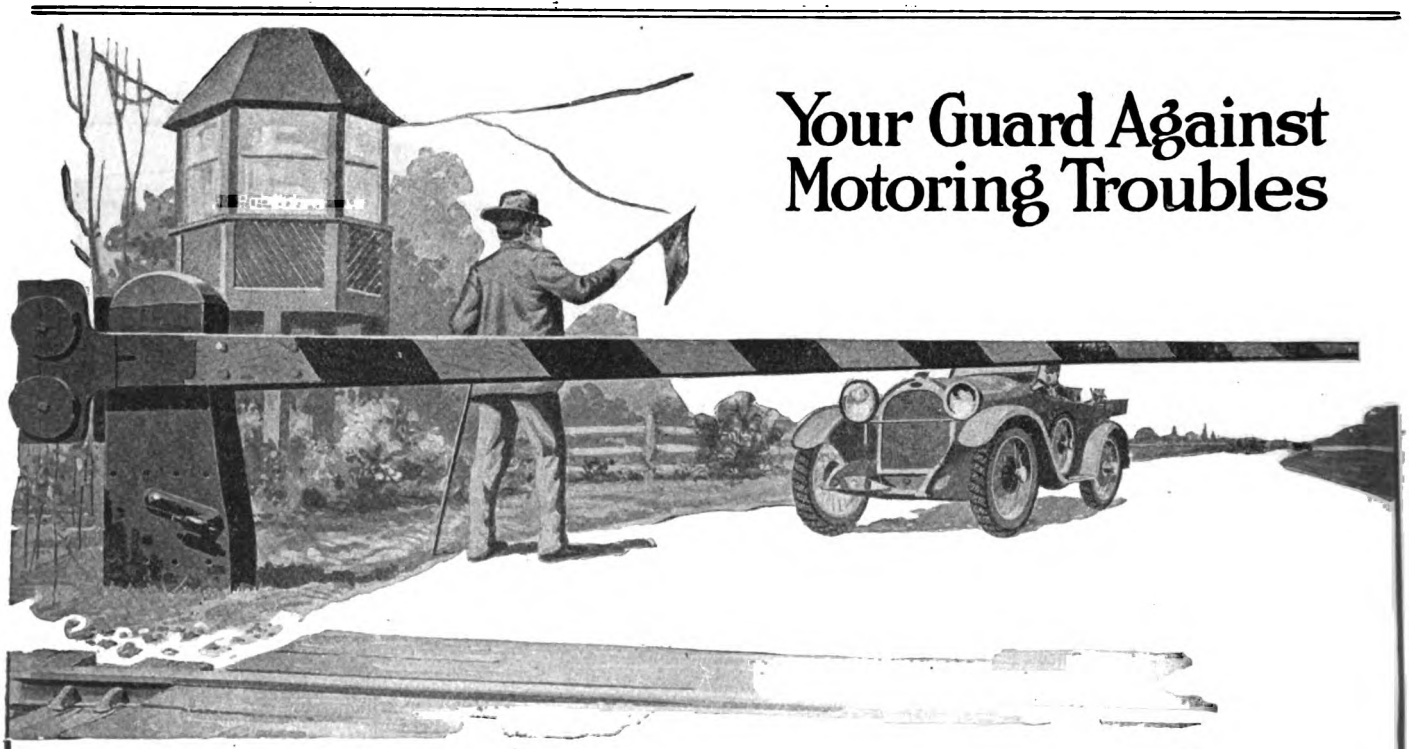
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Address.....

City.....

State.....

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Your Guard Against Motoring Troubles

ACCIDENTS will happen. They cannot be prevented. No one knows the day nor the hour of the day that will bring tack or nail or glass into contact with your tires. But, one can protect oneself from the long delays that those accidents may occasion. And the big helps in emergencies are Firestone Accessories.

Firestone Cementless Tube Patches are excellent examples of how much Firestone quality counts in "first aids." Easiest to apply. Always stay put. Tab on protecting muslin permits quick removal for motorists in a hurry.

The Firestone accessory line includes Hook-On Boots for Clincher or Straight-Side Tires, Lace-On Boots, Blow-Out Patches, Cure-Cut, Cement, Air Pressure Gauges, Tire Tape, Tire Mica, etc.

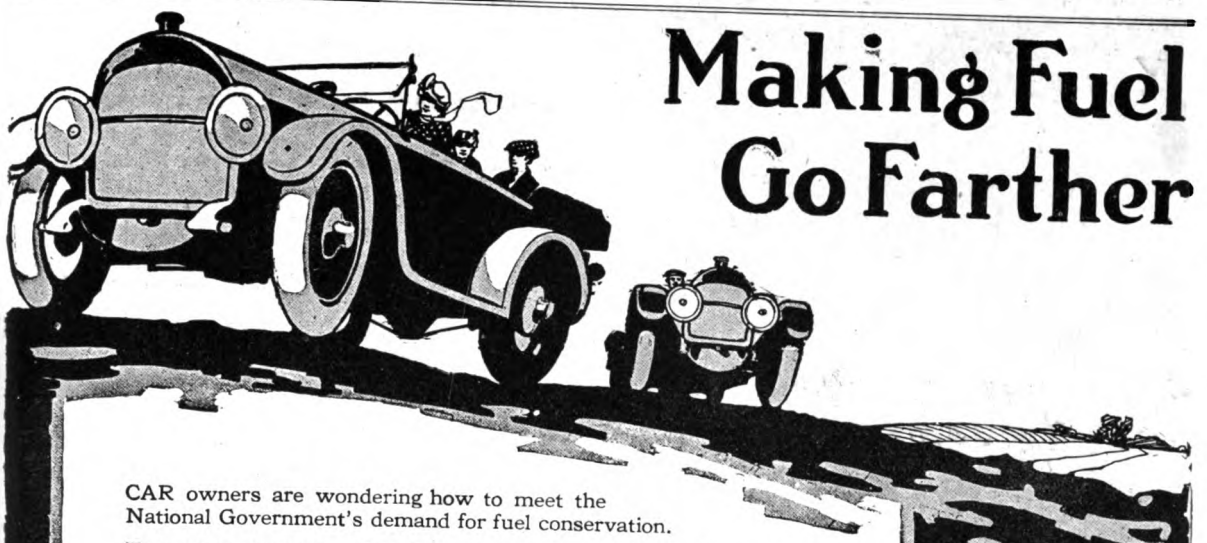
They embrace every emergency need. They provide first quality "first aid" when tire accidents threaten to delay. Your garage can provide you.

FIRESTONE TIRE AND RUBBER COMPANY
AKRON, OHIO BRANCHES AND DEALERS EVERYWHERE

Firestone ACCESSORIES



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Making Fuel Go Farther

CAR owners are wondering how to meet the National Government's demand for fuel conservation.

Two ways are open. One is to use their cars less. The other and pleasanter way is to make fuel go farther by installing

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

The average owner doesn't realize how much gas is wasted by old piston rings. Because he can't see the leakage, he doesn't think it amounts to anything, but you know it means a lot of lost mileage in a season.

Get your customers to use McQuay-Norris LEAK-PROOF Piston Rings. That's the only way to utilize every particle of power in every drop of fuel. The rings are wonderfully flexible and close-fitting; have absolutely equal bearing at every point, yet with light enough tension not to cause unnecessary friction loss.

Immediate service is the great thing about these rings. Anywhere—any time—you can get exact size rings for any make or model of motor, and thus earn the customer's satisfaction over a quick job. Over 300 jobbing and supply houses carry complete service stocks. Any oversizes, widths or diameters, are always available at the factory.

Get this Booklet—it's ***Free***—"To Have and To Hold Power", the standard handbook on gas engine compression. Every garage and repair man ought to read it. Write Dept. R.

Manufactured by

McQuay-Norris Manufacturing Co., St. Louis, U. S. A.

BRANCH OFFICES:

New York	Chicago	Philadelphia
Pittsburgh	San Francisco	Los Angeles
Seattle	Kansas City	St. Paul
Atlanta	Dallas	

Canadian Factory: W. H. Banfield & Sons, Ltd., 372 Pape Ave., Toronto.

-the Genuine



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Vesta Searchlights

Absolutely Dependable

In these days it isn't a case of teaching the motorist the advantages of a Windshield Searchlight.

He knows that.

It's now a case of showing him the best.

That's what he wants and must have.

$5.00 to $7.00

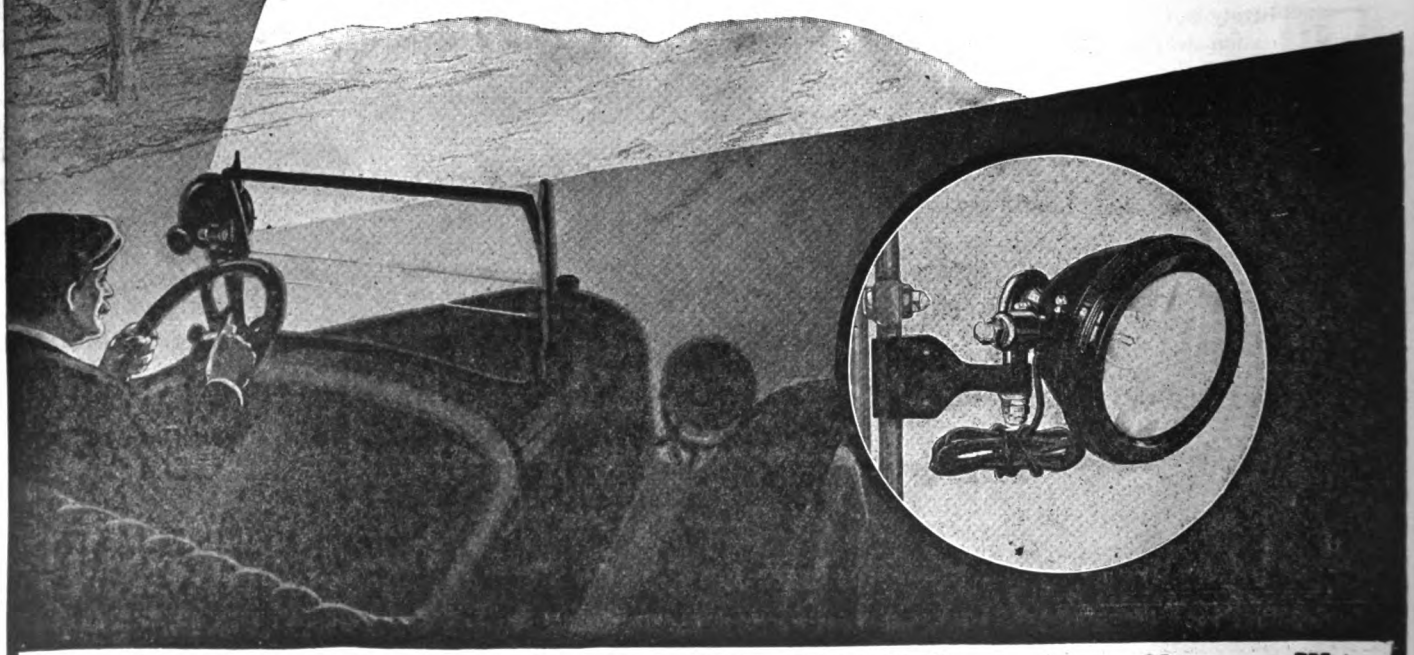
Here are a few of the many good things you can show him about the VESTA—a few of the things that make the Vesta absolutely dependable; that will make certain sales and consequent good profits for you:

Cutler-Hammer Switch in handle; machined taper joints; best malleable iron bracket; perfect attachment that fits all makes of cars; five feet of best conductor cord; doors hinged on both sides, can't rattle. New Mazda Nitrogen Bulbs; heavy gauge steel doors and body; German silver handle cap.

In fact, in the Vesta you will find that every essential to convenience and efficiency has been met. A powerful, versatile, sturdy lamp; throws a beam 800 feet; light in weight and easy to manipulate; can't rattle or jolt loose; will turn and remain in any position—it stays put.

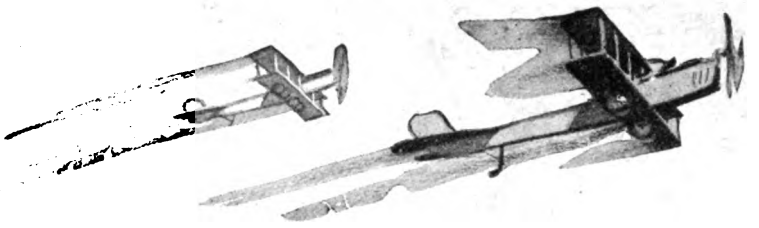
And remember the same high quality represented in the Vesta Batteries and other Vesta lighting accessories are embodied in these wonderful Searchlights.

Investigate them—learn more about them. Let us send you prices and complete information. Write today.

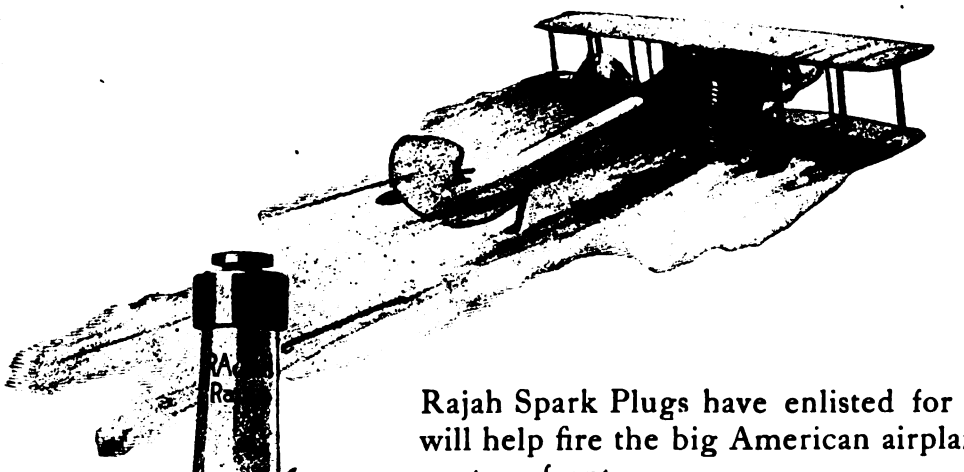


VESTA ACCUMULATOR CO., 2101 Indiana Ave., Chicago, Ill.

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Rajah enlists in the U. S. airplane service





Rajah Spark Plugs have enlisted for service in France. They will help fire the big American airplane fleet to victory on the western front.

Before the war Rajah Spark Plugs were standard equipment for our Army and Navy airplanes. They made so good in service that the Government continues their use.

A spark plug dependable enough to safeguard a fighting aviator's life is a pretty safe plug for a car owner to use. Talk up these Rajah records to your customers. It makes it easy to sell the first set. Rajah service will sell the rest. Your jobber can supply terminals for all models and all makes of motor car.

RAJAH *SPARK PLUGS*

RAJAH TERMINALS AND ADAPTERS

are furnished so that Rajah Plugs can be used on any car not equipped with the Rajah type of Clip Terminal. Any size exchanged if desired



Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.



Rajah Thumb Nut Terminal
Adapter for Dodge, Ford, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.



Rajah Packard Terminal
Adapter for Packard 4 and 6 cylinder.



Rajah Stud Termina
Adapter for Buick, Chevrolet, Oldsmobile.



Rajah Ball Terminal
Adapter for Franklin. Special type for Willys-Knight.

Address RAJAH, *Bloomfield, N. J.*

HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland, Seattle JOHN MILLEN & SON, Ltd., Montreal, Toronto

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GOODELL-PRATT

1500 GOOD TOOLS

SATISFACTION IN EVERY TOOL



IRON, steel, wood and brass are not the only things that go into a Goodell-Pratt Tool. We put good old fashioned honesty and care into every one and try to build in satisfaction. That is the reason that Goodell-Pratt Tools please all users.

We now make a large number of tools suitable for Automobile work. These tools are sold by most up-to-date supply dealers and jobbers everywhere.

You can always tell a Goodell-Pratt Tool by the user's smile.

GOODELL-PRATT COMPANY

Greenfield, *Toolsmiths* **Mass., U. S. A.**

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An arrangement has been effected whereby the Maxwell Motor Company has leased for a period of five years the properties of the Chalmers Motor Company.

The immediate effect of this transaction is:

1. The Chalmers car will be continued under the Chalmers name for a period of five years.

2. Those distributors or dealers who have been successfully marketing the Chalmers car will continue to do so.

The appraisers of the property and their engineers report the current Chalmers model a good car and the Chalmers plant a wonderful factory.

The first move we have made is to increase the efficiency of the Chalmers organization.

The second move was to place behind the Chalmers car the resources of the Maxwell Motor Company.

This is a business transaction between two automobile companies of probably no more than ordinary interest to the public but important to you if you have thought of buying a Chalmers for these obvious reasons:

1. You obtain a good car.

2. You obtain a car produced in a magnificently equipped plant.

3. You obtain a car produced by an organization materially strengthened by the addition of able executives.

4. You obtain a car produced by an organization materially strengthened by additional financial resources.

5. You obtain a car from a distributor or dealer who will have the support of this organization.

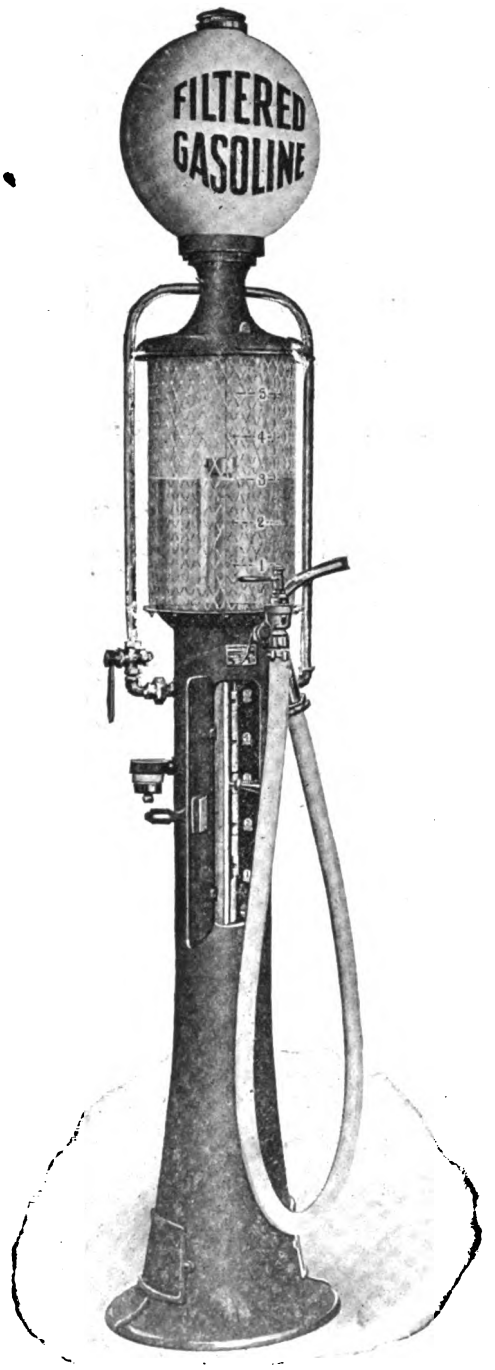
In this way all three of us prosper in the transaction.

Walter E. Flanders

President and General Manager
MAXWELL MOTOR COMPANY, INC.

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CASING HEAD GASOLINE



Here's one grade of gas that most pumps can't measure.

One experience always proves this to the dealer.

They simply can't handle it. Why?

"That stuff's too light for any pump," a dealer will tell you.

But it's not too light, there's no liquid so light, that it can't be handled quickly, accurately and without loss, by the

GUARANTEE VISIBLE PUMP

As an engineer, dealer, garageman, anyone with knowledge of the construction and operation of gasoline or oil pumps, compare the simplicity of the Guarantee Visible with the complexity of any other pump. Ask us to show you.

Then keep in mind this point—*visibility.*

That's what the motoring public demands today.

Write us at once for the pump book. Address Dept. 9

HEPBURN WALKER, Distributor

GUARANTEE LIQUID MEASURE CO., Farmers' Bank Bldg., Pittsburgh, Pa.

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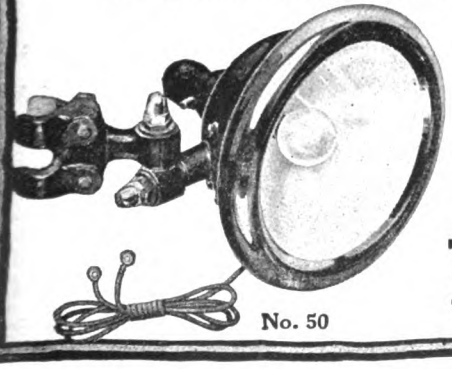


Makes Night Driving Safe!

Is your wife or daughter at a disadvantage when meeting other cars at night? Is much of her pleasure nullified by worry about the road?

A Victor Spot Lamp will afford comfort and confidence, relieve tension and reduce the chance of accidents. It is turned off and on by an instantaneous movement of the hand using Cutler Hammer Switch.

The streamline body, the beautifully designed nickeled door, the flush set mirror and the compact bracket are all expressed in lines and proportions befitting an accessory to the finest cars.



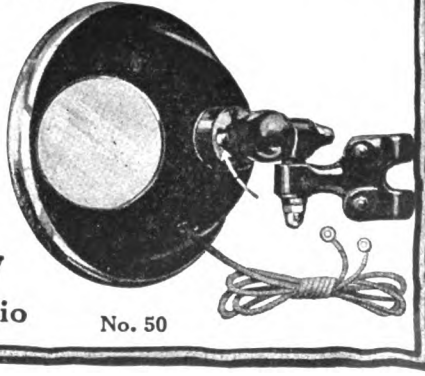
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A rigid reflector of the search-light type, and a focusing device in the socket make permanent, sharp and uniformly brilliant light possible.

Silence, beauty, convenience, safety in the superlative degree are yours in the Victor. $5.00 at your dealers.

The Corcoran Victor Company

704 Reading Court Cincinnati, Ohio



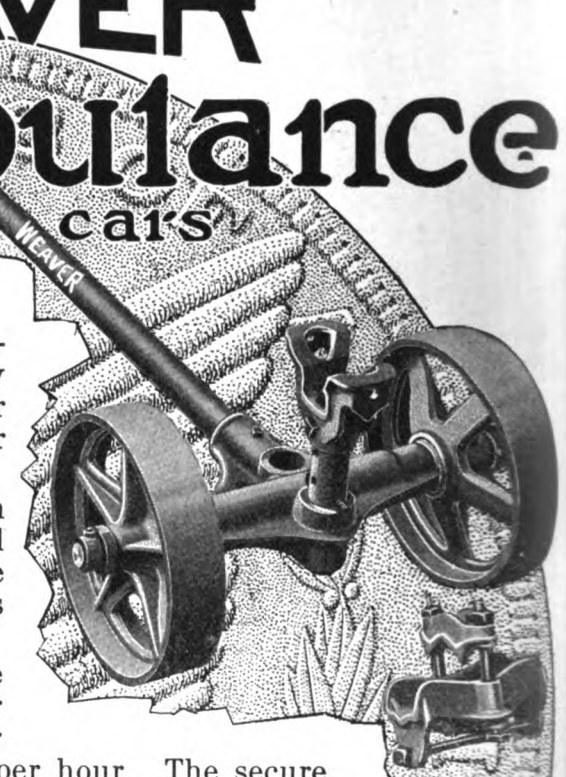
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Make Big Money on your "tow-in" jobs with a WEAVER Auto Ambulance

for crippled cars

WRITE FOR COMPLETE CATALOG



AT "one dollar per mile", or whatever YOUR basis of charge may be for tow-in services, the Weaver Auto Ambulance will pay for itself in a few trips.

It enables one man to run out and tow in a crippled car in one-fifth the time it would ordinarily require two or three men to do the same work with the improvised methods usually employed.

The strong, rugged construction and the high, broad wheels equipped with roller bearings, make it possible to tow cars over country roads at a rate of 15 to 20 miles per hour. The secure clamping construction eliminates all chance of accident.

A "One-Man" Equipment

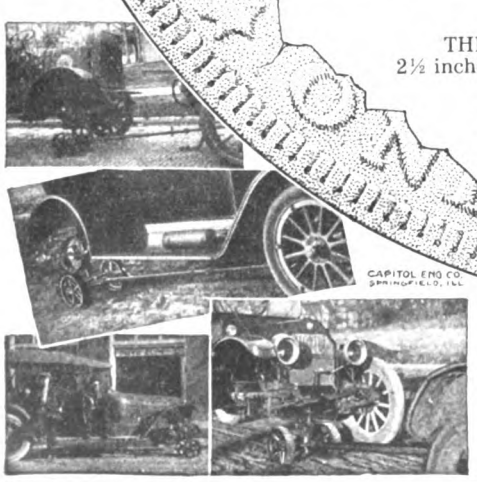
Though amply strong, this Ambulance is sufficiently compact and light to enable one man to handle it with ease. When under the front axle, the tongue does the guiding—so it is not necessary to have an operator in the rear car.

For Front or Rear Axle

The Weaver Ambulance is the product of a careful study of the conditions to be contended with in this kind of service. It will attach to either front or rear axle and has a wide range of adjustment to adapt it to any car.

Construction

THE TELESCOPING STEEL TONGUE is adjustable every 2½ inches from 6½ to 11 feet. The axle is 1¼ inches in diameter and extends entirely through the frame, giving ample support for the heaviest loads. The wheels are cast steel, 14 in. in diameter.





You Can't Break These Cast Steel Wheels

One of our favorite demonstrations is to have a customer try to break a wheel with a ten pound sledge.

WEAVER MFG. CO.

2175-79 South Ninth Street

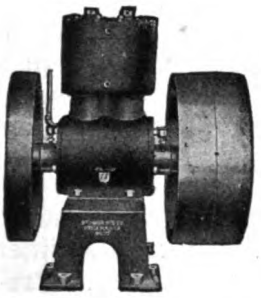
SPRINGFIELD, ILLINOIS

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They never fail to recognize
The Brunner Sign which Signifies-
A Service True-which Satisfies-
The Motorists who are Brunner-wise

YES, BRUNNER SERVICE SATISFIES



As the winter months draw near, Mr. Garageman, you should look around you and make sure that every detail of your service is as proficient as it should be—for instance, your compressed air service—is that what it should be? Is it a truly satisfactory service such as Brunner Service?—the one compressed air service that always satisfies.

DON'T WAIT TILL SPRING TO IMPROVE YOUR SERVICE—NOW IS THE TIME TO INSTALL BRUNNER EQUIPMENT

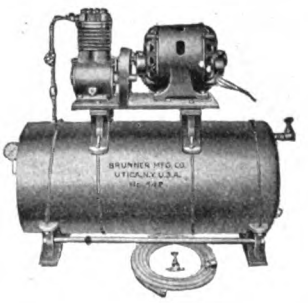
because it would help you over the hard winter months and make you ready for the Spring as well—your regular patrons would appreciate Brunner Service and it would bring to your door this Winter the trade of the Brunnerwise Motorist, which would help some.

INVESTIGATE THE BRUNNER AIR COMPRESSOR

There are seven standard sizes and any possible number of motor and belt driven combinations to suit the garageman's requirements—there are no extravagant promises of impossible performances—but simply the same good substantial business proposition it has always been for the garageman.

There are more Brunner Air Compressors in use in the garages than there are air compressors of any other make—the reason is obvious.

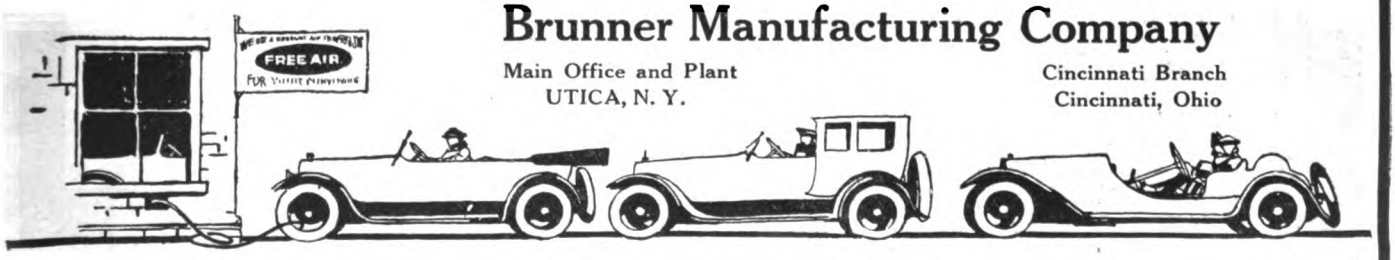
The BRUNNER Air Compressor is the Pioneer of All Garage Air Compressors, Because—



The Brunner has been demonstrating its sterling value in the garage ever since we have had garages—it is and always has been a real garage air compressor, designed and developed in a plant which was planned and built for the exclusive purpose of manufacturing Garage Air Compressors—backed by an organization whose entire time and attention has always been devoted to the building of Garage Air Compressors exclusively.

Write for our No. 14 Catalogue and Handbook on Compressed Air and get the facts.

Let us send you the name of the Brunner Jobber covering your town—he will be glad to recommend and guarantee a Brunner Outfit that will do your work right.



Brunner Manufacturing Company

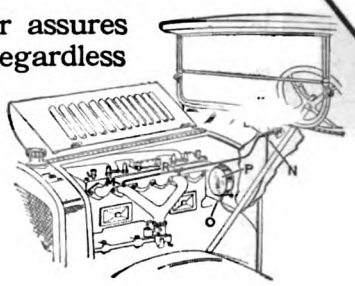
Main Office and Plant
UTICA, N. Y.

Cincinnati Branch
Cincinnati, Ohio

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A PROFITABLE WINTER NECESSITY

WITH its auxiliary tank (P), the Improved Imperial Primer assures a quick, positive start on the coldest day of winter, regardless of the grade of fuel used. The tank need be filled with high test gasoline only two or three times during the winter. Here is a guaranteed money and trouble saver for motorists; **a profit maker for every live dealer.**



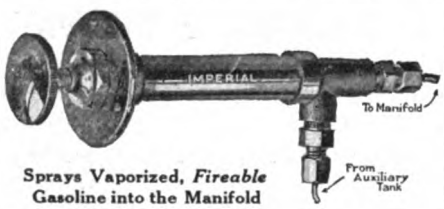
The car will **always** start on the **first turnover;** on the coldest day of winter! We guarantee it. We stand back of every sale you make.

An Imperial Primer **fits any car, any model.** Saves batteries and starters, when used on cars with self-starters. It puts an end to time wasted and good tempers spoiled in overcoming a winter-day "stall" by the old way of pouring raw, lifeless gasoline in the priming cocks.

Imperial Primer

$6 Complete

Through pages in the Saturday Evening Post and other publications read by motorists in your neighborhood, the advantages of the Imperial Primer as a winter motoring necessity will be emphasized. Prepare now for a big winter business!



Sprays Vaporized, *Fireable* Gasoline into the Manifold

Write Today for details of Our Proposition. Profits Are Right!

IMPERIAL BRASS MANUFACTURING CO.
506 S. Racine Avenue - - - - Chicago, Illinois

Motorists Will Be Glad to Know About This—



The only invention that gives the automobile a trouble-proof tire with pneumatic resiliency — the ***perfect substitute for air.***

The National Rubber Tirefiller takes the place of the inner tube, never blows out, saves worry, time and expense and doubles the life of the tire.

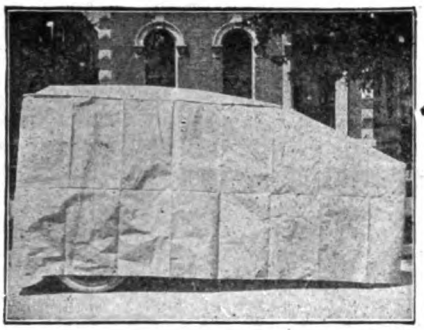
This Tirefiller is made of the finest quality of pure rubber treated under special processes, never gets "flat" and will last indefinitely.

One motorist says: "I would not do without it. Never bothered with punctures, blowouts, etc., and don't know what tire trouble is with use of your Tirefiller."

National Rubber Tirefiller is an accessory worth selling—it pays big dividends. Write for full details.

National Rubber Filler Co.
MIDLOTHIAN . . . . . TEXAS.

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Kennedy Auto Storage Covers

"Wrap Up" Your Cars When Not in Use

When you store your car for a season, don't let its polish be dimmed by dust, and its metal tarnished before it gets out of the garage. Cover it at once with a KENNEDY AUTO STORAGE COVER, and it will remain as clean and bright as washing makes it, until the cover is removed, next day or next season.

Protects the limousine all summer, or touring cars through the entire winter season. No cost but first cost. Never wear out if care is taken in handling. Insist that your garageman use them.

Popular for Use *and* Sale in Every Garage

Garagemen—Charge extra for storing with **KENNEDY AUTO STORAGE COVERS.** Service your patrons are glad to pay for. Many will demand it.

Made of strong, heavy paper, reinforced to prevent tearing. Protects a car against dirt, dust and moisture. Prevents polished portions from tarnishing and keeps finish from checking in cold weather, and also prolongs the life of the tires by excluding the light. Furnished for 5 and 7 passenger gasoline cars, electrics, and Ford cars. Good profits in retail sales and service use. KENNEDY COVERS can be sold at a season when trade on other accessories is usually light.

Write For Free Illustrated Literature

The Kennedy Car Liner & Bag Co., Shelbyville, Indiana

True in any position



Height with base, 5¾ in., length of body 7¼ in. Base 4½ in. diameter. Jaws 2¾ in. wide, 1⅞ in. deep; open 3⅛ in. Jaws have hardened steel faces. The hardened Steel Block with V-shaped grooves of various sizes is used for holding round or irregularly shaped work at any angle. Steel screw. Weight, 13 lbs., 6 oz.

Because each side, the end and bottom are carefully machined at right angles, the "Yankee" Bench Vise No. 1993 can be used as a jig for special work on drill press or shaper. Round or irregularly shaped work can be accurately drilled or carried through various operations without resetting each time. No matter how many vises a man has, he needs this time and labor saving, and accuracy ensuring vise.

"Yankee" Vise No. 1993

With Swivel Base Price, $6.50

Securely locked to its Swivel Base by turning set screw. Camthrow Lever locks Vise firmly in any position.

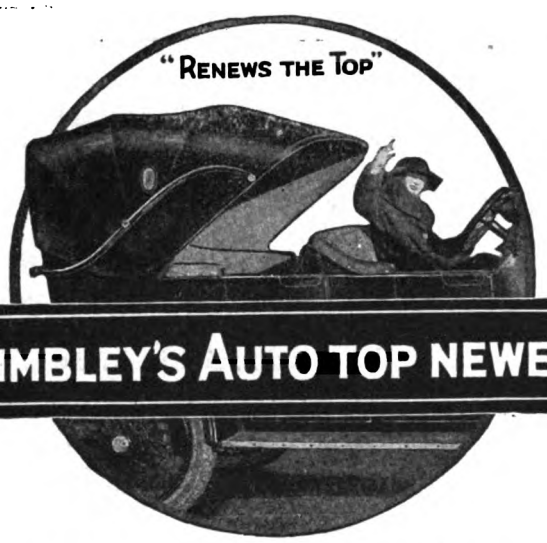
Your dealer can supply you

Write for "'Yankee' Tool Book" showing all "Yankee" wood- and metal-boring and screw-driving tools. Free.

NORTH BROS. MFG. COMPANY, PHILADELPHIA, U. S. A.

"YANKEE" TOOLS Make Better Mechanics

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PIMBLEY'S AUTO TOP NEWER

Top Like New, Body Like New—

And Sales and Profits Steadily Climbing

Here are three profit-giving accessories of advertised quality that you can find a big and steady market for:

PIMBLEY'S
AUTO-TOP-NEWER

for Leather, Pantasote and Mohair tops is more than a protection—actually lengthens the top's life and makes it look like new. Dries very quickly and resists sun and rain. Won't rub off. Retail price 50c, $1.00 and $1.50.

PIMBLEY'S
AUTO-BLACK-ENAMEL

is the next thing to a new body—won't nick or crack, and wears *long* and *strong*. Retail price 25c, 50c and $1.00.

PIMBLEY'S
AUTO-NEWER

does more than "coat up" the smart, original finish—it brings back its beautiful first finish and doesn't look streaky or greasy. Retail price 50c and $1.00.

Write for wholesale price list and advertising helps.

Pimbley Paint & Glass Co.
ST. JOSEPH, MO.



Service that makes Friends

Probably no business demands more action than the garage and auto repair business. Every day you are faced with a new line of customers requesting, demanding, beseeching "speed—more speed!" And you know that your success will be measured by the manner in which you meet this ever persistent cry.

Harvey RACINE

Boltless Steel Springs

When a spring breaks—if you haven't a Harvey in stock to fit the car, get the nearest Harvey Jobber on the wire. Tell him your needs. He'll not ask you when you want it. He knows the demands of your business and he will see that you get the springs you want by the first return express.

Speed In Delivery

Quality in materials, dependability in performance, accuracy in fit—these are the things which will win for you the loyalty and friendship of your customers—these are the things which combine to make Harvey Service predominant in the motor trade.

There's A Harvey Jobber Near You

Drop us a card and we will send you his name and our Spring Book giving complete weights, styles, measurements and prices of over 900 different kinds of springs.

Write today — you may need Harvey Help tomorrow.

Harvey Spring & Forging Co.
901 17th St., Racine, Wis.

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THE NEW ADAMSON MODEL "E" 5-MINUTE VULCANIZER

This light and handy outfit mends tube punctures ANYWHERE in five minutes. Makes repairing a pleasure.

Uses common gasoline, the most convenient and dependable fuel—always available.

Just as easy to use and sure in its results as the larger "Adamson" Vulcanizers—built on the same proven principles.

Price complete with box of a dozen "Adamson" 5-Minute Repair Gum Patches—

$1.00; Extra Box of 12 Patches, 25c

For general tube and tire repairing the "Adamson" line is complete with various models at from $1.50 to $12.00. Be sure to buy an "Adamson"—the most practical and largest-used Vulcanizer in the world.

Adamson Mfg. Company
East Palestine, Ohio

Sold by all Dealers
Booklet sent on request



WITHERBEE STORAGE BATTERIES

For

STARTING — LIGHTING — IGNITION



WITHERBEE BATTERIES are of correct size, shape, voltage and capacity for every make and model of car, and for starting and lighting systems of any manufacture in general use.

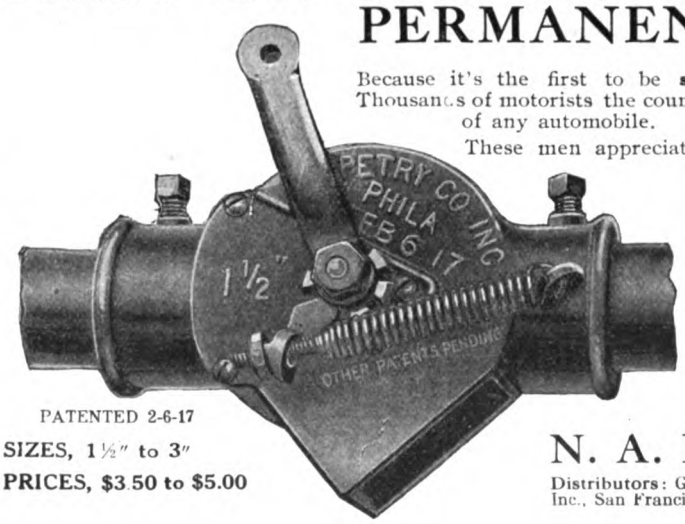
MODERN—carefully constructed batteries—they possess high starting-ability; the plates are specially processed to prevent buckling, and the jars are made of the finest rubber; the wood cases of acid-proofed hard wood.

Recognized standards since 1903.

Complete information, prices and illustrated catalog mailed promptly upon request.

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FIRST DEVICE OF ITS KIND TO GIVE PERMANENT SATISFACTION



PATENTED 2-6-17
SIZES, 1½" to 3"
PRICES, $3.50 to $5.00

Because it's the first to be **scientifically designed** and **scientifically** constructed. Thousands of motorists the country over testify to its efficiency in bettering the service of any automobile.

These men appreciate the absolute necessity of a cut-out—they also realize the uselessness of a cut-out of improper design and construction. Every Petry **user** is a Petry booster.

Exhaust gases are expelled through a full-size megaphone-shaped vent, which greatly augments sound and facilitates tuning up of motor. Has adjustable lever, positive cut-off, non-fluttering valve, and is absolutely noise-proof when closed. Makes a gas tight joint of permanent rigidity without strain on exhaust pipe. Spring is away from the heat. Easy to install and easy to operate. A size perfectly suited to every car

N. A. PETRY CO., Inc., 1313 Race Street PHILADELPHIA

Distributors: Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Hughson & Merton, Inc., San Francisco, Cal., Los Angeles, Cal., Portland, Ore., Seattle, Wash.

PETRY CUT OUT

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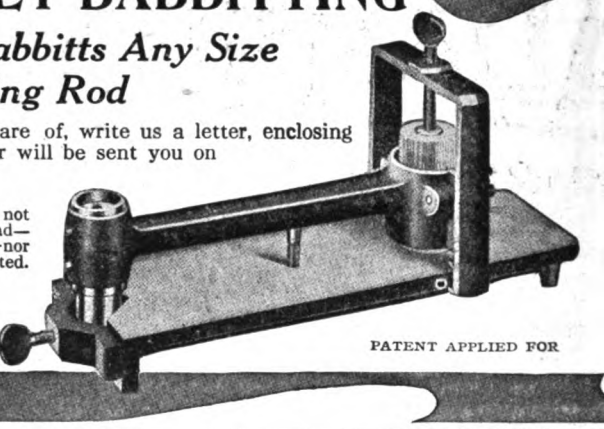
MAKE BIG MONEY BABBITTING

The N-A-Size Babbitter Re-Babbitts Any Size Auto Engine Connecting Rod

If you want all the babbitting business you can take care of, write us a letter, enclosing money order or check for $7.50, and the N-A-Size Babbitter will be sent you on

10 DAYS' FREE TRIAL

If you haven't made its cost by that time many times over—if you are not convinced that it's going to be the biggest profit producer you ever had—send it back to us and we will refund your money. This is not a joke—nor is there a "nigger in the wood pile." We will do just what we have stated.



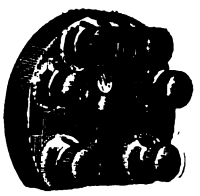
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BURLINGTON MACHINE WORKS CO.

BURLINGTON, IOWA

MAGNETO PARTS



FOR ALL MAKES OF **MAGNETOS AND COILS**



SPARK COIL PARTS TUNGSTEN CONTACTS

STARTER AND GENERATOR BRUSHES

ALL PARTS ARE GUARANTEED AGAINST DEFECTIVE MATERIAL

Write for our Catalogue and special agency proposition.





GUARANTEED MAGNETO PARTS CO.

1765 BROADWAY NEW YORK CITY

DO YOU HEAR

the UTILITY KID signaling you to go ahead and get



UTILITY VARNISH RENOVATOR

THIS is a NECESSITY, not a luxury. Because if you are particular about the appearance of your automobile in WINTER, you'll NEED "Utility." It's no joke to clean your car in cold weather the "Old Way." You require a multitude of tools—sponge, hose, boots, etc., and you have a cold, unpleasant job. Why not

Avoid that old-time dirty mess—
You can clean your car in evening dress

with cheese-cloth and a can of "Utility Varnish Renovator."

Remove the water spots from your car.
Cover up the blemishes caused by flying ice and sleet.
Dissolve and remove mud absolutely, without scratching the varnish.
PRESERVE the fine finish of your car at a minimum of time, labor and expense.

DEALERS: Why not be prepared to give your customer that which he will need? Our special offer sent on request.

LIST PRICES

4 Ounce Bottles	$0.25
12 Ounce Bottles	.50
Quart Cans	1.00
Gallon Cans	3.00

POUGHKEEPSIE UTILITIES CORP.

46 Winnikee Avenue Poughkeepsie, N. Y.

"HEXALL" RATCHET SOCKET WRENCH No. 2

The man who buys a "Hexall" isn't shopping for the lowest priced wrench—but demands THE BEST; also, he knows that the "Hexall" wrench you sell him to-day isn't going to be any cheaper to-morrow—at your or any other merchant's store.

SET, COMPLETE, ELEVEN PIECES

(Patented May 1st, 1917)

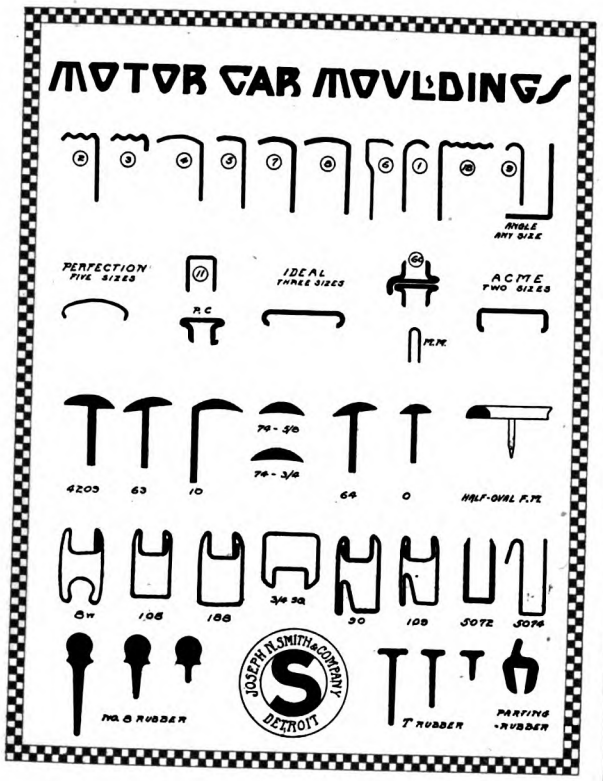
"Hexall" No. 2 contains—7 in. steel forged ratchet handle, two screw-driver bits, 7 in. extension bar, seven hexagon sockets. Packed in neat, strong cloth case.

Send for New Catalog—just off the press.



R. F. SEDGLEY, 2311-13 North 16th St., Philadelphia, Pa. Break any Sedgley Wrench and we repair it—no charge

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20th Century's No. 6



Self-Vulcanizing Patch

Note carefully from above illustration the construction of this Patch—how the Semi-Cured Rubber is vulcanized on to the Fabric, which gives an absolute GUARANTEE against leakage, while the RED RAW Rubber Guarantees a perfect Job of Vulcanizing on to the Tube.

GUARANTEED SATISFACTION or Money REFUNDED

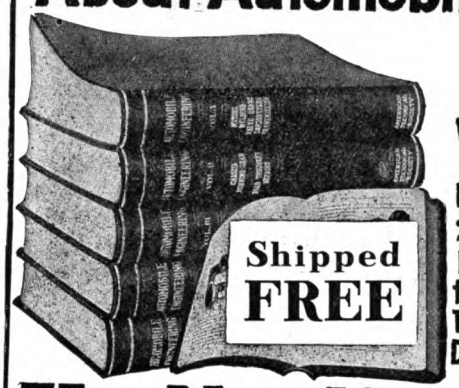
Made in 3 sizes
- 2¼x16— 36 Square Inches .....$ .50
- 4 x15— 60 Square Inches .....$ .75
- 6 x18—108 Square Inches $1.50

If you want a Patch, call for "20th CENTURY"
We make all kinds of Patches, all Sizes and Prices.

If your JOBBER or Dealer has not got them, write to us direct.

20th CENTURY TIRE PROTECTOR CO.
MIDLOTHIAN, TEXAS.

These Books Answer Ten Thousand Questions About Automobiles!



5 Volumes 2400 Pages 2000 Illustrations Tables & Diagrams

You Need Them in Your Business

Every Dealer, every Garageman, every Repairman, every Car Owner needs this wonderful set of books—the most complete, practical, **helpful**, up-to-the-minute auto books in existence. They tell you—**instantly**—anything and everything you want to know about all kinds of automobiles and garage work.

Automobile Engineering

5 Volumes, Flexibly Bound in Genuine Morrocco Leather, Gold Stamped

Recognized everywhere as the final authority on automobiles, their operation and repairing. Almost two entire volumes on latest Ignition, Starting and Lighting systems. 2,400 pages (5¼ x 8¼) and 2,000 illustrations, tables, diagrams, etc.

Everything About Automobiles, Including:

Explosion Motors; Welding; Motor Construction and Repair; Carburetors and Settings; Valves; Cooling; Lubrication; Fly-Wheels; Clutch; Transmission; Final Drive; Steering Frames; Tires; Vulcanizing; Ignition; Starting and Lighting Systems; Wiring Diagrams; Shop Kinks; Commercial Garage Design and Equipment; Electrics; Storage Batteries; Care and Repair; Motorcycles; Commercial Trucks; Glossary.

50c a Week If You Decide To Keep Them

Just your name and address on the coupon brings the entire set for 7 days' free use, express prepaid. If you decide to keep them, send only $2.00 within 7 days and then $2.00 a month—**50c a week**—until the special price of $17.80 has been paid.

Free Consulting Service

With each set we give you free, a year's Consulting Membership in the American Technical Society. The regular price is $12. Put your problems up to our Staff of Experts, for one entire year.

Free on 7 Days' Trial—Send Coupon

American Technical Society, Dept. A-7557, Chicago, Ill.

Please send me the 5-volume Automobile Engineering for 7 days' free examination. If I decide to buy, I will send $2.00 within 7 days and the balance at $2.00 a month until $17.80 has been paid. Then you send me a receipt showing that the $25.00 set of books and the $12.00 Consulting Membership are mine and fully paid for. If I think that I can get along without the books after 7 days' trial, I will return them at your expense.

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Address.....

Reference.....

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"WHITNEY" KEYS

FOR THE

WOODRUFF SYSTEM

For the benefit of dealers, garages, and repair men, we are prepared to furnish our keys put up in two assortments. Every garage and repair man should keep these on hand. They may be purchased from the leading jobbers or ordered direct from the factory.

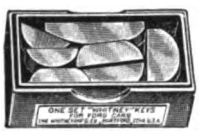


Regular Assortment

One hundred keys of the sizes most likely to be required for repair work.

Ford Assortment

One set of keys for the Ford car. These keys are of the special material and special treatment specified by the Ford Motor Company.



THE WHITNEY MFG. CO.

HARTFORD, CONN.

Chains Keys Hand Milling Machines

Guaranteed for 10,000 Miles



EVERY Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser.

"Absolutely Puncture Proof"

Brictson Tires are puncture proof, and proof against blowouts, skidding, rut wear, rim cuts, and can't be damaged by oil or gasoline. Wonderful resiliency, easy riding and economy commend them to every car owner.

The Big One-fourth Retread Feature

Should the tread surface wear out after 10,000 miles of service you can get a new retread for one-fourth the original cost of the tire, instead of buying a new tire, and you keep the remaining three-fourths in your pocket. With ordinary service the Brictson Tire should run enough beyond the 10,000 miles to require one or two extra retreads. The more retreads you use the cheaper your service.

FREE TRIAL OFFER

To convince you the Brictson Tire will give satisfaction TRY THEM ON YOUR CAR AT OUR EXPENSE. Write today for this Free Trial Offer, a copy of our guarantee and full information about Brictson Tires.

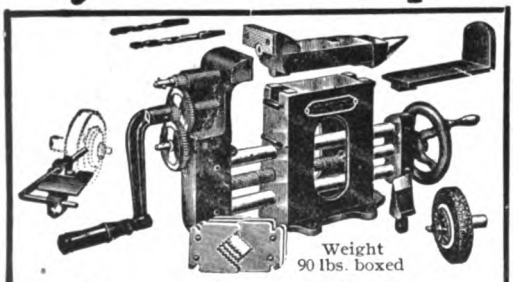
The Brictson Mfg. Co.

1107 Brictson Bldg.

Brookings, South Dakota

Brictson Pneumatic Tires

Try at Our Expense this wonderful Repair Outfit



Weight 90 lbs. boxed

Stewart Handy Worker "SIX-IN-ONE"

Price Complete $14

Handiest combination of tools you ever saw. Just the thing for the garage, public or private. Wonderful value for the money. If you were to buy separately all of the tools you get with this outfit, and get tools of the same high quality, strength and durability, THEY WOULD COST YOU AT LEAST $25.

A COMPLETE, COMPACT WORK-SHOP

A strong, practical anvil; powerful vise up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ in. pipe; A Corundum grinding wheel 5 inches by 1 inch; a two-speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing handle grip. It operates grinding wheel, buffing wheel, and many other similar tools.

With the STEWART HANDY WORKER you can do car repairing, blacksmith work, home repairing, make plumbing repairs, keep knives and other tools sharp and in good working condition.

OUR SPECIAL TRIAL OFFER

Send for one of these great combination outfits today. Order with this understanding: If you aren't thoroughly satisfied in every way, you can ship it back and we will return every cent you paid out. THOUSANDS HAVE BEEN SENT OUT ON THIS BASIS AND NOT ONE HAS BEEN RETURNED.

Send only $2 with your order, and pay the balance when it arrives. BOOKLET GLADLY MAILED ON REQUEST. But the best way to appreciate this wonderful outfit is to order it, on our special trial offer.

CHICAGO FLEXIBLE SHAFT CO., 320 N. La Salle St., CHICAGO, ILL.

IF YOU WANT THE DEPENDABLE KIND OF

DIFFERENTIAL AND TRANSMISSION GEARS AND SPROCKETS



That can be relied upon to be accurately machined, and of the highest grade material, to fit all makes of cars,

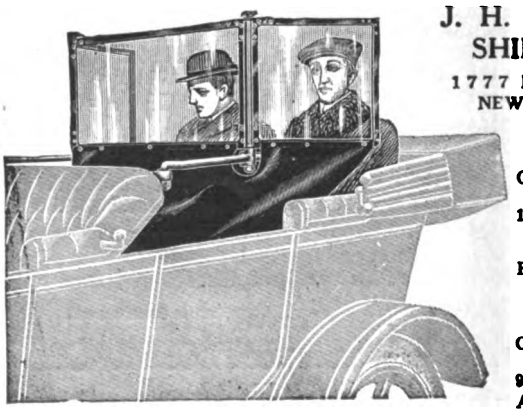
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William Ganschow Co.

Morgan and Washington Blvd.

CHICAGO, ILLINOIS

REAR SEAT SHIELD



J. H. TONNEAU SHIELD CO.

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Representatives

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R. C. Wall Mfg. Co., 228 N. 15th Street, Philadelphia, Pa.

Columbia Tire & Top Co., 922 Commonwealth Ave., Boston, Mass.

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Long Life

It is not uncommon for a good magneto to operate 25,000 to 50,000 miles without a cent of expense.



HIGH TENSION

SIMMS MAGNETOS

are constructed to outlast the motors on which they are installed.

Write for literature

The SIMMS MAGNETO COMPANY

274 No. Arlington Avenue
East Orange, N. J.



Leave Your Tube in the Vulcanizer

AND WAIT ON YOUR CUSTOMERS

Why Not?

AMERICAN AKRON

Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

IF YOUR VULCANIZER IS YOUR BOSS, DECLARE YOUR INDEPENDENCE TODAY

Write for Prices

The American Rubber & Tire Co.
AKRON, - - - - - OHIO.

AUTO THERM

HEAT INDICATOR

REGISTERED TRADE MARK

Will Safeguard You Against Overheating

In the new AUTO THERM is solved, at last, the problem of detecting overheating in ADVANCE of damage to your motor.

The AUTO THERM works directly in contact with the water in your radiator—NOT THE STEAM RISING FROM IT. By the time steam is generated, the water is boiling and serious harm may be already wrought your engine.

The warning signal of the AUTO THERM is plainly visible, day and NIGHT, from the driver's seat. Instead of a rise of a thin column of liquid, a broad ribbon of color flashes you warning of dangerously rising temperature.

Two transparent colored panels on either side of this "ribbon" maintain a continual color comparison, eliminating all guesswork and the eye-strain called for to read diminutive numerals and letters, as in the old-fashioned type of heat indicator.

A child could hardly fail to notice the signal of the AUTO THERM.

And the AUTO THERM Retails at a *Reasonable* Price:

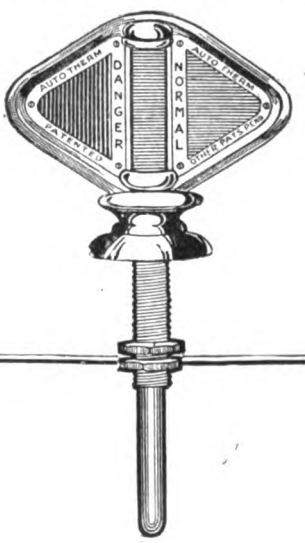
Standard—For Large Cars, $3.50 List
Junior—For Small Cars, 2.50 List

Also Furnished with Your Favorite Emblem – Fraternal or Patriotic
At ONE DOLLAR MORE

Write for Descriptive Folder in Colors

Liberal Trade Discount

THE H. & M. MANUFACTURING CO.
16 MULBERRY STREET - - NEWARK, N. J.



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"NORMA"

"NORMA" BALL BEARINGS

(Patented)

So small a thing as the bearing of the magneto or lighting generator may set the limit to the service capacity of a car or truck. The failure of such a bearing, impairing the ignition or the lighting, may result in condemnation of an otherwise high-class car or truck.

The almost universal standardization of high-grade magnetos and lighting generators on "NORMA" Ball Bearings is proof of the confidence the makers of these accessories have in "NORMA" Quality as a safeguard to themselves and to the makers and owners of cars and trucks.

Be Sure—See that Your Electrical Accessories are "NORMA" Equipped

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

Ball, Roller, Thrust and Combination Bearings.

"NORMA"



DO TIRE REPAIRING

the approved way, with Akron-Williams equipment—the same outfits that have been designed with the aid of the World's largest tire manufacturers.

More than sixty leading tire companies use Akron-Williams equipment in their factories, and recommend and sell them to their agents and dealers all over the World.



Get our new catalog, "Everything for the Tire Repairman."

The Williams Foundry & Machine Co.

Glendale St., AKRON, O.

Exclusive Distributors for California:
THE WATERHOUSE & LESTER CO.
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NEED a new top? Don't waste your money! Give the old one a new lease on life with

"F-S" "Evernew" Auto-Top Dressing

It gives old tops the brand new look; makes them waterproof, and won't crack in folding. Easily applied and dries quickly.

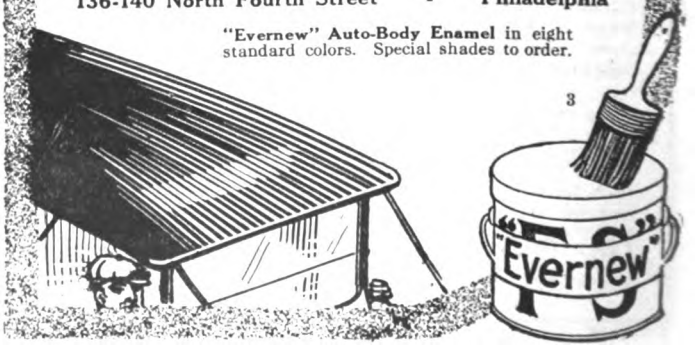
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Mfrs. of Colors, Paints Varnishes since 1863

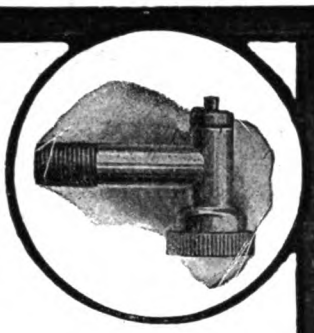
136-140 North Fourth Street - Philadelphia

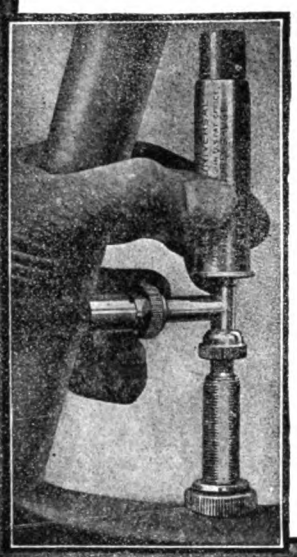
"Evernew" Auto-Body Enamel in eight standard colors. Special shades to order.



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. . . . and you can't tell how many miles your tires *can* give you until you put them on a REGULATED, MEASURED, air diet.

Just so many pounds pressure, no more and no less.

If you pumped up your tires every time they fell below the pressure specified by the tire-maker they would last for the maximum distance.

Don't say pumping is too much trouble. With a

SCHRADER UNIVERSAL PUMP CONNECTION

it is no trouble at all.

Ask your dealer to show you how it works

Price, Thirty-five Cents

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For Starting Motors and Lighting Generators

Why not add this profit-making line of starting and lighting brushes to your business? Pyramid Brushes are standard equipment on the great majority of starting and lighting outfits.

Sooner or later they must be replaced and nothing will make your customers more satisfied than to supply brush renewals of the same reliable type.

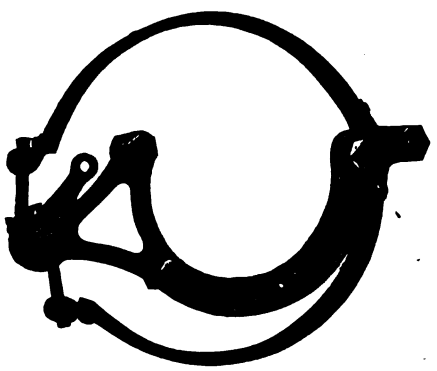
Let us show you how easily you can order the brushes you need with the aid of our Automobile specification sheet. The proper brush for every car equipped with a starting and lighting outfit is listed in a simple manner.

NATIONAL CARBON CO., Inc.
CLEVELAND, OHIO

HOLDFORD BRAKES

SAFETY FIRST

PRACTICAL



POSITIVE

ASSURES YOUR SAFETY

HOLDFORD BRAKES are high-grade external contracting brakes for Ford cars which can be easily and quickly installed to act from the hand lever as emergency brakes, or from the foot pedal as service brakes. Designed in accordance with the best engineering practice; the band and brace are of steel, the toggle crank and bracket are dropped forgings and the lining J-M non-burn. Do not drag when released, no readjustment for wear is necessary and oiling is easy.

HOLDFORD BRAKES save wear and tear and will be attached by the wise owner on his pleasure car, delivery car or truck. They will positively stop a Ford with locked wheels on *any grade, at any speed, with any load.* Not necessary to remove old brakes.

When Ordering State Whether for Hand or Foot.

THE G. H. DYER COMPANY, Cambridge, Mass.

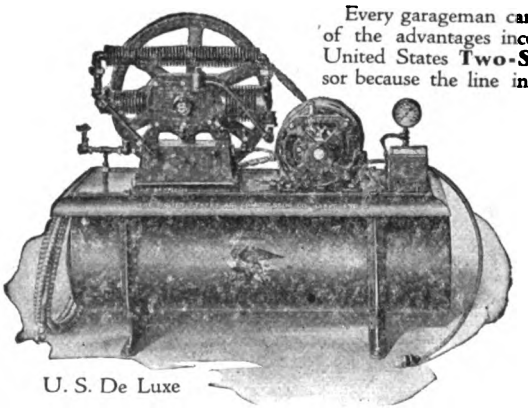
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BEST of the GOOD Compressors

ONE air compressor stands out boldly from the varying mass manufactured because refined and improved in 14 important details.

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THE UNITED STATES AIR COMPRESSOR CO., 6542 Carnegie Ave., Cleveland

TWO-STAGE AIR COMPRESSORS

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Uncle Sam Knows the Real Answer

NOT ENOUGH!

Save Leather for Soldiers

To make America's hide supply go as far as possible, hides are being split into five or more thin sheets; but even this saving scheme fails to meet the requirements for soldiers' shoes, harness, equipment, ship upholstery, factory needs, etc., chiefly because too much hide leather is used by the public in places where high grade leather substitutes will serve as well or better.

For instance, the leather upholstery of one average size automobile would make twenty pairs of soldiers' shoes. For years America's largest producers of automobiles have successfully used

DU PONT FABRIKOID
REG U S PAT OFF

Motor Quality

for upholstering their cars. Thousands of owners never even knew their cars were not upholstered in leather, because Fabrikoid looks and feels just like the finest leather and actually wears better than the coated split leather most used for upholstery of automobiles not covered with Fabrikoid.

It is true that some few high priced automobiles are still upholstered in genuine grain leather of good quality.

But the pride of possession of luxurious, expensive leather should now yield to patriotic preference for satisfactory substitutes that will divert this leather to more necessary uses.

Uncle Sam Has Set The Pace

The new U. S. motor trucks and ambulances will be upholstered in leather substitutes.

The upholstery specifications for the new Merchant Marine call for "Craftsman Quality Fabrikoid."

What Uncle Sam has found by experience and tests good enough for the Government's severe requirements should be good enough for every loyal American.

If you are a manufacturer using leather, probably part or all of your requirements can be met by some grade of Fabrikoid.

When buying an automobile prefer Fabrikoid upholstery. Help the manufactuaer conserve leather by patronizing those who use good leather substitutes like Fabrikoid.

Every hide displaced by a good substitute helps supply our armies with shoes, our farms with harness and our factories with belting—it helps win the war.

Manufacturers! Write us your requirements and let us co-operate with you.

Send for samples and booklet.

DU PONT FABRIKOID CO., WILMINGTON, DEL.

World's Largest Manufacturers of Leather Substitutes.

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With competition among garages and repairshops getting keener every day, SERVICE is becoming the biggest factor in *getting* and *holding* new customers.

MAYO ELECTRIC GARAGE PUMP

will put your garage or repairshop in a class by itself. in your town—attracting enough new business to shortly pay for itself. Portable—can be taken anywhere about the garage—out to the curb or into the street.

Operated by ¼ h.p. electric motor with silent chain drive. In ordering state whether for alternating or direct current. 110 or 220 voltage motor is required.

Send for prices and full details

MAYO-SKINNER MFG. COMPANY
2115 Elston Avenue CHICAGO

The instant your car starts—

TRADE MARK REGISTERED IN
NON-FLUID OIL
UNITED STATES PATENT OFFICE

begins lubricating

All common greases must first ***melt*** before they start lubricating. Frictional heat must do this melting. Meanwhile your gears are grinding—heating—wearing.

This happens for the first few minutes ***every time you start your car.***

But Non-Fluid Oil lubricates every instant the car is in motion. It is a special process lubricant far superior to grease. Give it just one trial.

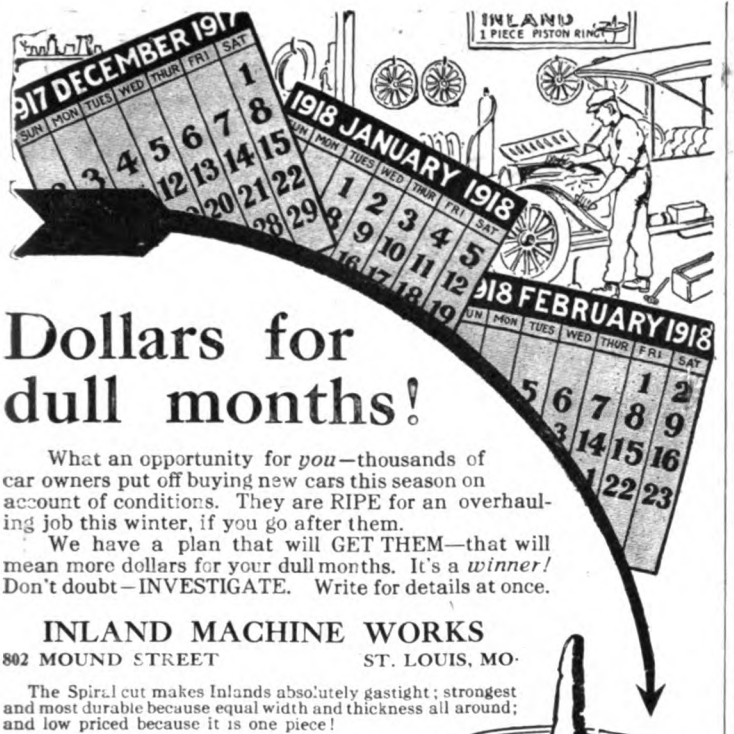
In orange-colored cans at your ***dealer's.***



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N. Y. & N. J. Lubricant Co.
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Dollars for dull months!

What an opportunity for *you*—thousands of car owners put off buying new cars this season on account of conditions. They are RIPE for an overhauling job this winter, if you go after them.

We have a plan that will GET THEM—that will mean more dollars for your dull months. It's a *winner!* Don't doubt—INVESTIGATE. Write for details at once.

INLAND MACHINE WORKS
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The Spiral cut makes Inlands absolutely gastight; strongest and most durable because equal width and thickness all around; and low priced because it is one piece!

INLAND 1 PIECE PISTON RING



VULCANIZERS Complete Cure—One Heat **MILLER TIRES** Extra Ply—5,000 Miles

NEW 1918 MODEL "4 CAVITY" EN BLOC

Insulated Air-Cooled Flanges Prevent Marking Tires

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$150.00



One of 53 Kinds and Styles From 75c up

We teach Tire Repairing FREE OF CHARGE at factory or by mail.

Extra Ply Tires
Give More Miles at Less Cost

"COG" & "Wrapped" Treads contain 25% more Fabric and Rubber than Standard.

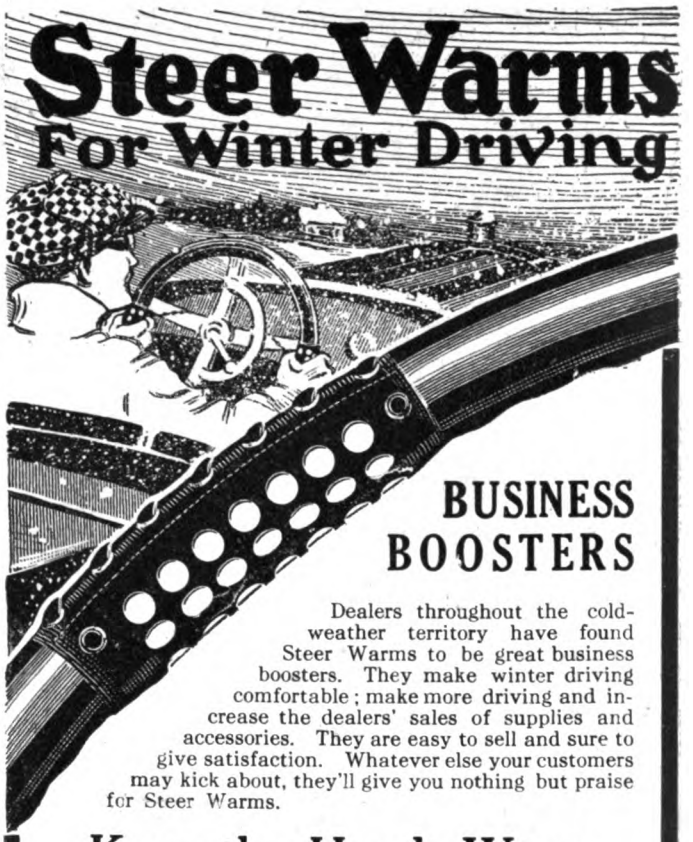
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Exclusive Tire Distributors are Repeating Sales
For Price-Lists—Repeat Sales System

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Steer Warms For Winter Driving



BUSINESS BOOSTERS

Dealers throughout the cold-weather territory have found Steer Warms to be great business boosters. They make winter driving comfortable; make more driving and increase the dealers' sales of supplies and accessories. They are easy to sell and sure to give satisfaction. Whatever else your customers may kick about, they'll give you nothing but praise for Steer Warms.

Keep the Hands Warm In Coldest Weather

On the longest drive, in the coldest weather Steer Warms keep the hands warm; and, besides the comfort of Steer Warms, they ward off "bad colds"; make driving safer by keeping the fingers limber and the grip firmer, and they save money on gloves.

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Steer Warms are nationally advertised and up-to-date autoists are on the lookout for them. Put them in your stock and let people know where to find them. They'll draw trade and help you make sales of other things as well.

Good Profits

There's a good profit and "big money" in Steer Warms; the retail prices are small and you can sell lots of them. For all gasoline cars, $7.50 the pair (in Canada, $11.00); Special for Ford cars, $5.00 (in Canada, $7.25).

Guaranteed 5 Years

Steer Warms are made of the best material and are absolutely guaranteed in every way; guaranteed against burnout for five years; money refunded if they don't do all we claim for them.

Get the Genuine

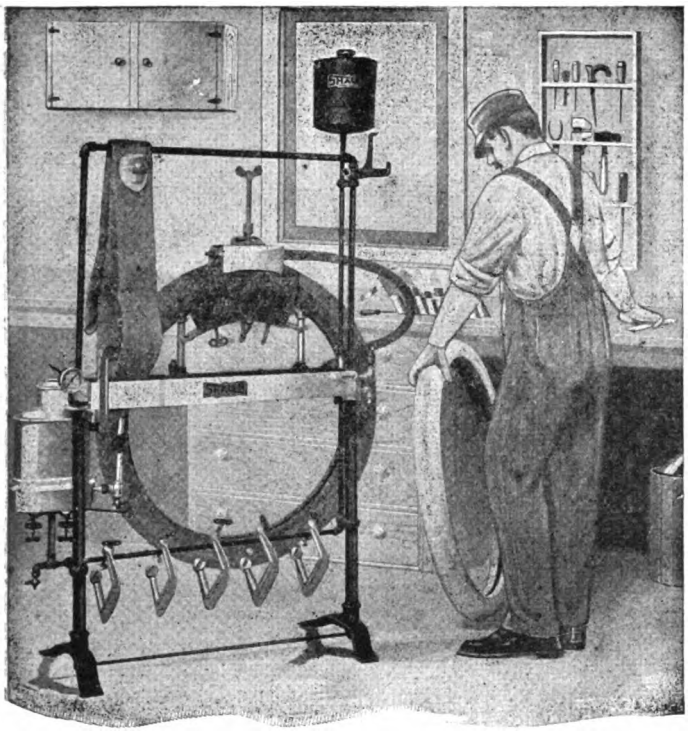
Steer Warms are the only hand-warmers in which the heating element is protected, thus insuring uniform heat and unbroken service. Don't experiment with inferior infringements; get the genuine Steer Warms.

We Help You Sell

We furnish to dealers advertising aids and practical sales suggestions. Write for full information and be ready to order in ample time for your winter business.

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Make Money Like This Man

He is a garage man and is repairing tires for his storage customers. These cars need to have the tires vulcanized very often and he makes more money from this source than he does from the storage bill or sale of supplies. You can do the very same thing with a

SHALER Vulcanizing Plant

The auto owner, when he comes to you for supplies, gasoline, oil, etc., and knows that you can repair his tires, will gladly give you the job. Give your customers this complete service they like and be ready to repair their tires.

You can easily add $20 to $30 more to your daily revenue without adding to your pay roll.

Anybody who can clean or adjust a car can operate a Shaler, because of the simplicity of Automatic Heat Control and

The Shaler Wrapped Tread Method

The Shaler System has been used successfully by tire makers for many years.

Automatic Temperature Control

This is an exclusive feature that keeps the temperature of vulcanizing exactly at the right point from morning till night without any watching or regulating.

New Complete Catalog Free

Write us today for full particulars about the money-making possibilities with Shaler Vulcanizing Plant—the low price and liberal discount. We will also send you our new catalog of the complete line of Shaler Vulcanizers—and our book for dealers, "Common Sense About Tire Repairs."

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The largest Manufacturers of Vulcanizers in the World

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STURDILY CONSTRUCTED to retain accuracy under the most severe conditions. Handsome in appearance. Made in both flush and surface types. Finished in bright nickel or black rubberoid as desired.

Better Ammeters Cannot Be Purchased, PRICE.....$1.90

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MAKE YOUR GREASE SALES MOUNT

by selling the one kind of lubricants that serve your customers best.

DIXON'S GRAPHITE Automobile LUBRICANTS

bring your customers back and make increased sales for you because they are the 100% lubricants.

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ESTABLISHED 1897

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90,000 **SPRINGS** 90,000



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We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

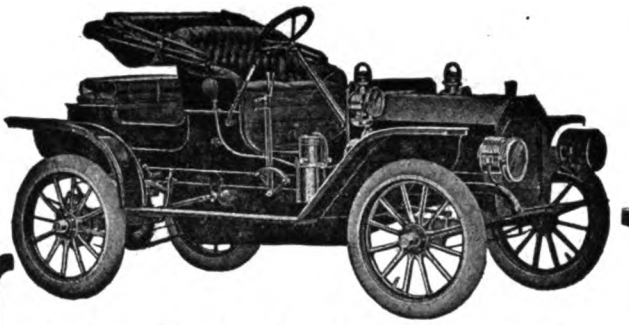
GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

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The **Auto Repairers' Guide & Price Maker** is issued in the interest of automobile repairers, dealers and garage men—**it's free to the trade** and sent to them only.

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B	1¼	½	12	3½
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D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15½
K	3½	2½	12	17
L	4	3	12	21
M	4¼	3¼	12	20



The Bunting Brass & Bronze Co.
740 Spencer Street Toledo, Ohio

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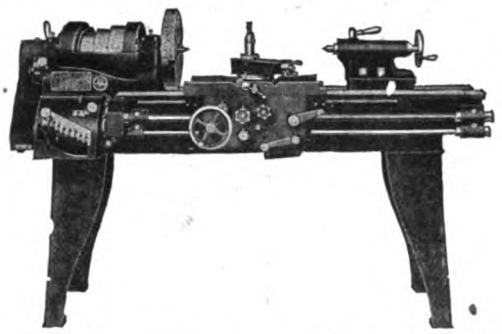


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14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices

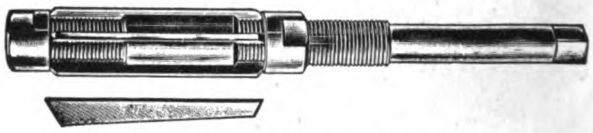
THE MONARCH MACHINE TOOL CO.
SIDNEY, OHIO

The best made for repair work

The Critchley Expanding Reamer

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Try One and You Will Want More.



Reams odd size holes

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MOTOR REPAIR PACKAGE

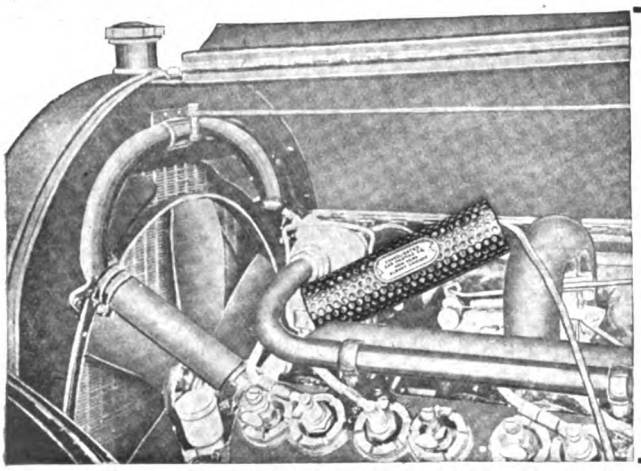
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CONSOLIDATED CAR-HEATING COMPANY

NEW YORK Singer Bldg. ALBANY CHICAGO Fisher Bldg.

(Largest manufacturers of Electric Heaters for Railway Cars in the World.)

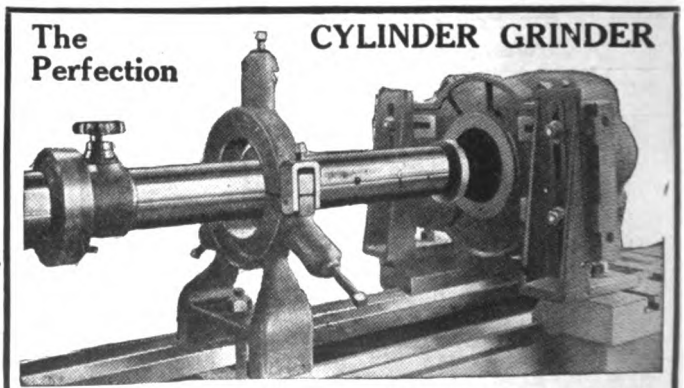
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PRICE
ALL STANDARD SIZES
$1.50

The Perfection CYLINDER GRINDER



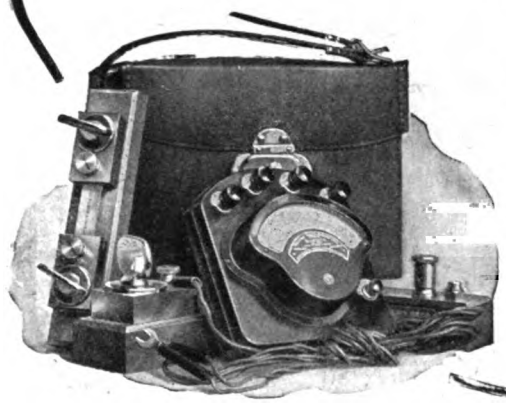
Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. **Descriptive literature on request.**

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If you can repair and adjust Electrical Equipment, you will get the cream of the garage business and make more money. With the increasing demand for service of this sort, you must equip to handle the business, or lose it to your more enterprising competitor.



Weston

Model 280

GARAGE TESTING INSTRUMENT

is your one great and urgent necessity, to enable you to locate electrical troubles quickly and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electrical equipment you can install.

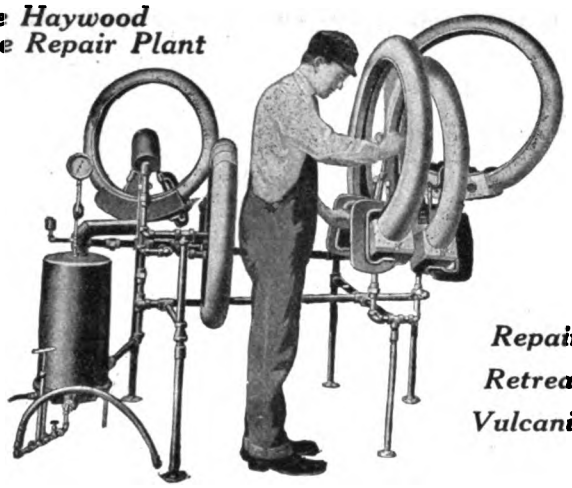
The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.

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Repairs
Retreads
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Give Haywood Service

HERE'S a standardized method of Tire Repairing—a method Nationally Advertised and known to motorists. Big money can be made either as side line to your present business or as a business by itself. **Equip your garage or store with a Haywood Plant.** Let it earn extra profits, or open a Haywood shop in your locality. **It's a rich opportunity.**

Write For Attractive Offer

ALL you need is one machine, a little training and you are ready to make money. A letter or post card brings all details. Interesting catalog explains **New Scientific Method** and gives particulars of our Co-operative Business Building plans. Write today.

Haywood Tire & Equipment Co.

965 N. Capitol Ave. Indianapolis, Ind.

REFLEX SPARK PLUGS

One cylinder, Reflex fitted, will tell you in language stronger than words that there must be *something* about a Reflex Spark Plug that gives it bull-dog tenacity when it comes to length of service.

Invariably a Reflex Plug in one cylinder eventually means Reflex Plugs in *all* cylinders. The *practically*, scientifically correct design; the basic construction; the tremendously durable Chromite porcelain; the unequalled insulating material; and workmanship of the highest skill to do justice to these elements, supply the *reason why* Reflex Spark Plugs do stand up under the most *punishing* conditions—and continue to stand up—*why* they "Keep the Car on the Go."

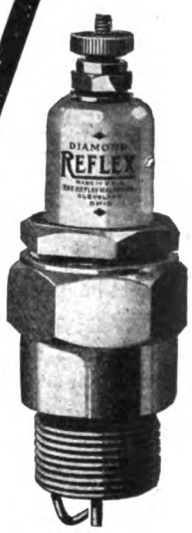
Do this—try *one* Reflex Plug in your motor, and then decide what plugs you'll use in future.

DEALERS

find this is just about the kind of plug that sells itself—on its merit, not price. Write us.

THE REFLEX IGNITION CO.
1711 Payne Ave.
CLEVELAND
OHIO





"KEEP THE CAR ON THE GO"

KNOWLSON'S Spring Spreader

Gives 100 per cent easier riding

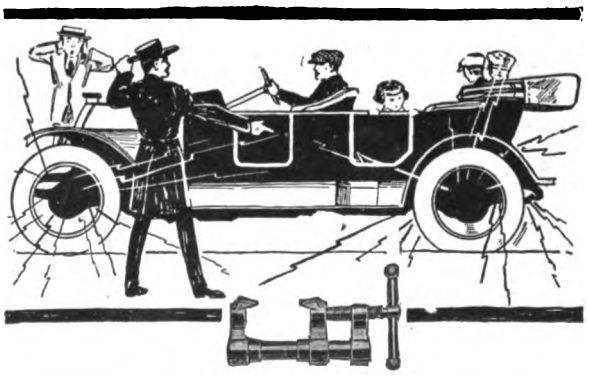
Securely clamps a broken spring.

A durable tool made of drop forgings, nickel-plated and polished.

At all Best Dealers, or sent prepaid for

$1.50

YOUR SPRINGS NEED LUBRICATING!



KNOWLSON'S Spring Spreader

STOPS THE SQUEAK

Adjustable to any size spring.

Protected by Basic Patents and Guaranteed.

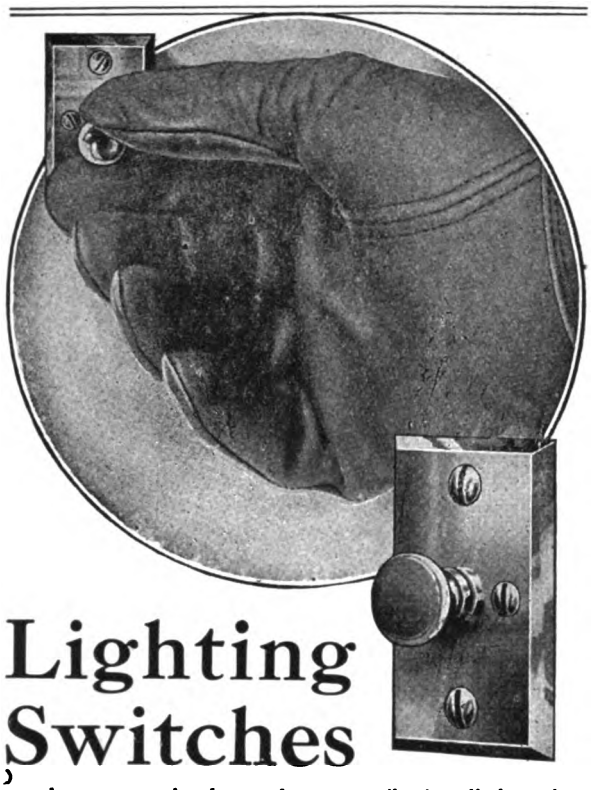
Money Refunded if Not Satisfactory.

One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., Ann Arbor, Mich.

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CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

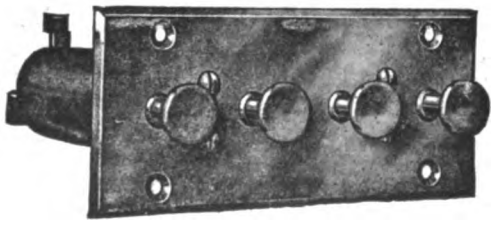
One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

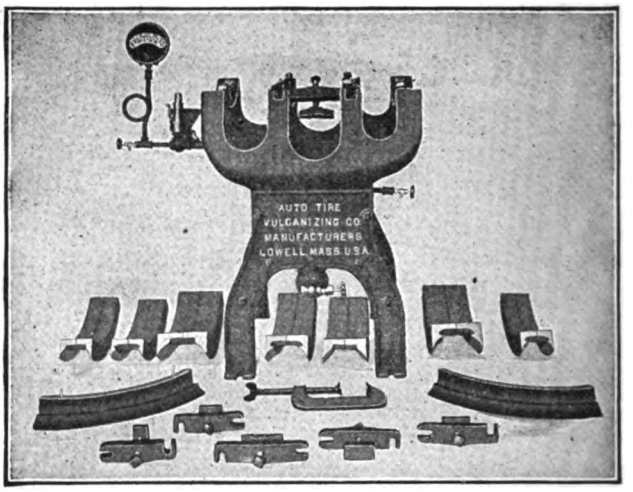
HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP
Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.



Exceptionally Large Profits can be made by Repair and Garage Men with

No. 8 Lowell Adjustable Sectional Vulcanizer

It's different, superior, economical in operation, in fact beyond comparison.

Complete and thorough work can be accomplished with this vulcanizer at all times.

DON'T LOSE A MINUTE—WRITE TODAY!

Auto-Tire Vulcanizing Company,
140 Powell Street - - - Lowell, Mass.

WALDEN WORCESTER WRENCHES

SPECIALISTS IN MOTOR CAR WRENCHES

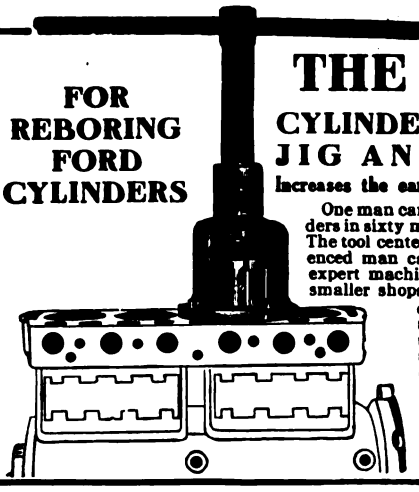
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JOBBERS—DEALERS EVERYWHERE, ASK THEM

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FOR REBORING FORD CYLINDERS



THE DAVIS
CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

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O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

$1/4^{20}$, $5/16^{18}$, $3/8^{16}$, $7/16^{14}$, $1/2^{13}$, $5/8^{11}$, $3/4^{10}$,
U. S. Standard

$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $7/16^{20}$, $1/2^{20}$, $5/8^{18}$, $3/4^{16}$,
S. A. E. Standard

LIST PRICE — $20.00

This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies. This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

F. E. Wells & Son Company Division

Greenfield Tap and Die Corporation
Greenfield, Massachusetts

GTD

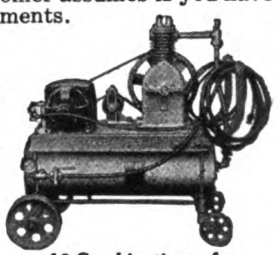


CURTIS AIR FREE FROM OIL

The Curtis Compressor is the only one designed to prevent flooding the cylinder with more oil than it needs for lubrication. This, because of our controlled-splash oiling system. No excess oil is forced into the air line. **Oil ruins tires**—air free from oil means fewer blowouts and increased mileage all around for your customers, with less tire adjustments to you. Make your place the most popular one in town. An easy and inexpensive way, is to install a Curtis Compressor. The customer assumes if you have the best free air service, you will have the best service in all departments.

Costs No More Than Ordinary Compressors—But Note The Difference

Live garages and service stations are using Curtis Air Compressors. Motorists expect free air service. Why not give them the best and win over new customers by supplying, not only reliable air service, but **Curtis Air—Free From Oil.** A poor air system which shoots oil into the tires, or which is unreliable, drives customers away. Thousands of Curtis Outfits are rendering daily, effective, efficient service all over the country. Your Curtis Compressor can further pay for itself by supplying air for air hoists, painting, cleaning, vulcanizing, blowing dust and drillings from tools, and many other things. Curtis Compressors are backed by manufacturers who have been specialists in this line for twenty-five years.



10 Combinations of Compressor and Tank Sizes—Any Current

Five Sizes—Tight Pulley Only, or Tight and Loose Pulley

11 Combinations of Compressor and Tank Sizes—Any Current



Makes New Customers—Holds Old Ones

Quickly pays for itself in bringing in new trade and holding the old trade, for it not only is the source of a dependable supply of air when your customers want it, but it also supplies clean, cool air—free from oil. Motorists realize that oil will quickly destroy their inner tubes, and, therefore, look for a station that supplies Curtis Air—Free From Oil.

Curtis Compressors are built to meet the requirements of your business in sizes, arrangements and prices. Send coupon at once for full information and attractive prices. It will pay you to investigate our proposition. *Write us today, or ask your jobber for prices—but insist on a Curtis.*

Curtis Pneumatic Machinery Co.
1530 Kienlen Avenue St. Louis, Mo.
530E Hudson Terminal, New York

Curtis Pneumatic Machinery Co.
1530 Kienlen Ave. St. Louis, Mo.

Gentlemen: Please send me full details regarding Curtis Garage Air Compressor—your proposition and low prices.

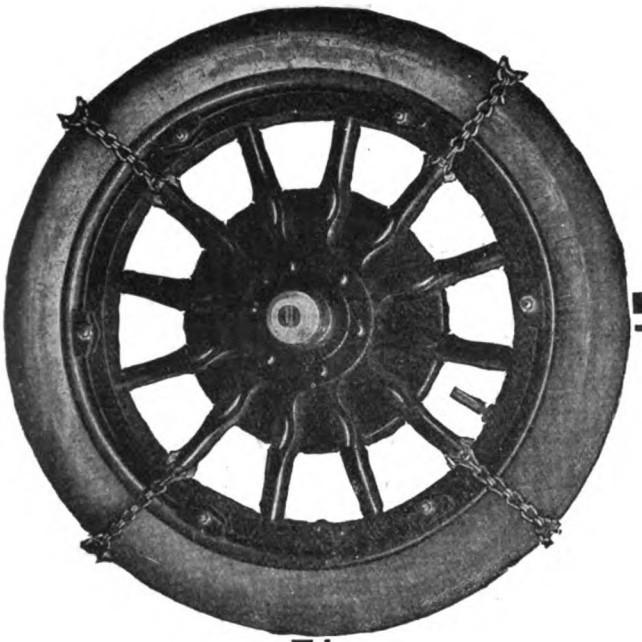
Name.....

Address.....

Jobber's Name.....

Address.....

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"Grip like Mud Hooks"
"Ride like Bare Tires"

Half the Weight—Half the Bulk
Half the Price
Only Three Sizes to Stock

Easyon Chains

NO jacking up—no moving the car. Drop them over the tires, then snap, snap and it's done! Whether in hub-deep mud or on slippery pavement, Easyon Chains can be attached easiest, quickest, surest by any man, woman or child.

Packed in a set of eight in a bag, four for each rear wheel, enough to give a good grip on any road.

Size 3½ fits 3 inch or 3¼ inch tires	**$4.00 per set**
Size 4½ fits 4 inch or 4¼ inch tires	**5.00 per set**
Size 5½ fits 5 inch or 5¼ inch tires	**6.00 per set**

EASYON CHAINS sent prepaid on approval to any part of the United States or Canada on receipt of price. If not satisfied after examining, return them at our expense and we will refund the full amount.

Send for FREE Booklet

which illustrates other useful auto accessory parts—Easyon Truck Chains, Spring Covers, Fan Belts, etc., made by this well-known manufacturer.

DEALERS—Write for Proposition

and open territory. Handle these necessary automobile accessories which sell on sight. Write NOW—today.

WOODWORTH MFG. CORP.

2000 WHIRLPOOL STREET, NIAGARA FALLS, N. Y.

NEW YORK AGENTS
ROSE AUTO SUPPLY CO., 1765 Broadway, New York City

Also ask about EASYON Truck Grips for solid tires.

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Automobile Dealer AND Repairer

A JOURNAL OF PRACTICAL MOTORING

Registered in the U. S. Patent Office

VOL. XXIV, No. 2. NEW YORK, OCTOBER, 1917. PRICE { 10c PER COPY / $1.00 PER YEAR

ANTI-FREEZING SOLUTIONS.

The Cleansing and Preparation of Cooling System for Winter Service.

BY CLIFTON EGERT.

If one will consult any standard dictionary, Webster's, for example, he will find that the word freeze is defined as follows: To become congealed by cold; to be changed from a liquid to a solid state by the abstraction of heat; to be hardened into ice or a like solid body; as water freezes at 32 degrees Fahrenheit. Now during this process of congealing or freezing there occurs an expansion which, although slight, is sufficient to burst any container that is rigid and cannot expand with the congealed fluid.

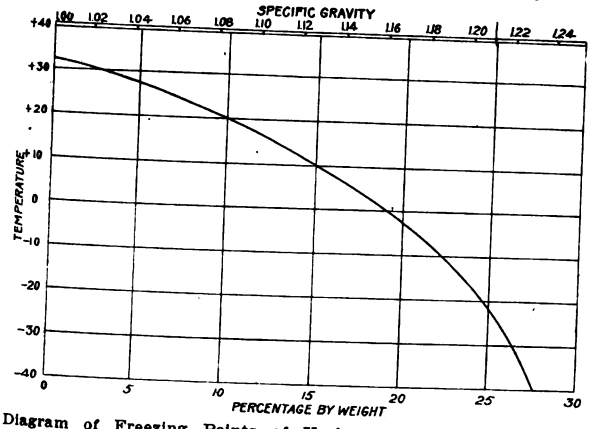


Diagram of Freezing Points of Various Solutions of Calcium Chloride in Water.

Don't Be Caught Napping.

Inasmuch as the water utilized for cooling the automobile engine is susceptible to freezing temperatures which may be expected any day, preparations should be made to repel the attack of Jack Frost. There are three effective methods and these are the use of an anti-freezing solution, draining the circulating system and garaging the machine in a heated building. The last named, however, will require care when the car is left on the street for any great length of time and when the temperature is well below freezing. The emptying of the radiator, etc., is favored by many, but one must be sure that all water is removed. The first named method, the use of an anti-freezing solution, is, perhaps, the best for all around purposes, although there are some who do not favor its use.

Solutions Commonly Used.

The three principal ingredients used for making an anti-freezing solution are calcium chloride, alcohol and glycerine. The calcium chloride is recommended by many car manufacturers and when used care should be taken to purchase none but the chemically pure. The commercial form should be avoided as it contains acid. Crystallized calcium chloride contains about 50 per cent. water of crystallization and dissolves in about half its weight in cold water; consequently eight pounds dissolved in one-half gallon of water will obtain one gallon of the saturated solution. An accompanying chart shows the percentages of calcium chloride and the corresponding specific gravity required to prevent freezing at temperatures ranging from freezing to 40 below zero. This information is also contained in an accompanying table.

Alcohol Solutions Simple.

The alcohol solution is favored by many because it is easily obtained and prepared. An alcohol solution may be made with either wood or denatured alcohol, the latter being alcohol that is made unfit to drink by an admixture of certain substances. The various freezing temperatures of the alcohol solution are shown in an accompanying diagram, also the proportions to be observed in preparing the mixture given in an accompanying table.

Alcohol and glycerine is a combination that is liked by some because of the low boiling point of the latter. The disadvantage of using glycerine is that it attacks the rubber hose of the circulating system, causing the plies of fabric to disintegrate. Another factor mitigating against its use is the cost. Whenever used it generally means renewing the hose in the spring.

Precautions to Observe.

In the use of the calcium chloride, and when employing other than the chemically pure article, one must guard against the action of acid. This can be neutralized by gradually adding ammonia or soda ash and until blue litmus paper no longer turns red when dipped in the solution. Litmus paper indicates if acid be present.

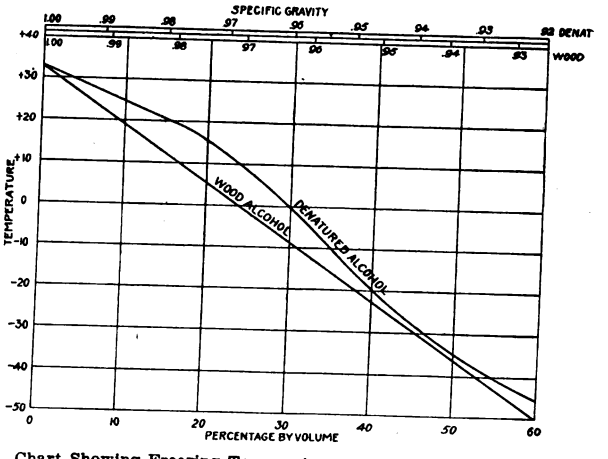


Chart Showing Freezing Temperatures of Alcohol and Water.

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With the alcohol solution one must expect it to give off an odor when heated and to boil readily when the thermometer registers above the freezing mark or in mild weather. Because of these factors and the tendency of the alcohol to evaporate readily, thus lowering the freezing point of the fluid, many object to the solution. If one employs alcohol it is advisable to purchase and use a hydrometer graduated to read below 1.000. These instruments are sometimes termed pyrometers. They indicate to the user the strength of the solution which should be maintained and according to the requirements of the locality.

Cleansing the Radiator.

It is well to avoid the practice of using any anti-freezing solution until the radiator and other components of the cooling system are inspected for leaks, for the alcohol will escape through openings where water will not pass. It is also important that all "fur," scale or other deposits be displaced from the radiator, matter generally deposited through the use of hard water.

Anti-Freezing Solutions.

CALCIUM CHLORIDE.

			F.
2 pounds	1 gallon water	Freezing point	18°
3 pounds	1 gallon water	Freezing point	1.5°
4 pounds	1 gallon water	Freezing point—	17°
5 pounds	1 gallon water	Freezing point—	39°

ALCOHOL.

Per cent.		Per cent.		F.
Alcohol..... 5	Water	95	Freezing point	25°
Alcohol.....15	Water	85	Freezing point	11°
Alcohol.....20	Water	80	Freezing point	5°
Alcohol.....30	Water	70	Freezing point—	5°
Alcohol.....35	Water	65	Freezing point—	16°

GLYCERINE.

Per cent.		Per cent.		F.
Glycerine.....10	Water	90	Freezing point	28°
Glycerine.....30	Water	70	Freezing point	15°
Glycerine.....40	Water	60	Freezing point	5°
Glycerine.....48	Water	52	Freezing point	0°
Glycerine.....54	Water	46	Freezing point—	5°
Glycerine.....58	Water	42	Freezing point—	10°

ALCOHOL-GLYCERINE.

Per cent.	Per cent.		F.
Alcohol-Glycerine...15	Water...85	Freezing point	20°
Alcohol-Glycerine...20	Water...80	Freezing point	15°
Alcohol-Glycerine...25	Water...75	Freezing point	8°
Alcohol-Glycerine...27	Water...73	Freezing point	5°
Alcohol-Glycerine...29	Water...71	Freezing point	0°
Alcohol-Glycerine...30	Water...70	Freezing point—	5°
Alcohol-Glycerine...32	Water...68	Freezing point—	15°
Alcohol-Glycerine...40	Water...60	Freezing point—	23°

There are several ways to clean the radiator. One is to make a solution of washing soda and water, using as much of the former as the water will take. Drain the radiator and fill with this mixture, then run the engine for some little time. If the water from the radiator is very dirty, is rusty, it may be necessary to give the radiator a second treatment. After rinsing with clean water follow with a 25 per cent. solution of the commercial grade of hydrochloric acid. Flush the radiator with clean water after using the acid solution.

Prepared Solutions.

It is a simple matter to determine when the radiator is clean, as the water will come away fairly clean. Another method of removing rust from the system is to dissolve about half a pound of lye in about five gallons of water. Strain the mixture before placing it in the radiator and run the engine for at least five minutes. As with the other preparations, flush thoroughly with clean water. If one does not care to bother with soda, acid or lye, he can obtain a prepared solution, several of which are marketed. These will clean the system and are, perhaps, more convenient and easier to use than the mixtures described. Any and all leaks should be remedied before using any anti-freezing solution. In conclusion, the writer suggests that the automobilist take steps to avoid the possibility of the circulating system freezing, for by so doing a large repair bill will be averted.

TO COMPETE WITH FORD.

New Overland Car Costing Under $500 to Be Made By Willys-Overland Co.

What has every indication of being the first serious challenge to the Ford car and the Ford Motor Co., is the announcement of the Willys-Overland Co. that it will market a car that will sell for under $500, have electric lighting and starting and a number of features not included in the Ford vehicle.

The new machine, which will be produced in large quantities, has a four-cylinder power plant, will weigh about 1,550 pounds and has a two-speed sliding gearset. The bore and stroke of the engine is 3¼x4 inches, and among the features of the chassis is the frame which combines the cross members and running board supports in one. Even the battery box is utilized to brace the frame instead of hanging from it. A unique spring suspension eliminates the need of shock absorbers.

It is stated that not only is the car unusually comfortable but it will create records for fuel and tire consumption. In appearance and style the car has everything to commend it. The fenders are crowned and merge gracefully with the hood lines at front and with the body at the rear. The top is a one-man design, and the equipment is very complete.

The Willys-Overland Co. is the second largest individual manufacturer of motor vehicles in the world, the Ford being at present the leader. John N. Willys and his engineers are confident that mechanically good as is the Ford car, they have far exceeded it in their present design. Work on the machine was started a long time ago, and those who have seen the car state that it rides as nicely as a heavy vehicle of 130-inch wheelbase. Despite the shortage of labor and material the Willys-Overland Co. is in a position to manufacture and deliver an enormous number of cars. The car will be exhibited at the New York Show.

If the new owner will learn to make use of the throttle when desiring to check the speed of the car, he will save his brakes. Using the brakes instead of the control is a common fault with the new driver.

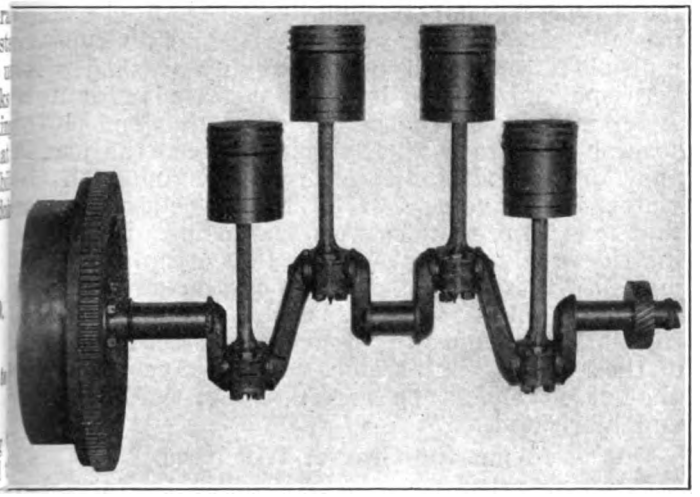
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OVERHAULING THE MOTOR CAR.

Steps Necessary to Prepare the Chassis for Winter Driving.

BY C. P. SHATTUCK, M. E.

Motorists intending to use their machines this winter should give them a systematic inspection and overhaul. The preparation for the cold months should be thorough, but it need not involve any



howing Flywheel with Crankshaft, Connecting Rods and Pistons Removed from Engine. Rods Should Be Adjusted, Carbon Displaced from Pistons and Rings, and Slots in Rings Placed Equidistant.

reat labor or expense, particularly the late model n which the maker has incorporated means for aking up components subject to wear. Machines hat have seen considerable service will require more ttention than those which have been driven a few housand miles. In the latter event it is probable ittle will be necessary other than removing carbon leposits, reseating the valves, making minor adjustments and renewing the supply of lubricants.

What the Owner Can Do.

Some motorists hesitate to undertake the work f placing the chassis in condition for winter service ecause of a lack of knowledge of mechanics. The riter does not advise the novice to attempt the isassembling, adjusting and reassembling of the ore complicated parts, work that is best left to the xperienced, but the owner can accomplish successully the greater part of the work and thereby effect considerable saving in expense.

How to Use the Expert.

As it is possible to call in the expert for adjustments requiring experience one can easily clean and prepare the parts, work that ordinarily costs from 60 cents to a dollar the hour in the repair shops. It is not a difficult matter to arrange with some automobile mechanic to spend a few hours with one each Sunday, for as a rule a repairman is glad of the opportunity to earn a little extra money. Generally these experts will explain the work as it progresses, and the knowledge acquired will prove extremely valuable. Many times an arrangement can be made whereby the expert oversees the work and will make the necessary inspection of the adjustments, etc. This is an excellent plan, as the owner learns to do the work right and avoids the expense occasioned by the novice making errors in the work through ignorance. The writer recommends the method for the simple reason it combines the practical with the technical; that is, when the expert will explain the why and wherefores of each component the owner obtains a schooling not possible under ordinary circumstances.

How to Start the Work.

In the overhaul one must be systematic and this will apply to both the partial and thorough overhaul. The inspection, which precedes any work, should be equally as thorough. The steps to take and progressively, are given in an accompanying table. It is not essential that they should be followed as printed, but can be varied to meet the requirements of design, etc. As may be noted, the phrase, "Remove old lubricant, clean and renew supply," occurs frequently. This is important.

Cleaning the Radiator.

The first step in the work is to make sure that the circulating system is free from rust and deposits. Inasmuch as complete instructions are given elsewhere in this issue for preparing the cooling system for winter, the subject will be dismissed. Wash the body and chassis clean, then remove the lamps, extra tires, accessories, etc., laying these to one side. In a complete overhaul it is well to remove the body, but before displacing it, and particularly if the fuel tank be located in the cowl and numerous connections exist, shut off the fuel supply at the tank. Study all connections and devices attached to the body and which lead to some part of the chassis. Make absolutely sure that all are free before attempting to lift the body from the frame. After

HOW TO PROCEED WITH THE WORK OF THE OVERHAUL.

POWER PLANT.

Clean circulation system.
Drain crankcase.
Clean oiling system.
Remove grease and dirt.
Clean fuel system.
Remove carbon deposits.
Clean pistons and rings.
Adjust bearings.
Reseat valves.
Check valve timing.
Adjust fan belt.
Examine water connections.
Renew defective gaskets.
Clean grease cups.
Refill crankcase and reservoir.

CLUTCH.

Inspect bearings for wear.
Examine clutch facing.
Drain wet type of disc clutch
Flush case with kerosene.
Adjust spring or springs.
Adjust clutch release.
Inspect lever and linkage.
Adjust clutch brake.
Renew supply of lubricant.

GEARSET.

Remove old lubricant.
Clean gears and case.
Adjust bearings.
Test mesh of gears.
Adjust shifting rods.
Renew supply of lubricant.

REAR AXLE.

Clean and wash differential.
Adjust bearings.
Inspect pinion and gear.
Examine truss rod.
Adjust radius rods.
Clean muffler.
Adjust torque arm.
Clean universal joints.
Inspect brake linings.
Adjust brakes and linkage.
Renew supply of lubricant.

STEERING GEAR.

Clean and inspect all parts.
Remove lost motion.
Adjust drag link.
Renew worn bushings.
Adjust spark linkage.
Adjust throttle linkage.
Repack gears with grease.
Renew supply of lubricant.
Test action of linkage.

WHEELS AND SPRINGS.

Clean and adjust bearings.
Test alignment of wheels.
Clean and lubricate springs.
Inspect hangers and bolts.
Tighten spring clips.
Clean and graphite rims.
Inspect tires and tubes.

IGNITION.

Clean and oil timer.
Clean and adjust contact points.
Clean timer and distributor.
Inspect couplings for wear.
Check timing.
Clean and adjust spark plugs.
Examine and test wiring.
Tighten connections.
Clean battery box.
Clean and test battery.

FRAME.

Remove grease and dirt.
Try rivets for play.
Tighten nuts and bolts.
Examine tire irons.
Tighten fender irons.

MISCELLANEOUS.

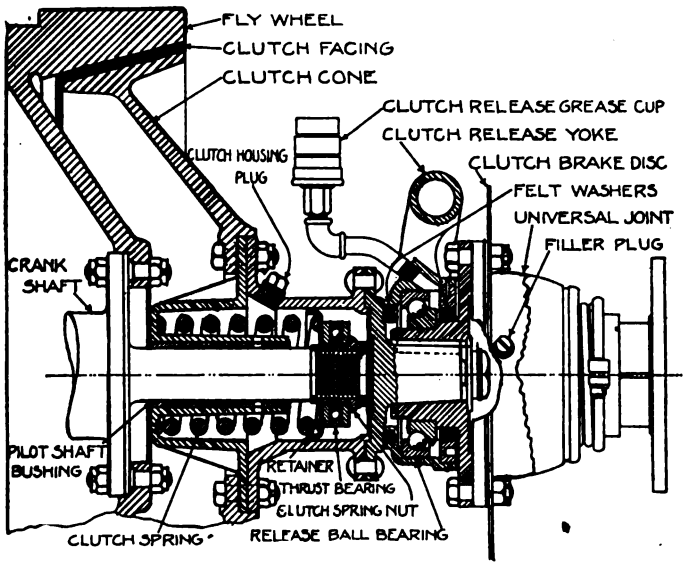
Clean and inspect speedometer drive.
Replace and repack grease boots.
Clean and refill grease cups.
Lubricate motor starter.
Oil lighting dynamo.
Inspect lighting wires.
Clean top and curtains.
Tighten windshield.
Clean upholstery.
Overhaul tool kit.
Inspect accessories.

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displacing the body place it on suitable support, and raise the top.

Power Plant Connections.

Before attempting to remove oil, grease and other foreign elements from the power plant, cover the magneto, carburetor, generator, motor starter or



Showing the Cone Type of Clutch, Universal Joint and Components Requiring Inspection and Adjustment in the Overhaul.

timer-distributor with cloths to prevent the cleansing fluid from reaching these members. Inasmuch as gasoline is expensive, use kerosene for cleaning. A stiff brush combined with a little elbow grease will work wonders. As it is an easy matter to displace wires and a difficult task to replace them correctly, study all connections between the power plant and the dash, tagging wires, etc. In marking the spark plug wires start with the cable leading to the first cylinder and attach a tag with the mark No. 1 to the timer or distributor terminal. Leads between the timer-distributor and coil can be similarly marked, and by using tags for each connection and properly numbered, mistakes will be avoided in the replacement of the wires.

Cleaning the Oiling System.

If the motor is not to be overhauled, and only the carbon removed and valves ground, the lubricating system should be emptied of the old oil. Open the petcock under the engine and drain the crankcase. Refill with kerosene and run the engine about a minute but not at high speeds. Drain kerosene and refill with fresh, clean oil. The method of doing this work will depend upon the type of lubricating system. The splash is easily cleaned as the kerosene can be introduced through the breather or other filler opening.

Dismantling the Engine.

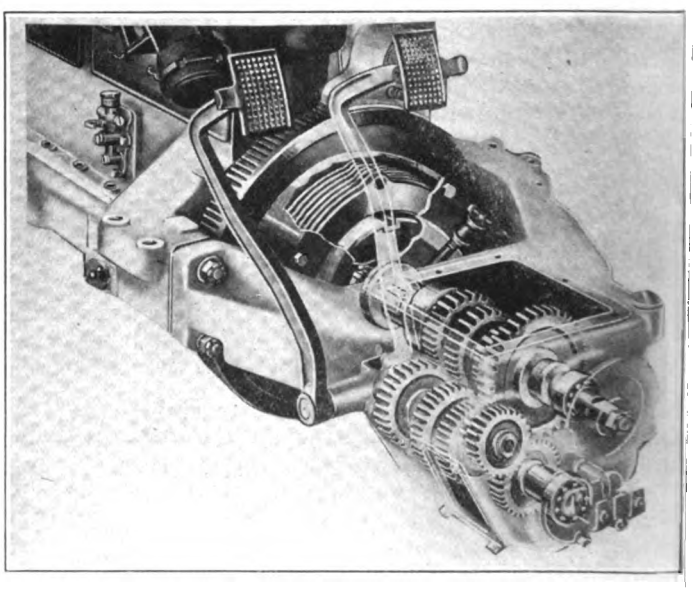
The next step is to strip the motor, removing the intake and exhaust manifolds if these be of the detachable type. Displace the spark plugs, inlet and outlet water pipes, etc., and after loosening the nuts securing the cylinders, the last named can be removed, giving access to the pistons and rings. Carbon should be removed from the heads of the pistons, cylinders and grooves of the pistons. Displacing the crankcase will afford access to the main, connecting rod and camshaft bearings and these if worn should be adjusted. Generally the removal of a shim or two will compensate for the wear. The tightness of the bearing will depend upon the type, but this data is usually contained in the instruction book, which should be consulted as the work progresses. If not familiar with the work of taking up bearings obtain the services of the expert. Whenever possible adjust a bearing or so under his supervision.

Overhaul the Clutch.

The clutch requires attention particularly if it has been slipping or is harsh in its action. Leather-faced types become dry and can be restored by the use of neatsfoot oil, while the wet plate type of multiple disc should be thoroughly washed with kerosene and the old lubricant replaced with new. After introducing the kerosene declutch and clutch several times to work the fluid between the plates, and it is a good plan to crank the engine with the plates disengaged. This will work out any dirt that may be present between the plates. In renewing the supply of oil it may be that a thinner grade may be recommended by the car maker for cold weather. Inspect and adjust the clutch springs if the clutch does not grip properly, and test the action of the brake or clutch stop. The linkage operating the clutch should be carefully cleaned, adjusted and lubricated.

What the Gearset Will Need.

Coming next to the gearset, remove the lubricant and wash the gears, bearings and shifting forks. Test the shafts for end play and if adjustable eliminate the lost motion. Also test the mesh or alignment of the gears and if faulty correct same. The shifting mechanism may require a slight adjustment, particularly if a gear shifts itself when in service. Examine the dogs of the high-speed gear



Phantom View of Gearset and Showing Bearings and Shifting Mechanism. Gears Should Align and Mesh Easily and Shifting Forks Adjusted. The Clutch Should Be Cleaned and Adjusted and Lubricated if of the Wet Type.

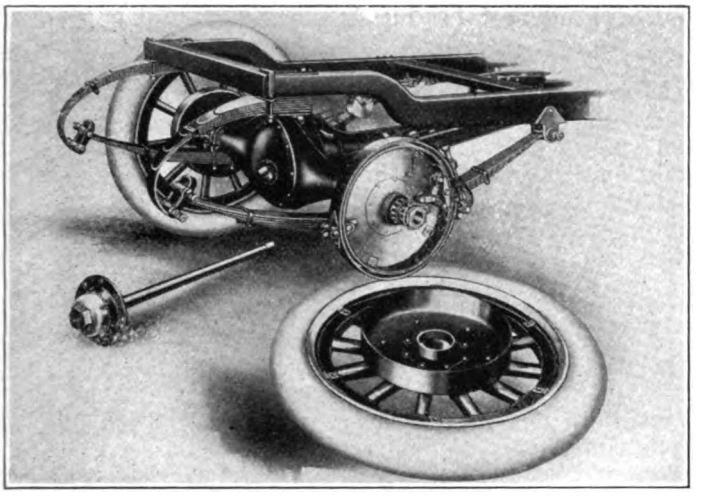
and if badly worn have them trued up. Failure of the high to remain in speed will be revealed by an inspection of the gearset and its linkage. Clean, inspect and lubricate the linkage between the shifting lever and the gearbox.

Remove all lubricants from the rear axle, clean and inspect the gears, particularly the mesh of the pinion and gear, and if there be side or end play, correct same. If roller bearings are utilized care

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must be taken not to adjust them too snugly else damage will result. The adjusting of the mesh of the pinion and gear requires experience, and it is suggested that the expert be called in to do this work, unless, of course, one is entirely familiar with it.

While on the rear axle look over the universal



Illustrating Full Floating Type of Axle with Shaft and Wheel Removed to Show Bearings and Brake Adjusting Mechanism. In the Overhaul of the Rear Axle Should Be Included the Cleaning and Lubrication of Springs.

joints. These are frequently neglected until badly worn. They are a most important part of the power transmission system and, despite the educational work conducted by the manufacturer, owners will neglect these joints. Clean the joints and if worn take them to the expert for restoration of the parts. Use the lubricant recommended by the maker of the joint.

Torque Arms and Radius Rods.

The torque arms and radius rods require attention and these should first be cleaned, then tested for play or lost motion. With some types it is a simple matter to restore worn parts, while others are more difficult. If the car has been run a large number of miles, and particularly if the mixture has been slightly rich, one is likely to experience muffler trouble. This member ought to be cleaned thoroughly, for with some types the openings fill readily, setting up a considerable back pressure which not only cuts down the energy of the engine but contributes to hard starting. Sometimes the muffler can be cleaned by tapping with a wooden mallet. The deposits will be removed by the exhaust when the engine is started.

Brake Overhaul Important.

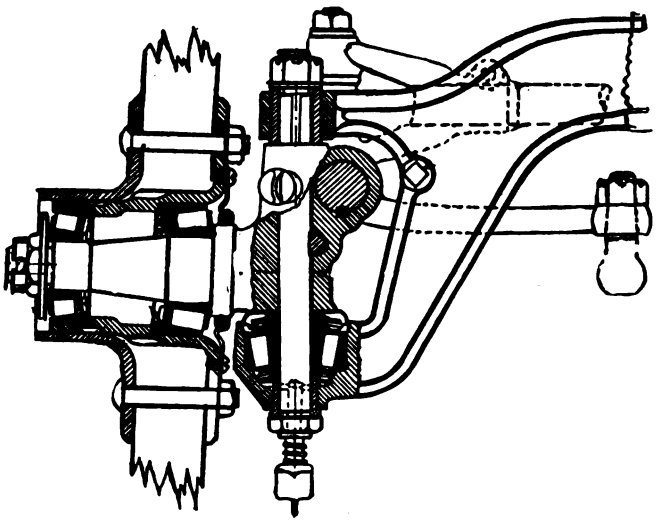
The writer could discourse for some time on the subject of brakes, one of the most important components of the machine. In overhauling the brakes it is best to entirely disassemble the mechanism and the linkage. By so doing all rusty and worn parts are easily noted and not only is the work of restoration made easy but it insures proper lubrication previous to the reassembly. It may be that the linings require replacing or the levers, cams and studs are so badly worn as to interfere with transmitting the proper leverage. Very often the linings are blamed for failures of the brakes to hold when the worn members in the linkage practically make it impossible to obtain the correct leverage. The brake part of the overhaul requires extreme care, particularly the adjustment, for any friction between the lining and brake drums cuts down power and decreases fuel efficiency. A simple test of the brakes is to stop the car after a short run and place the hands on the drums. If warm, it indicates friction which should be eliminated. Right here the writer desires to emphasize a point frequently overlooked by the repairman and that is worn bearings may be responsible for faulty brake action. For this reason the bearings should be adjusted before tackling the brake members.

Do Not Slight Steering Gear.

The overhaul of the steering gear is most important and no part of the work should be slighted. End play of the steering column can be eliminated and lost motion in the wheel corrected by remeshing the gears, bringing a new section in mesh or by renewing worn bushings with new. Repack the gears with grease or oil as directed by the maker. Play in the drag link can usually be removed by adjusting the position of the plug in relation to the ball end of the arms, but extreme wear of the linkage of the tierod, yokes, etc., will require new bushings and bolts. These parts should be well lubricated and where boots are used these packed with grease.

Adjustment of Bearings.

The bearings of the front wheels should be cleaned, lubricated and adjusted, and if of the ball, race and cone type and worn, replace with new. Never use one or more new balls with old. After completing this work test the wheels of the car for alignment and any error existing can usually be corrected by lengthening or shortening the tierod. Observe the gather of the front wheels and correct if too much or too little. It is a good plan to test



Showing a Longitudinal Sectional View of Roller Type Front Wheel Bearings and Components Used in Adjusting. Roller Bearings Must Be Adjusted Carefully Else Damage Will Result.

the alignment of the wheels at least once a month, as wheels out of true quickly destroy tires.

Clean and Lubricate Springs.

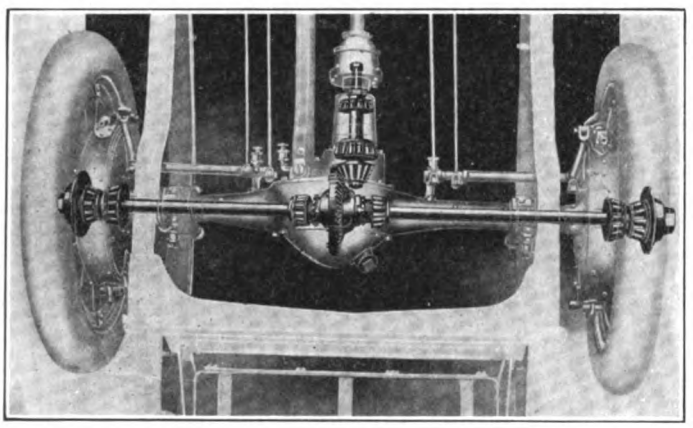
The springs should either be entirely disassembled or the leaves spread apart for cleaning and lubrication. A mixture of graphite and oil, forming a thick paste, is excellent for springs, and the same material can be successfully employed on the tire rims, which should first be cleaned. Worn spring bolts and hangers should be replaced with new when

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considerable play exists, and all spring clips set up snug. The rivets of the frame and its cross members should be inspected and the nuts and bolts retaining the fender irons and running boards gone over with the wrench, as one or more loose parts may be the cause of that annoying squeak.

Checking Valve and Ignition Timing.

After any car has been in service for some time it is advisable to remove carbon deposits, reseat the valves and check the timing of the valves. This work can be performed by the owner, and as the flywheel of the engine is generally marked it is not a difficult matter to adjust the valves so as to obtain maximum efficiency from the power plant. Irrespective of the type of ignition system employed, whether it be the battery, timer and coil, the timer-distributor or magneto, the components of the system should be cleaned, adjusted and lubricated. The contact points of the breaker mechanism of the magneto and of the late types of battery ignition, must be clean and true to obtain good results, and the gap should conform to the dimension given by the maker. It is equally important that the gap



Phantom View Illustrating Rear Wheel, Differential and Pinion Shaft Bearings, Components Requiring Careful Cleaning and Adjusting. It Is a Good Plan to Clean Differential Case and Refill with Fresh Lubricant.

of the spark plugs does not exceed that specified and that each plug of the set have the same gap. Guesswork in the shape of dimes, cards, etc., should be avoided. Use a gauge if results are desired.

Lighting and Starting System.

Relative to the starting and lighting system the writer goes on record as opposed to the owner attempting to do other than strictly follow the directions of the maker. The average lighting and starting system includes the ignition, and to correct other than minor troubles is inviting trouble and expense. The methods of controlling the output of the generator vary and when these be at fault they should not be tampered with by the owner but by the service station expert or a repairman who has had factory instruction. The writer's contention is borne out by an investigation of the subject, and as a rule the owner is more likely to add to his troubles than to remedy the original one. The starting and lighting equipment is not as yet perfect and until it is more foolproof owners will avoid the possibility of trouble if they do not tamper with their equipment.

Care of the Battery.

Inasmuch as the slight or thorough overhaul will take a few days at least, it will afford an excellent opportunity to send the storage battery to the service station or expert for a careful inspection. It may be that the plates are slightly sulphated and require a long, slow charge, or that other slight repairs may be necessary. It is much better to do this than have the battery give you trouble some cold night when starting is not easy.

Cleaning the Carburetor.

After the overhaul comes the testing out on the road, but before trying out it is best to clean the fuel system. If the fuel filter be attached to the tank, empty and clean the former. Disconnect the fuel line from the tank to the carburetor and use compressed air to clean it. As to the carburetor, clean the float chamber, also the spraying nozzle, for the last-named is becoming a general offender. Tiny particles of dirt lodge in the nozzle and when they do the engine balks like a mule. If you clean the carburetor, do it thoroughly. And inasmuch as water will congeal in freezing weather, make it a practice to empty the filter and draw a little fuel from the float chamber at least once a week. If water gets into the float chamber and freezes it will afford one a very interesting time starting the engine.

Tools and Equipment.

No suggestions are given herein as to the tools required in the work of the overhaul. Ordinarily those accompanying the car supplemented by a few others will serve all practical purposes. If an arrangement be made with a repairman to assist in the work he will supply the special tools required, and it is advisable to mention this when obtaining his services. Overhauling one's car, either partially or wholly, not only eliminates a big repair bill, but affords the motorist experience that will be invaluable on the road.

Cause of Tread Wear.

Excessive tread wear can in almost every instance be traced to improper alignment of wheels, says the Goodyear Tire & Rubber Co. There are many minor accidents that force a wheel out of line. The car may be driven diagonally against the curb, or one wheel drop into a large rut with the opposite wheel unaffected, an axle, steering rod or knuckle may be bent or the demountable rims may be applied crooked—any of these produce abnormal tread wear, for they cause the tire to undergo a diagonal grind as it passes over the road surface. This grind wears off a tread just as surely as if it were applied to an emery wheel.

It is a wise procedure to check these points just as soon as premature tread wear begins to show. The cause is usually found in a few moments when searched for properly.

Gasoline Exports Increase.

One of the reasons for the high cost of fuel in this country is seen in the figures for gasoline exported during the seven months ending in June. During that period we shipped abroad 241,986,595 gallons, which compares with 198,147,553 for the same period in 1916.

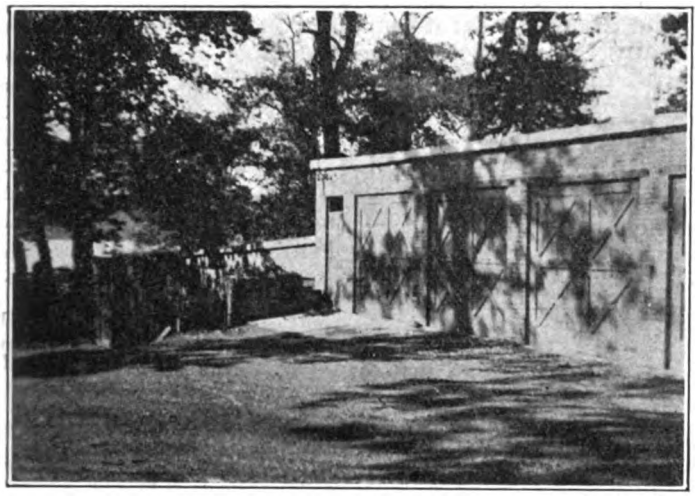
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SOLVING THE GARAGE PROBLEM.

How High Cost of Storing Car in Big City Is Avoided by Novel Plan.

BY C. S. PERRY.

Automobilists who move to New York City, particularly the class of salaried men or those wage earners who have incomes from $25 to $50 a week, are confronted by what is to them a serious problem when it comes to finding a place to store their machines. There are hundreds of garages on the



A Sample of the Individual Garage Where the Owner Can Tinker to His Heart's Content.

island of Manhattan, and it is not a lack of accommodations that bothers the out-of-town motorist locating in New York but the prices.

Law of Supply and Demand.

It costs from $35 to $75 and more to garage a motor car in New York. This seems to be an exorbitant price to the man who is used to small cities and places where $10 the month for live storage is considered a high charge. And in some cities live storage can be obtained for $5 the month. The reasons why prices are high in New York are numerous. In the first place sites for garages are not easily obtained, owing to restrictions; secondly, land comes high, and the garageman figures that he must obtain a good return on his investment to make a reasonable profit. What is, perhaps, the most reasonable explanation is that given by a garageman to the writer. Said the garageman, "My spaces are always occupied and any vacancies are in demand, so why should I not get my price?"

How Prices Affect Trade.

It is estimated by a conservative agent of pleasure cars that thousands of machines could be sold annually in New York to the salaried class referred to if there could be arranged garage spaces and at reasonable prices. Because there is a lack of space sales are lost to the trade. It is not the first cost of a machine that is figured by the prospect, it is the cost of garaging and maintenance. And those who figure these things become discouraged when they reckon that it will cost nearly the price of a popular make of car to garage it for one year.

How Problem Is Solved.

Among the efforts made to solve the garage problem for the motorist of moderate means is that of the individual garage which appears to have been successfully worked out by a couple of enterprising young men familiar with the requirements of the owner-motorist. These young men have leased a large tract of land in the vicinity of the Polo Grounds, the home of the noted Giants of the National Baseball League, and have erected approximately 60 individual garages on a plot of ground about 155x175 feet. As may be noted from the accompanying illustration there is ample space between the rows of buildings for one to handle a car, and room is a feature that attracts the woman motorist of which there are a large number at this place.

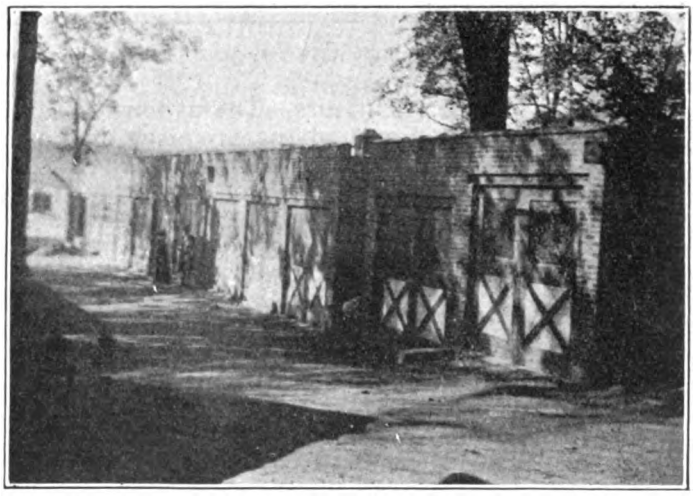
Fireproof Construction and Roomy.

The garages are of heavy sheet metal, of the angle frame type; that is, the roof and wind loads are carried on rolled steel trusses, columns, purlins, etc. The wooden doors are covered with metal, have wire glass panels affording plenty of light, and head and floor bolts hold the doors open when desired. Yale locks are used throughout. The windows are of wire glass and can be swung outward, and ventilators are included. Cement floors and good drainage are among the features. All buildings are electrically lighted and have sockets for plugging in a trouble or inspection lamp. There is ample room for a workbench, supplies and lockers, and a cement washstand near the entrance provides means for keeping the cars clean. Gasoline is sold at a reasonable profit as are supplies and equipment.

At the time this article was written consideration was being given to heating at a slight extra cost. All of these conveniences are obtained for $12 the month, and it is interesting to note that at least 40 per cent. of the tenants are new owners; that is, they are garaging their first motor car. The company operating the garages own another large group operated on a similar plan.

Another Garage Village.

At the foot of a hill leading from Riverside Drive to the Hudson River, and well up town, is what is termed the Garage Village, so named because the



Some of the Individual Brick Garages of the Garage Colony. These Are Heated and Have Every Convenience.

75 or more garages are arranged much in the same manner as cottages in a country village. The rows of individual buildings run east and west or at right angles to the river, and standing at the entrance of each garage one obtains a splendid view of the Jersey shore and Hudson River.

Although but slightly over two years old the vil-

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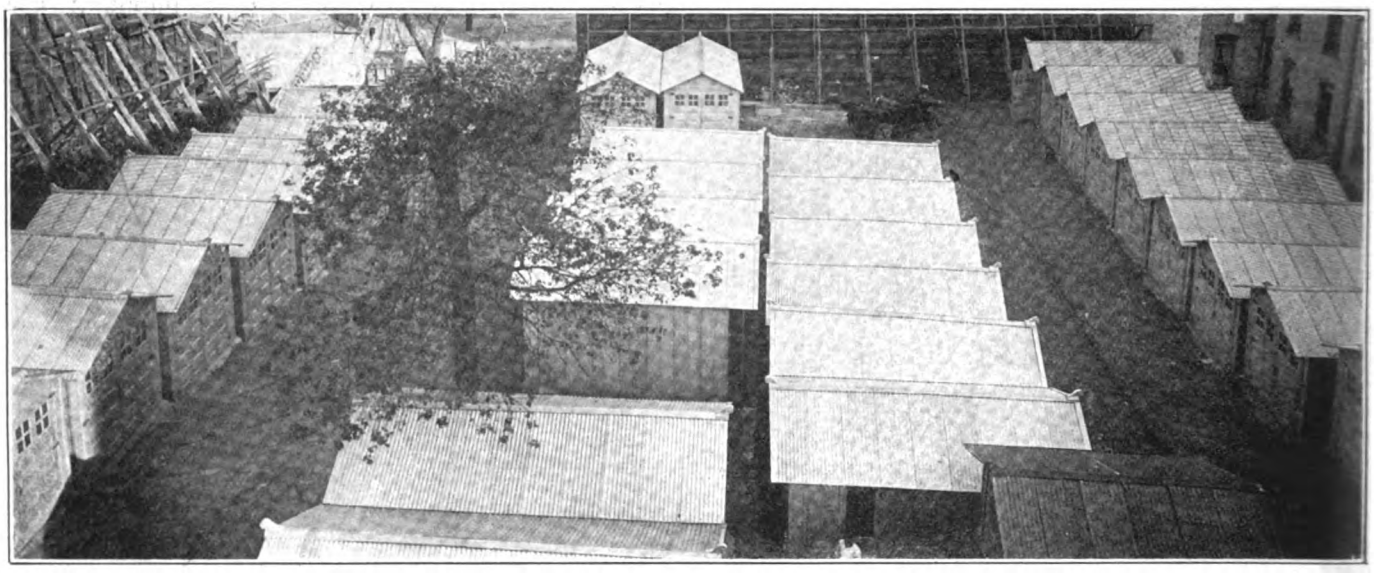
lage has grown steadily, and new structures are constantly in the process of building. These buildings represent different types; that is, different material. The first were of cement but these were followed with metal and now brick rules favorite.

Rentals Vary.

When the writer obtained the data for this article the buildings rented from $12 to $20 the month. The conveniences included running water, cement and drained floors, electricity, toilet, washroom, telephone, air compressor, etc. The brick structures are heated, and the services of an expert mechanic are available during the day. Fuel is sold at almost cost price, and supplies, etc., are carried by the proprietors of the garages. The dimensions vary, some being 10x16, 10x18 and 10x20. The space between each row is ample, being 30 feet. There is plenty of room to enter and leave.

Many Women Occupants.

It is interesting to note the number of the fair sex who are tenants, and who care for their cars. While the garages appeal particularly to the private owner, there are a number of cars garaged by owners who employ chauffeurs. These, however, are not allowed to loiter around the premises, nor are outsiders encouraged to visit the place. The cases cited demonstrate the possibilities for the man of moderate means obtaining space at a reasonable figure, but unfortunately the new building laws discourage the development of the individual and colony plan of garages. This is to be regretted for there are thousands of persons in New York who would invest in a machine were it not for the high cost of garaging. It is one of the penalties for living in the leading city of the country. But it is particularly hard on the automobilist who comes to New York from a place where garage rentals are reasonable.



Illustrating Some of the Individual Garages Located Near the Polo Grounds, New York. These Obtain Modern Conveniences at Reasonable Prices for the Owner of Moderate Means.

Points on Auto Insurance.

In discussing the different clauses in insurance policies, Charles C. Missall, automobile insurance specialist, says that "property damage coverage provides indemnity for the policyholder against loss by reason of his legal liability for the damage to or destruction up to the limit of $1,000 of any property on account of any accident due to the maintenance or use of the assured's automobile (excluding in any case the resultant loss of use of property so damaged or destroyed)."

Now, that clause "excluding the resultant loss of use of property so damaged or destroyed" means that while the insurance company will pay under the conditions of the policy for the actual damages caused by the assured's car the company will not pay for expenses incurred by the other party, for the hiring or renting of other vehicles, etc., while the damage to his property is undergoing repairs. For example: A physician's automobile is damaged by the assured's car to such an extent that while repairs are being made he is compelled to use a taxicab to make his professional calls in and includes that expense in his claim; that expense will not be assumed by the insurance company unless the property damage coverage is extended to include the resultant loss of use of the property so damaged or destroyed, by an additional charge of 25 per cent. of the property damaged premium.

Taking in consideration that the majority of automobiles are used for business purposes, it is advisable to provide for "loss of use" when taking property damage protection.

Draining the Cooling System.

Those owners who make it a practice to run the water from the radiator to avoid the possibility of freezing, will do well to make sure that every drop is removed. While the modern car is easily and effectively drained, there are some machines having pipes which are lower than the drain cocks. It is a good plan to study the system and make sure that it can be perfectly drained. This rule is more applicable to old models than the late ones.

Motor Cars Thick in Iowa.

The automobile business in Iowa is flourishing, a condition due to the fact that the farmers have had a successful season. There are 262,772 motor vehicles registered in the State, according to the figures given out by the Secretary of State.

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Allot Space for New York Show.

At the regular October meeting of the National Automobile Chamber of Commerce, held in New York City, more than 100 automobile manufacturers discussed the new three per cent. tax on the industry imposed by the War Revenue Bill which became effective October 4. It being the intention of Congress in placing this tax that it be paid by the buyer of the car, it was the sense of the meeting that the amount of the tax should be added as a separate war item on each car and truck sold.

It was voted to subscribe $50,000 of the organization's funds in the second issue of the Liberty Loan, and also to carry bonds for employees of the association.

R. H. Collins, president of the Cadillac Motor Car Company, was elected a director to fill the vacancy caused by the resignation of Wilfred C. Leland, who has entered the aeronautical industry. There were reports from committees on traffic, good roads, commercial vehicle, and patents.

New members elected include the Barley Motor Car Co., Kalamazoo, Mich.; Elgin Motor Car Co., Chicago, Ill.; Republic Motor Truck Co., Alma, Mich.; G. A. Schacht Motor Truck Co., Cincinnati, O., and Stegeman Motor Car Co., Milwaukee, Wis.

New divisions of the chamber were voted upon, to be known as the passenger car division and motor truck division, to be headed by Vice-Presidents H. H. Rice for the passenger cars and Windsor T. White for the trucks. Charles Clifton presided at the meetings of the directors and members, which were attended by most of the presidents or executives of the leading companies of the industry.

S. A. Miles, the show manager, stated that with the addition of non-members who have applied, the number of car exhibitors will be greater than ever before, while the demand for the display of accessories and parts exceeds all previous records. The Motor and Accessory Manufacturers have applications to allot space to about one hundred of its members, and when the final allotment of accessory space is made the total will reach close to three hundred for each show.

The following makes as members of the National Automobile Chamber of Commerce were served at the first drawing for both shows: Gasoline—Abbott, Allen, Apperson, Auburn, Austin, Briscoe, Buick, Cadillac, Case, Chalmers, Chandler, Chevrolet, Cole, Columbia, Crow, Davis, Detroiter, Dodge, Dorris, Dort, Elgin, Elkhart, Empire, Fiat, Franklin, Grant, Glide, Hackett, Hal, Haynes, Hudson, Hupp, Interstate, Jackson, Jordan, King, Kissel, Kline, Lewis, Lexington, Liberty, Marion-Handley, Marmon, Maxwell, McFarlan, Mercer, Mitchell, Moline, Monroe, Moon, Nash, National, Oakland, Olds, Overland, Owen, Packard, Paige, Paterson, Peerless, Pierce-Arrow, Premier, Regal, Reo, Roamer, Saxon, Scripps, Standard, Stearns, Stephens, Studebaker, Stutz, Velie, Westcott, Willys and Winton; Electrics —Anderson, Baker, Milburn, Ohio and Wood. The Glide, Dorris, Hackett and Stephens will be shown at Chicago only, while the Kline will be exhibited at New York only.

Space was allotted to the following concerns, not members of the N. A. C. C.: American, Harroun, Monitor, and Stanley (steam). The American will exhibit at the New York show only, while the others will be at both shows. Allotment to other non-members will be made.

The number of exhibitors for both cars and accessories is greater than for any previous show and all the space on the four floors of Grand Central Palace and the Chicago exhibition buildings will be filled to overflowing. The New York show will be held the week of January 5 to 12, and the Chicago show from January 26 to February 2.

How Fords Have Multiplied.

Figures dealing with the Ford car are always of interest to owners. The annual report of the Ford Motor Co. for the fiscal year ending July 31, 1917, shows an increase of $26,754,560 in total assets and a reduction of $7,420,381 in the amount of cash on hand and in the banks. The total business transacted during the year is between $350,000,000 and $400,000,000 as compared with a gross business of $206,867,347 for the preceding year. The company produced 785,432 cars as against 533,291 for 1916. The schedule for 1918 calls for 900,000 machines and the company is now producing 2,700 a day and anticipates a production of 3,000 daily. The record number of cars for a single day during the year just closed was 3,310.

The production figures for the past 14 years are of interest and show how the Fords have multiplied. The figures follow:

Year	Cars Made and Sold	Increase or Decrease	Daily Average
1917	785,432	+ 251,511	2,618
1916	539,921	+ 255,708	1,816
1915	308,213	+ 59,906	1,027
1914	248,307	+ 83,855	827
1913	164,452	+ 95,908	545
1912	68,544	+ 30,078	228
1911	34,466	+ 15,802	115
1910	18,664	+ 8,057	62
1909	10,607	+ 3,209	35
1908	6,398	— 2,025	21
1907	8,423	+ 6,284	28
1906	1,599	— 96	5
1905	1,695	— 13	5
1903-4	1,708		

The Ford company has also changed its dealer policies and in place of making the usual one-year contract, as has always been done in the past, it is now making contracts with agencies which stipulate the yearly allotments but which may be terminated at any time.

Solves Shipping Problems.

A Louisville, Ky., automobile manufacturer has evolved a plan whereby freight congestion does not worry him. After the cars are completed and tested the demountable wheels and rims are displaced, flange wheels fitted and the cars sent to their destination under their own power in trains of 25 to 50 over the railroad rights of way. This presents possibilities of an interesting character.

Do not allow oily waste or greasy rags to accumulate about the garage. They are likely to create trouble in the way of fire and through spontaneous combustion. Sawdust soaked with oil will act in the same way. Either burn the rags or keep them in a can made for them.

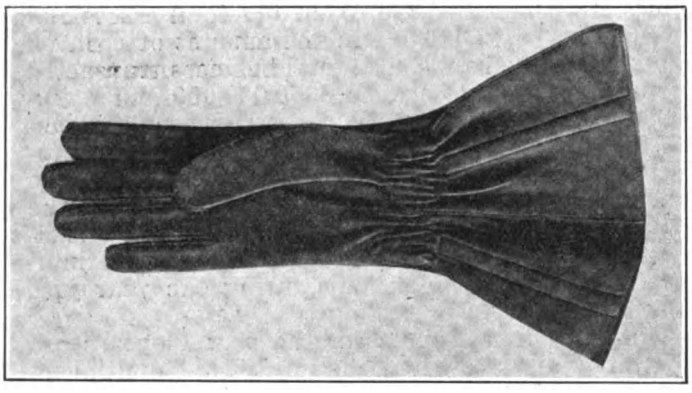
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FORECAST OF MOTOR FASHIONS.

What the Fair Sex Will Wear When Motoring—New Garments Simple in Style.

BY MRS. A. SHERMAN HITCHCOCK.

There are three things which the motor woman should strictly observe when buying clothing to wear in the car: practicability, serviceability an attractiveness. Time was when it was impossible to combine the three in motor raiment, but, since motoring has become an established manner of locomotion, all the noted designers and manufacturers have turned their attention to achieving something



The Kaptain Kid Motor Glove for Women. It Comes in Tan, Gray and Black, Is Soft and Pliable and Is Easily Folded.

in the sartorial line for women motorists that will be becoming and attractive, as well as protective. That they have succeeded admirably is clearly evidenced by the many extremely practical and decidedly modish garments built for motor wear.

One-Piece Dress Popular.

For general motoring during the colder season, the one-piece dress is deservedly very popular, Serge, Kashmere Kloth, Roshanara Crepe, Nanken, Velutina and the jersey cloths are the best materials for the motor frock, varied, of course, by those of silk—and there is nothing better and more modish than these attractive and durable frocks. There was a time, not so very long ago, when I should have hesitated to call silk or satin durable for motoring, but times have changed decidedly in this particular, and now that the Government has requisitioned such vast quantities of wool, and we are dependent to a large extent upon other materials, the manufacturers of silks have turned their attention to producing a product of durability and serviceability and the results show that they have succeeded in "doing their bit" in a most satisfying manner.

Frocks Plainly Made.

The new "slenderizing" Pussy Willow satin, the Satin Faced Poplins, Khaki-Kool, Indestructible Voile and Indestructible Crepe are ideal materials. Frocks are plainly made and show little trimming, a little hand embroidery or beading, or buttons, being about the only elaboration. Very straight and very narrow are the majority of frocks and the decided round neck and long sleeve are effectively used on motor frocks. An attempt to put newness into the popular sraight line is being introduced by an arrangement of back looped or side drapery which changes the slim outline to the bustle silhouette but it is too early yet to predict its success or failure, although I am very doubtful if women will take kindly to such an innovation.

Coats Are Simple in Style.

There is really no especial style that is followed in motor coats, to the exclusion of all others. Some of the new fall and winter models are so simple that they become distinctive by their very simplicity, while others are as dressy as it is possible for the expert to fashion them, without wholly transgressing the laws governing motor raiment.

The motor coats are to be long and fairly loose, and reach almost, if not entirely, to the hem of the gown. The heavy fur coats will do duty when upon the road and especially a little later, and are indispensable for winter touring. The Pontine coats are also garments of utility, but the cloth coats are most conspicuous at this season, and the Velours, Pom Poms, Bolivias, Broadcloths, Tweeds, Burellas and Duvatyns in the handsomest of plain colors, will prevail with the best dressed motorists. In many of the coats the figure or waistline is outlined by the introduction of panels, shields, surplice crossings and bolero effects. White Worumbo wools in the most lovely of quality is one of the newest and best-liked ideas for smart motor coats for city wear. They make up in garments of decidedly chic appearance, and the best part of these wools is that they can be cleaned with the greatest satisfaction and look perfectly new after each cleaning.

Sleeve Styles Change.

There are decided reminiscences of the dolman effect to be seen on some of the most attractive wraps for motoring. Sleeves that start almost at the hem of the garment and ripple their way to the shoulder line are among the newest models, and the



Illustrating Latest Motoring Fashion: At Left, Motoring Coat of Wool, a Smart Model of Worumbo Polly in New Furlough Red. Center, A Squirrel Fur and Moon-glo Satin by J. C. Stratton Co. Right, Goldflex, a New and Durable, Warm, Light Material.

arm size is a perfectly huge opening in the majority of these designs. This makes the wrap one of perfect comfort, and especially when the sweater is worn underneath. Kimono sleeves, sling sleeves, cape sleeves, and dolman sleeves are some of the designations that bring to the mind's eye the class

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of arm coverings that are seen on advance models, as well as the regulation coat sleeve, which is always in good taste and in the mode.

Linings Are Artistic.

The linings of coats are so artistic and unusual that to see them is to long for them, and one motor woman expressed her delight to me in the following words: "The lining in my new motor coat is so beautiful that I really want to turn the coat inside out and wear the lining where it may be seen." The lining in question was a wonderful design in the Pussy Willow Silk of a most unusually realistic rose in its natural lovely shades of pink, against a dark blue background. These Pussy Willows, as well as the Zodiac Pussy Willows, and the Indestructible Crepe, are the favorite coat and fur linings for the season. The color combinations in these fabrics are as unusual as the designs and combined in striking and artistic blendings.

Rainproof Garments.

The motor wardrobe should contain at least one Raynster. These garments combine smartness and utility, and give ample protection from wind and rain. They come in Repps, Cashmeres, Tweeds, Fancy Mixtures, Honeycomb Weaves and many others.

There is more variety than usual this fall in the sweaters, and many attractive designs are shown. The pull-on sweater continues its popularity and especially adapts itself to the slender figure. The long, loose coat sweater, shaped much like a man's overcoat and supplied with numerous patch pockets, is a decidedly comfortable and practical garment. Angora and Shetland sweaters are particularly well liked, and there are also the silk, fibre and the silk or wool jersey.

Favor Turbans.

When it comes to headgear, the motor woman laughs the weather to scorn. The turbans which sit well over the head and hug the head closely are the most approved type of hat for motoring. A veil can be easily adjusted over this style of hat, and makes it so secure that the strongest winds cannot dislodge it. The turbans are very high-crowned this season and there is very little trimming. There are some lovely motor hats of the softest velour in charming colors in the mushroom style, and little shirred toques of velvet, fur, and the very fashionable Roshanara Crepe. Some of the motor hats take on a very military air and when this is not too obvious it is very smart. Smart motor hats are also made of bure and duvetyn, while there are very many felt hats; felt, however, is apt to be just a little heavy for motor wear, and velvet, while always attractive, possesses the same objection. Lightness of weight is one of the chief requisites in motoring millinery.

No Change in Veil Styles.

Veils have not changed much from those exploited for the summer wear. The chief requisite for motoring—and especially for touring—is a thick, heavy veil, that will keep out the dust and protect the face from the biting winds. The veils of chiffon cloth are always to be recommended for utility. The Po-Lo and the Koo-Koo are two stunning new veils which come in a vast number of lovely colorings.

Gauntlet Gloves Popular.

Gloves of buckskin, mocha and capeskin come for the motor woman, and are equipped with long gauntlets, in some cases extending nearly to the elbow. Some of the best gloves brought to my notice are the Kaptain Kid, Pirate, Sportif, and Air Pilot, all gloves made of the finest quality and many equipped with double weight knit lining which may be taken out and washed. The Kaptain Kid, shown herewith, comes in tan and gray, with or without the knit lining and is a splendid glove, being very smart and attractive on the hand and also most comfortable and very durable.

Shoes Now Lined.

The shoemaker also recognizes the requirements of the motor-lover. High-laced boots for motor



Illustrating Latest Motoring Fashions: At Left, the Palmer Model in Green Velour with Trimmings of Mole. Center, The La Jerz Blue Militaire Frock Ornamented in Chinese Embroidery. Right, Gray Blue Burella Cloth Trimmed in Military Style.

wear come with linings of fleece-down, fine cotton, flannel and silk flannel. The regulation motor boot, with its fur lining, which is a really splendid accessory to the motor wardrobe, is high in popularity. These boots, however, are intended to be slipped on over the kid shoe or slipper, while the new lined boot, mentioned above, fits directly to the foot, affording much warmth and comfort.

The very newest is the Pettibockers. They are really a bloomer made of the Vanity Fair silk, with which nearly all motor women are familiar. The Pettibockers are considerably fuller than the average bloomer, which really gives them the appearance of a skirt. At the bottom they are equipped with a wide frill and underneath the frill is a rubber band which makes them close around the ankle, thus offering protection from cold and wind. They may be had in nearly all the standard colors as well as pink and white. They have been designed wholly for the use of the motorist. The Vanity Fair silk garments wear wonderfully and are always delightful to wear. They may be laundered very easily and present an appearance exactly like new after repeated washings.

Breakage of bulbs is frequently caused by vibration. The filament is more or less susceptible to shocks, particularly when cold, and unless the lamps be braced they are likely to communicate the shock to the bulbs. Any blacksmith can make and fit a brace and the job will not be expensive.

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HEADLIGHTS LAWS DISAGREE.

Lack of Uniformity Emphasizes the Need of a National, Universal Law.

The subject of headlight regulation; that is, the elimination of glare, is of interest to the motorists throughout the country. In their endeavor to formulate laws to prevent blinding of an approaching driver or pedestrian by the brilliant light, the legislators have enacted laws which make it practically impossible for any automobile manufacturer to comply with them; that is, without utilizing devices invented and marketed to prevent glaring.

The manufacturers recently requested the National Automobile Chamber of Commerce to digest the regulations relating to headlights in force or those to become effective on January 1 so that they could use equipment meeting all requirements.

An analysis of the laws compiled by the National Automobile Chamber of Commerce, and which is presented herewith, shows a marked need of having enacted a national law that will not only replace the conflicting State laws but will be universal. In analyzing the laws it will be noted that a number of States have adopted the suggestion of the S. A. E. and stipulate that the beam of the reflected light from the headlights shall not rise over 42 inches above the level of the surface of the road on which the car stands, unless the lamps are equipped with lenses or other non-glaring devices. Others require a dimming device.

The distances the light shall be visible ahead and at 42 inches from the surface of the road also vary. There is also a difference of opinion as to what constitutes the proper use of the spot light. These differences are given in the digest herewith.

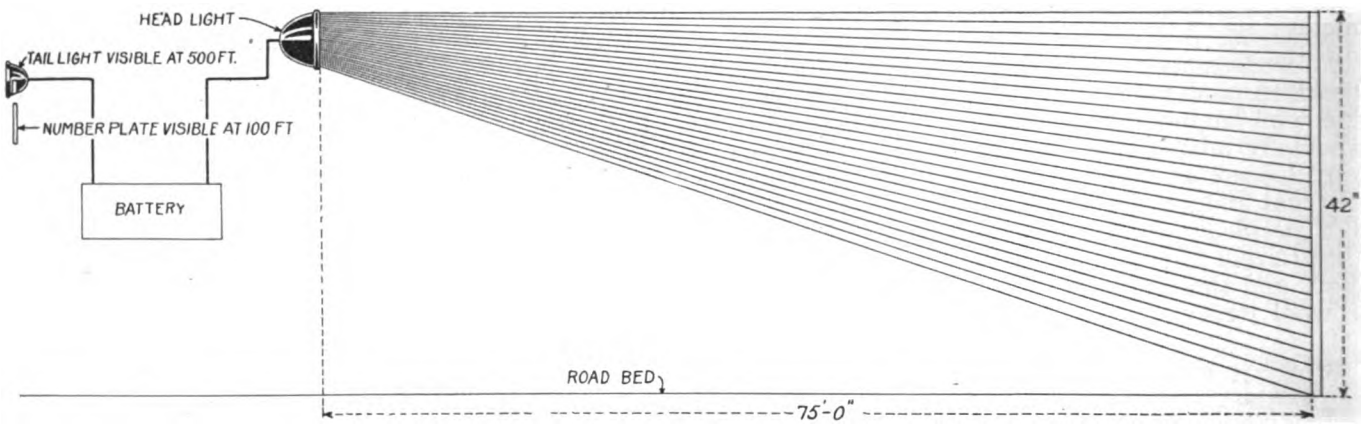


Diagram Illustrating the Regulation of Beams of Headlights in the Majority of States. The Sketch Suggests a Method of Testing the Lamps.

Front Lights.

Number—One or more—In Michigan, Nebraska, Virginia, West Virginia, Wisconsin, Wyoming.

Two or more—In Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Delaware, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Montana, Mississippi, Missouri, Nevada, New Hampshire, New Mexico, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Washington, Wisconsin.

Color.

White—In Arizona, Arkansas, Delaware, Colorado, District of Columbia, Georgia, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Montana, Mississippi, Nebraska, Nevada, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wyoming, Wisconsin.

White, amber or yellow—California, Denver (Colorado).

Not specified—In other States.

Position.

One on either side—In District of Columbia, North Dakota, Montana, Washington.

Visibility.

Reasonable distance in direction toward which vehicle is proceeding—In Arizona, Georgia, Nebraska, Nevada, Wisconsin.

Visible at least 100 feet—In Virginia.

Visible at least 200 feet—In Arkansas, Connecticut, Delaware, District of Columbia, Florida, Idaho, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Montana, New Hampshire, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Washington.

Visible at least 250 feet—New Jersey, Utah.

Visible at least 300 feet—Denver (Colorado), Kansas.

Visible at least 500 feet—California, Iowa, Missouri, Texas, Wyoming.

Illumination.

Sufficient to reveal any person, vehicle or substantial object on the road 150 feet ahead—In California, Connecticut, Denver (Colorado), Indiana, Massachusetts, Missouri, Utah.

200 feet ahead—In Louisiana.

250 feet ahead—In New York.

10 feet to side of road 10 feet ahead of lamps—In California, Connecticut, Massachusetts, New York, Utah.

Candlepower.

Gas lights must not exceed 21 candlepower—In Delaware.

Electric lights must not exceed 24 candlepower—In Delaware.

Any light must not exceed 30 candlepower—In Maryland.

Not exceed 36 candlepower—In Missouri.

Beam of Light.

Parallel, focalized rays, from lamp of more than 4 candlepower, gathered and projected by a reflec-

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tor, lens or other device, must not rise more than 42 inches above level surface of road on which vehicle stands, under all conditions of load, at a distance of 75 feet or more ahead of lamps—In California, Connecticut, Denver (Colorado), Iowa, Maine, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Utah, Vermont, Washington.

50 feet ahead—In Massachusetts.

4 feet above level of road—In Florida, Texas.

Dimming Devices.

Headlights must be dimmed or shaded, or rays diffused to prevent glare, by some coating or other device—In Delaware, Florida, Chicago (Illinois), Indiana, Kansas, Maine, Michigan, Missouri, Nevada, New Hampshire, New Jersey, Ohio, Oregon, South Dakota, Texas, Wyoming.

Dimming Device Controlled.—Dimming devices must be capable of being operated at will of driver—In Illinois and Michigan.

Must not be capable of being operated from driver's seat if lamp can project direct rays more than 4½ feet above road—In New Jersey.

Devices Approved.—Headlights, dimming devices, lenses, etc., must be approved—In New Jersey and New Hampshire by Commissioner of Motor Vehicles; in Chicago by Board of Motor Vehicle Light Inspection; in District of Columbia by Commissioners of District.

Regulations Delegated.—Headlight regulations must or may be promulgated—In Maine by Public Utilities Commission; in Rhode Island by State Board of Public Roads.

Inspection Tag.—Manufacturer, distributor or wholesaler of automobiles may affix a tag upon lighting equipment showing same has been inspected and approved—In Chicago.

Spot Light or Searchlight.

Position.—Must be mounted on left side—In Delaware.

Deflection of Beam.—Must be deflected so beam will not rise more than 42 inches above road—In California, Denver (Colorado), Connecticut, Iowa, New York, North Carolina, North Dakota, Ohio, Oregon, Utah, Vermont, Washington.

More than 4 feet above road—In Florida, Texas.

Dimmers.—Must be equipped with dimming device—In District of Columbia, Indiana, Kansas, Michigan, Nevada, New Hampshire, South Dakota, Wyoming.

Use of Spot Light.—Must not be used as permanent headlight or for driving—In Delaware, Maine, New Jersey.

Light must not be thrown in face of approaching driver—In Connecticut, Iowa, Kansas, Maine, Michigan, Nevada, New Hampshire, Ohio, Vermont, Washington.

Must be used only in emergency and for rounding turns—In Wyoming.

Only for reading signs and house numbers—In New Jersey.

Only in emergency in cities and towns—In Missouri.

Only in accidents, reading signs and numbers and examining edge of road—In Delaware.

Only when car is stationary, in reverse or at slow speed—In Maine.

Must be directed down—In Missouri.

Must be projected directly upon road not exceeding 10 feet ahead of car—In Delaware.

Not exceeding 30 feet—In Nebraska, North Dakota, Utah.

Not exceeding 50 feet—In Indiana, Ohio.

Not exceeding 30 feet when approaching other vehicles—In Connecticut, Vermont.

Not exceeding 60 feet when approaching other vehicles—In Ohio.

Sale Prohibited.—Must not sell, offer for sale or have in possession with intent to sell, any vehicle equipped with lighting device of over 4 candlepower with reflector, unless same complies with special lighting law—In Denver, Chicago, Washington (State).

Rear Lights.

Number.—One—In all States.

Position.—Left side—In District of Columbia (not specified in others).

Color.—Red—In most States (not specified in some).

Visibility.—Red light must be visible from rear not less than 200 feet—In Rhode Island.

Not less than 300 feet—In Colorado.

Not less than 500 feet—In California, Missouri, Texas.

Visibity of Number (on license plate).—Not less than 50 feet—In Alabama, California, Iowa, North Carolina, New Hampshire, New Jersey, New York, Vermont, Wyoming.

Not less than 60 feet—In Connecticut, Rhode Island, Washington.

Not less than 100 feet—In Idaho, Indiana, Montana, Nebraska.

Not less than 150 feet—In Illinois.

Independent.—Must be independent of other lights and capable of being lighted or extinguished only when vehicle is stationary—In Indiana.

New Plan to Foil Thieves.

It is not unlikely that the automobile thief of the future will arm himself with a large magnifying glass instead of the pliers and jimmy, for a new method of catching the purloiner of motor cars has been tried out and proven a success. It consists of each owner placing private identification marks on the different components of the machine. If the car be stolen and even broken up and the parts scattered, it is possible for the owner to aid the authorities in identifying the parts by means of the private marks. This results in the detection of the thief. The system worked out nicely in Detroit, where a Ford car was traced through a number of hands to the junk pile by means of marks known to the owner only. A conviction was easily secured of the guilty parties. So if one sees a party examining a radiator, magneto, carburetor or other component of a car with a magnifying glass, says Automobile Topics, it may be assumed that the vehicle is protected by identification marks.

New Massachusetts Registration Marks.

Massachusetts has established new registration figures which reflects the prosperous condition of the country and the increasing demand for automobiles. The number of vehicles registered in July and August was seven times greater than the increase for the first half of 1917 showed over all of 1916. The figures show that the increase in the two months mentioned was 15,451 passenger cars and 2,051 commercial vehicles. Up to September 1 there were 136,238 vehicles registered.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK OCTOBER, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

LARGE INCREASE IN ACCIDENTS.

The Police Department of New York has kept a careful record of the street car and automobile accidents in the city for the past year, as it always does. It appears that in the month of August, 1916, 559 people in this city were struck by automobiles. In the month of August, 1917, 716 people were struck by automobiles. During the same period in 1916 171 people were struck by motor trucks, and in August, 1917, 236 people were struck by motor trucks.

The above shows a large increase in accidents by motor vehicles. This may be in some degree accounted for by the increased use of automobiles and trucks, and, to some extent, of course, by the more or less reckless acts of the pedestrians themselves. Familiarity with motor vehicles, of course, naturally induces less exercise of care than ordinarily is shown. People take more chances than they used to, with the result that a great number of them are injured. Drivers themselves exercise less care than they used to, probably. They push ahead, sometimes, in crowded streets, where they ought not to, taking it for granted that the pedestrian will skip out of the way—but he doesn't always do it.

In an automobile trip through the White Mountains this summer, over the excellent but crooked New Hampshire roads, the writer could not fail to note the numerous instances of more or less reckless, or at least careless, driving. Curves are numerous on this route, and the driver of the car in which the writer rode never failed to sound his horn on approaching a curve, but in not a single instance during this trip was this precaution taken by cars which were met; and some of them were guilty of cutting corners, with the result of several close shaves, during a ride of several hours.

THE NEW LIBERTY LOAN.

We wish to make a personal appeal to every reader of this magazine with reference to the second Liberty Loan.

Subscriptions for this new loan will close October 27 and we hope that any of our subscribers, who have not already purchased a Liberty Bond, will surely do so before the closing date.

These bonds bear interest at the rate of four per cent. per annum, and they are also convertible into any later issue which may be brought out by the Government during the present war, at a higher rate of interest, thus making an ideal investment for your savings.

It is the patriotic duty of every loyal American citizen, without regard to his political opinions, to "Do his bit" by taking as large a block of these bonds as his financial circumstances will permit. Enormous expenses will be involved in the prosecution of the great war. Remember that the nation's need is your opportunity. If you cannot fight, your money can. You can buy a Liberty Bond from any bank, trust company or reputable brokerage house in the United States. Banks have made arrangements by which these bonds can be purchased on the easiest possible terms, even to the extent of only paying $1.00 down.

There are only a few days more in which to fulfill your patriotic duty in this matter. Buy a Liberty Bond!

MOTOR TRUCKS AND DEALERS.

Despite the fact that an enlargement of capacity of nearly 800,000 freight cars has been added without purchasing new equipment, the freight car shortage still continues. This has been largely due to the withdrawing of cars and equipment for government use in moving supplies for the army camps and to the seaboard for shipment abroad. That the transportation problem is becoming more complex is admitted by those who have made a careful study of conditions. The only relief available is the motor truck or commercial car for haulage in short as well as long distances. The commercial car industry has anticipated the present conditions and is well prepared for the emergency. It is now up to the dealer to study local transportation conditions and to show the manufacturer and merchant how trucks can be profitably and economically operated. The present and future affords the established dealer a great opportunity. Those contemplating the taking over of an agency for commercial cars cannot choose a more appropriate time.

OVERHAULING THE CAR FOR WINTER.

This is the season of the year when the thoughtful motorist will consider the preparing of his car for fall and winter service. After continuous service the average machine will require more or less attention to place it in first-class condition. The work may not involve other than the removal of carbon, the grinding in of the valves and minor adjustments. On the other hand, the overhaul may be very thor-

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ough. General instructions for accomplishing the work are given in this issue and include suggestions for the new owner. Those desiring detailed advice as to how best accomplish the work, the adjustment or overhaul of any particular component, should address the editor of the technical department. Any and all questions will be answered promptly.

AUTOMOBILES AND THE NEW TAX BILL.

Most of our readers undoubtedly have been waiting to see what Congress would do in the way of levying a tax upon automobiles.

The new War Tax Bill as it came from the hands of the Conference Committee places a tax of three per cent. upon all automobiles, automobile trucks, automobile wagons and motorcycles. Manufacturers of motor vehicles are permitted to deduct an amount equivalent to five per cent. of the amount paid for the tires, including inner tubes.

Practically all automobiles, if this measure becomes a law, will hereafter cost $30 on every thousand dollars in excess of what they cost before, because the car manufacturer must either pass along the exact amount of the tax to the purchaser or raise the price to a point which will cover the tax.

The increase in the cost of material has already made it necessary for some manufacturers to raise prices, and others doubtless in due time will follow suit. So that whether the manufacturer demands the exact amount of the tax or not, he will get it in his new schedule of prices.

WINTER EQUIPMENT.

October opens the fall and winter season and there is every reason to believe that the dealer, garageman and repairman stocking suitable equipment and supplies will enjoy unusually good business. The selection of the stock requires careful consideration as well as a study of the requirements of the prospective customers. There are always certain standard supplies and equipment which are always in demand and salable, but the progressive dealer will study the merits of the new devices brought out and thus anticipate the wants of his customers. Advance information of those articles which make for comfort and convenience as well as economy in motoring, is contained in this number and should be well studied by the dealer, repairman and garageman.

CREDIT WHERE CREDIT IS DUE.

A concern which does a large and successful mail order business—all done by advertising—has been trying to figure out the percentage of results from advertisements in different publications. An elaborate series of experiments has demonstrated that it is possible to trace less than fifty per cent. of sales made to any given medium. This concern has adopted the plan of multiplying all traceable inquiries by two, as giving to each publication the fairest credit for results obtained.

NON-GLARING LIGHT DEVICES.

The attempt of the legislators of the various States to safeguard the users of the highways by enacting laws to control the use of headlights and spotlights on motor vehicles has resulted in a conglomeration of laws which work a decided hardship to the car manufacturer, to say nothing about the owner. What is legal in one State is illegal in another. Devices recognized in one State are taboo in another. Under these conditions it is impossible for the automobile manufacturer to produce or equip his product with a non-glaring device that will conform to the laws of every State. The case illustrates and forcibly too the need of government regulation, of the enactment of a universal law or laws.

TROUBLE DEPARTMENT.

Owing to an unusual number of letters from readers desiring information as to the care, maintenance and repair of their machines, a number of replies have been held over until the November issue. Relative to the Trouble Department, we suggest that readers wishing an answer by mail so state in their letters. When this is done a reply will be made on the same day the letter is received. Once again we would request that when information is desired as to a certain component of the car, a magneto or generator, for example, that the make, model and year be given.

WASTING THE FUEL SUPPLY.

Economy of gasoline does not mean restricting the intelligent use of motor vehicles, but rather the stopping of the various leaks. If the fuel wasted through leaking and flooding carburetors, by passing out unburned in the exhaust, or by use of too rich a mixture, and by operating the engine when the car is idle, could be measured the figures would be amazing. There is no doubt but what millions of gallons of gasoline are wasted in the manner above described. Let us all begin to practice as well as preach fuel economy.

A NEW FEATURE.

A new feature presented to our readers in this issue is an article on motoring apparel for the woman who motors. It is compiled by a well-known writer, is well illustrated, and gives advance information as to what is to be worn this winter. We will appreciate an expression from our readers as to the desirability of making these articles a permanent feature.

INSPECT YOUR INSURANCE POLICIES.

A correspondent of The New York Times sounds a note of warning to all who are carrying automobile theft insurance. He says if a car is stolen by a chauffeur, or other employe, no insurance can be collected. Very few car owners are aware, probably, that their policies contain an exemption clause of this character.

Makes Driving Safe.

Two measures for making driving safe have been adopted by Hull, Mass., which is nearby to Nantasket Beach. At one point where there is a dangerous right angle turn with a telephone pole that has caused many accidents the authorities have painted the pole white from top to bottom. At another point where the traffic officer was not always easily seen because of being placed in a shadow, there has been placed a searchlight for signalling.

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CUSTOM MADE BODIES.

Why the Made to Order Enclosed Body is Increasing in Favor.

DESIGNED BY R. G. WILLIAMS.

Despite the fact that the manufacturer of the stock body offers many beautiful designs with richly upholstered interiors, there is an increasing demand for the custom made body. The custom made body is favored by those whose pocketbooks permit for the reason the designer can incorporate in it the personal ideas of the customer. It is not an easy matter to please the particular discriminating motorist, particularly when it comes to the arrangement of the height and depth of the seats, etc. Then again there is the back cushion to be considered and its fit to the customer is an important factor.

Details of Design.

Probably the most popular type of body is the town or enclosed design which is offered in many types. One of the difficulties in designing a body of this character is the treatment of the driver's seat and its entrance. The tendency is to set the driver distinctly apart from the passengers, yet at the same time the flowing lines of the entire design, from radiator to the rear spring, should not be broken to any great extent. The solving of the driver's seat is not an easy one and very frequently the result of the designer's work is, at the best, a compromise.

Comfort is Considered.

Considerable more attention is being paid toward providing the driver with comfort, and the latest practice is to line the under side of the carpet in driver's compartment with asbestos so as to exclude the heat in mild weather. The tendency toward protecting the driver from the weather is also more noticeable than formerly.

Weight Is Undesirable.

The enclosed body designer is making noticeable progress toward a lighter construction, and the old, heavy type of limousine which is death to tires is no longer favored. Fuel economy is desired even by those of means.

The enclosed design shown on the opposite page is of the limousine type, and has several advantages over the stock construction. The design is for attachment to a 1917 Studebaker six-cylinder chassis which has a wheelbase of 122 inches. One of the advantages of the design is that the front and rear fenders and hood do not have to be altered to conform to the flowing lines.

Construction Is Cheaper.

The body is considerably lighter than the stock design of similar type and the framing construction is cheaper. Inasmuch as it is what is termed a straight side body the framing can be mortised and formed together in much faster time than the construction including the curved sides. While the roof is practically flat the straight line effect is relieved by the graceful curves at the sides, front and rear, the last named being particularly attractive and pleasing to the eye. The elimination of bending roof bows should make this design an economical one to produce.

Seating Arrangements.

The seating arrangement has been carefully worked out and provides comfort with plenty of room for the passengers. There is ample space between the back of the front seat and the front of the rear seat, and even the use of the auxiliary seats does not inconvenience the occupants of the rear seats as is evident from the dimensions given.

Ed. Note:—Complete details including working draft can be obtained by addressing R. G. Williams, care the editor of the Automobile Dealer and Repairer.

Autos Increasing in Hawaii.

So rapid has been the development of the automobile service in the Hawaiian Islands, with the addition of many new machines upon each island, that two large reinforced concrete garages and display rooms are being built in Honolulu. One is for the Von Ham-Young Co., and will cost about $52,000. This building will be 290 feet long, and will form practically the keystone of what is now known as "Automobile Row." Another extensive garage is being erected and will form practically the keystone of what is now known as Garage Co.

There are now registered in Honolulu (which includes the island of Oahu) 3,540 automobiles and 500 motorcycles. In Hilo, and including the island of Hawaii, there are 1,500 registered automobiles and 22 motorcycles. At Wailuku and throughout the island of Maui there are 700 registered automobiles and 20 motorcycles. On the island of Kauai are 600 registered automobiles and 30 registered motorcycles.

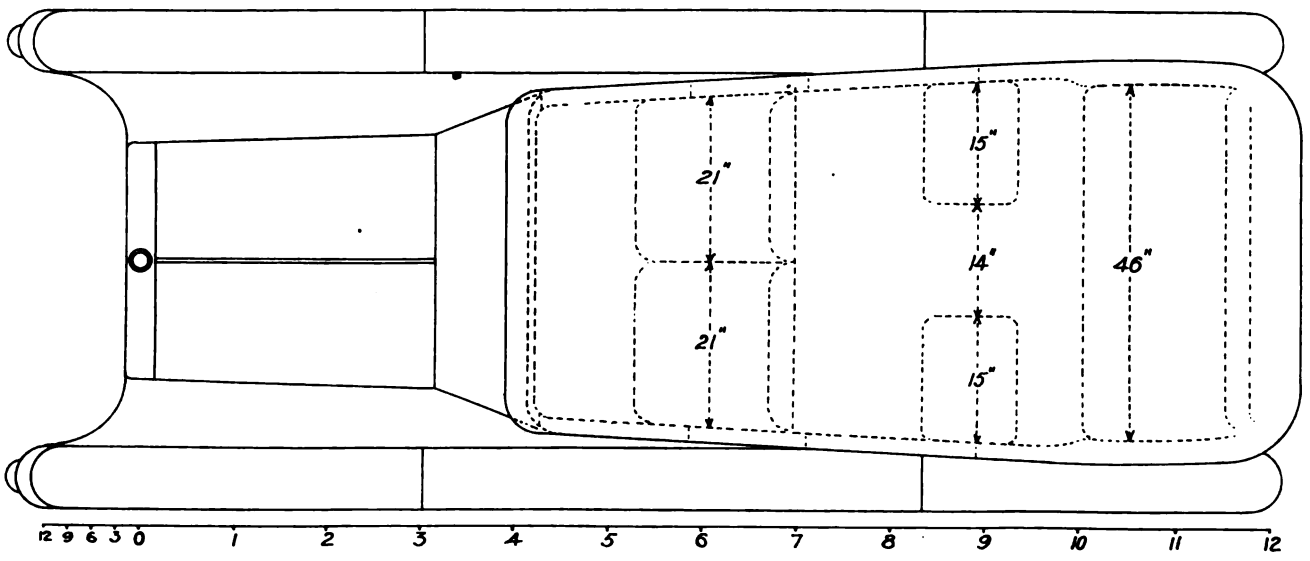
In Honolulu a corps of traffic policemen is maintained, embracing many of the former patrolmen, who have been transferred to the traffic squad. These are stationed at the intersections of streets in the business section from 8 a. m. to 6 p. m. There is also a motorcycle squad whose duties are to regulate traffic in the outer sections, and which has been instrumental in running down auto thieves. In Hilo there are no traffic police, but because the city has no street car tracks the highway intersections are provided with "silent policemen" or ornamental posts surmounted by electric globes, and motor cars always keep to the right of them.

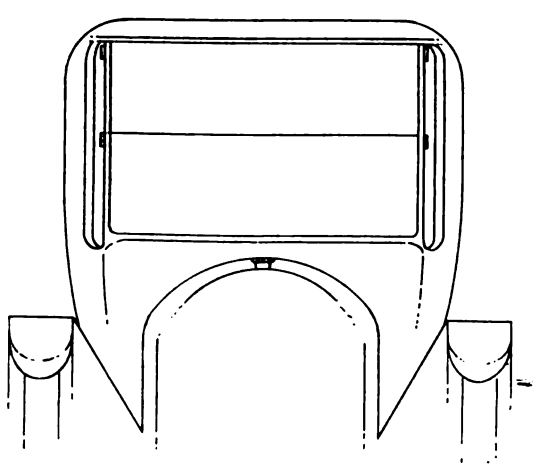
The Territory of Hawaii has 850 miles of main public roads suitable for auto travel. The mileage was recently ascertained during a tour throughout the islands by a pilot car party which studied the roads and places of interest to visit on a ten weeks' tour. Scarcely an island hamlet or a fishing village in Hawaii is so small or remote that it is not accessible to autos.

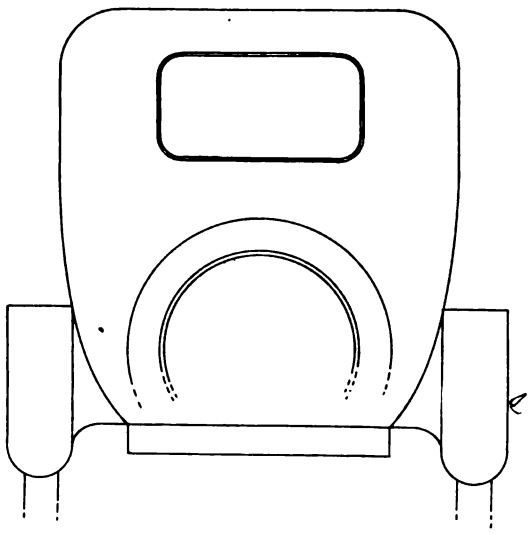
Service stations are found throughout the territory, and there is not a small steamship landing or a village where an auto for hire cannot be found or obtained in a short time by a telephone call. The price also is so low as to astonish strangers. The territory has been inoculated with the "good roads" virus, and there are now in course of construction or to be constructed on the islands roads for which sums aggregating $2,500,000 have been appropriated during this year.

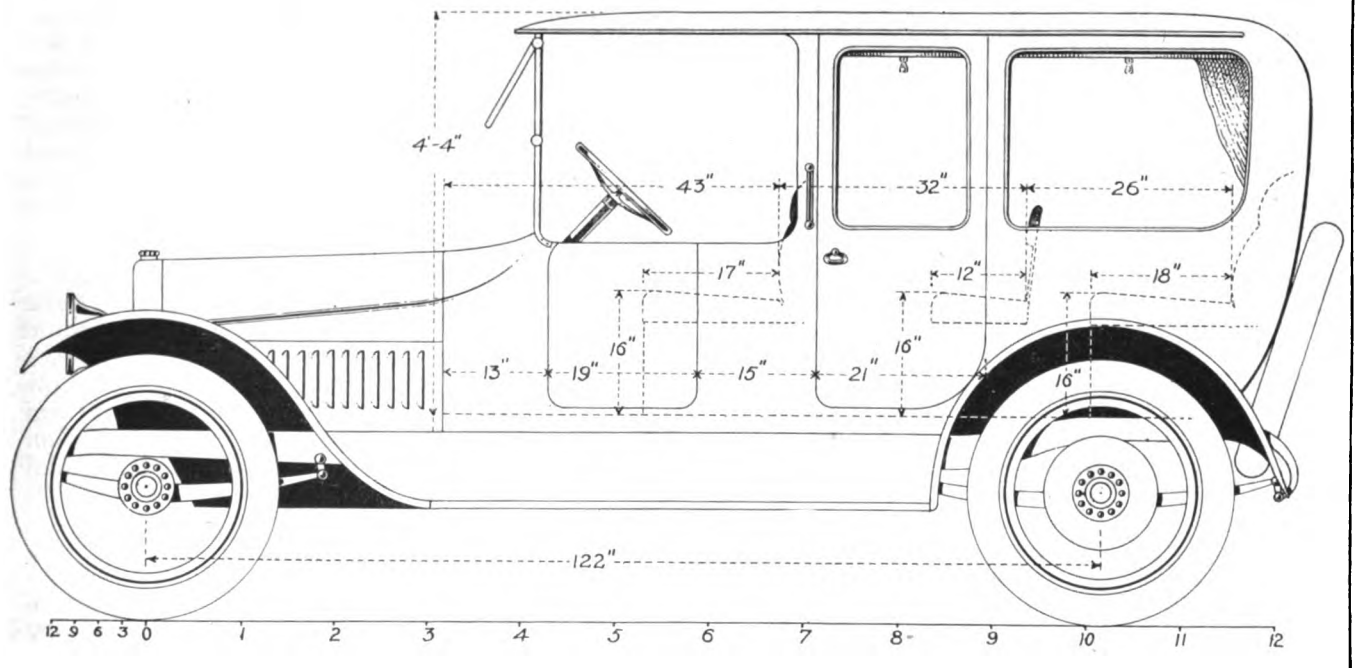
In installing new water pipes, rubber hose, do not tighten excessively at first. This will not stop any minute leak except temporarily and the rubber walls of the hose are apt to become broken. Tighten gradually and the leak will be cured.

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Illustrating and Giving Dimensions of Limousine Type of Town Car Body Mounted on 1917 Six-Cylinder Studebaker Chassis.

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This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

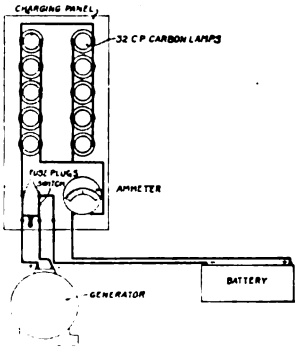
Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2220 Charging Storage Battery.

From L. R. Hall, Michigan.—Can I charge a battery with a direct current generator, 32 volts, 11 to 35 amperes, and would you wire it up the same as shown in the drawing in the last issue? If not, please supply a drawing showing how to wire it.

Reply. — In charging storage batteries with a direct current there are several matters to be carefully considered. One should be careful to connect according to polarity, also to charge according to the directions of the maker of the battery. The chief point to be considered is the reducing of the charging current or rate to that required by the battery. This is accomplished under the conditions you refer to by placing resistance in the circuit. This resistance regulates the amperage of the current allowed to flow through the battery. It should be borne in mind that the internal resistance of a battery is very low and if it were coupled directly into a circuit without the interposition of additional resistance an excessive amount of current would flow through the battery and injure the plates. By using a bank of carbon lamps as shown herewith you can create the desired resistance. Standard carbon lamps of the voltage of the circuit are used. The resistance of a 32-candlepower carbon lamp on a 110-volt circuit is such that about one ampere of current will flow. Two 16-candlepower lamps may be used instead. It should be borne in mind that when the voltage is doubled the amperage is cut in half, therefore a 32-candlepower carbon lamp on a 220-volt circuit will pass but half an ampere. By varying the number of lamps in the bank the charging rate may be increased or decreased as desired and required by the battery maker. These facts should be understood before attempting the work. While battery charging is possible under the conditions named we believe that it will be more satisfactory to have the battery charged by an expert, particularly if the plates be sulphated and require special charging. Charging by the method suggested requires care, to say nothing of the work and expense involved in preparation for the work.



Utilizing Bank of Lamps for Resistance in Charging Storage Batteries.

2221 Several Questions.

From A. L. Scott, New York.—1—When does the patent on the sleeve valve engine expire? 2—After the expiration of the patent would the expense of manufacturing the engine be so great as to prevent it from being universally adopted? 3—How much more internal friction has a sleeve valve motor than an ordinary poppet valve engine?

Reply.—1—This information can be obtained at the United States Patent Office. 2—No. 3—The friction is that of the sleeves.

2222 Another Case of Oil Trouble.

From Henry Lobeck, Missouri.—I have a 1916 Maxwell. The spark plugs, particularly the one in the third cylinder, fouls easily. It seems to be the oil working up. I am obliged to clean the plugs every 10 miles at times. I was told to put in patent piston rings and had it done but it did not cure the trouble. I was also told that it would take 100 miles running before the new rings would work to a fit. Have run the car 1,000 miles since putting in the rings but the plugs still foul. Can you tell me how to remedy it? Too much oil is the cause but I do not notice any improvement when the oil supply is low. And is there not danger in running with too little oil?

Reply.—If the new rings were properly fitted and have been run in, they should eliminate the trouble provided, however, that the cylinder is not scored or worn. Under the conditions mentioned we would suggest that you have an expert examine the cylinder at fault and it is very likely he will discover that the cylinder is out or that the rings were not properly fitted. The use of a heavier oil will help but a change in lubricant should not be made without consulting the agent or maker of the car. There is danger in operating with an insufficient supply of oil. Follow the instructions and keep the oil level as recommended.

2223 Is Losing Power.

From Lamar Van Syckel, New Jersey.—I have a 1917 Dodge Sedan car, bought the first of May; been run 1800 miles, at first without any trouble; could get it down to three miles per hour on high, in fact so low would not register; but of late, when below seven miles jerks. At the garage today they told me that two of the cylinders had no compression in them, on account of carbon being in them, and that I had to have them ground. I was also told it was on account of two of the spark plugs being defective; someone else told me that. I put in two new ones, and cleaned the other two, but with the results stated above. Can you advise me what the trouble is and how it can be remedied? I think they often tell you in the garage that it is carbon when it is not. When I removed the spark plugs I found

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very little carbon. If I do not have the carbon removed and valves ground, would it do any harm to my car, or ruin the valves? I wish you would give me this information at once, thanking you in advance for same.

Reply.—The cause of your being unable to operate the car at low speeds, to throttle the engine down, can be due to mixture or to failure of the valves to seat properly or a combination of these troubles. It is a simple matter to determine whether or not the valves are seating by cranking the car by hand and noting the resistance. Of course, the better method would be to use a pressure gauge. If you find the compression poor it is advisable to have the valves reground as it is poor economy to run the car in this condition for any great length of time. The valves will not be ruined by operating the engine but it may result in a more expensive repair bill in that it may be necessary to reface the valves and their seats. To have the valves ground does not necessarily mean a large bill of expense.

2224 **Engine Overheats.**

From Henry Trolio, Mississippi.—Am driving a 1916 Velie model 22 and would like a little information on the following, if possible: With the engine idling it makes a noise as if the oil in the crank case was at a hard boil. With car running 25 or more miles per hour makes a knocking noise as if a loose bearing. With car running between 30 and 40 miles per hour for four or five miles, the water in radiator boils. Oil leaks past piston rings and out around the spark plugs. Using Mobiloil A Oil. Cylinders are not scored. What I have done to remedy the above without any success: Cleaned out carbon, ground valves, adjusted pushrods, tightened up all connecting rod and crank shaft bearings, put in new "Inland" piston rings, new set of timing gears, new connecting rod wrist pins, new inlet and outlet hose on radiator. And also a Hoosier Sub-carburetor, which I thought would help to keep the engine cool. Car has automatic spark control. Car has been run about 1,000 miles since new piston rings were put in. Spark control and carburetor are adjusted right. What is the probable cause of the noise, and what makes the water boil? Regarding the oil leaking, is Mobiloil A Oil a heavy enough oil for this motor? Could a slight play (¼ of an inch, about) back and forward of the crank shaft be the cause of the noise? My repair man says it shouldn't, as all motors are supposed to have this much play in the shaft. The play is not up and down, but from end to end. Any information will be appreciated.

Reply.—The noise referred to may be due to the compression escaping from the crankcase or to the air intake of the carburetor. It is difficult to state without inspecting the engine what is the exact cause. The fact that oil leaks past the rings would indicate crankcase compression. The knocking may be due to a number of causes, but if the bearings and other components of the engine are in good operating condition, the trouble is either due to incorrect timing of the spark or to an alteration of the timing of the engine. You state new timing gears were installed. The fact that the water boils indicates timing trouble as well as ignition and possibly mixture and circulation trouble. You should use the kind and grade recommended by the maker. The play in the crankshaft is too great as stated by the repairman. We would suggest that you check up the valve and ignition timing and look over the circulating system.

2225 **Wants Wiring Plan.**

From George Cottingham, Pennsylvania.—Please supply me with a wiring diagram of the 1914 Paige car. The system is a Gray & Davis. I have trouble with my lights going out when the car is running. I also have a magneto on the car.

Reply.—We have no record of the diagram mentioned. It can be obtained from the maker of the car or the manufacturer of the system, Gray & Davis, Inc., Boston, Mass. It would appear that you have some form of a short circuit. The manufacturer of the system supplies a very comprehensive instruction book which should be of service in locating the trouble.

2226 **Carburetor Hard to Adjust.**

From J. B. Keeron, Michigan.—I have a model 56 Overland which starts hard. I have to pump on the accelerator to keep the engine going and until it warms up. If I set the carburetor so that it starts easy, then the mixture is too rich for running. The carburetor is a model L Schebler. I have attached an extra heating pipe, taking heat from the exhaust to the bottom of the carburetor. I also have an extra thimble on the manifold just above the carburetor as a fuel saver. Is there anything I can do to remedy the trouble? The car has been run but 1,000 miles. Engine was overhauled last winter. Car will run fine then suddenly the engine will miss. It will pick up and run all right. If it does not it will stop. Do you think a new carburetor would remedy the trouble?

Reply.—The trouble mentioned is not uncommon. A mixture obtaining satisfactory results when the engine is warmed up and at operating speeds can be slightly thin or weak for starting speeds. Because of the difficulty experienced in vaporizing the fuel, carburetor manufacturers make use of a strangling valve or choker which enriches the mixture for starting. The valve either cuts down the supply of air or increases the amount of fuel. You might install a form of butterfly valve in the heating pipe and close to the carburetor. By closing the valve you would obtain a richer mixture than formerly. The fitting of such a valve should not be difficult. The carburetor mentioned is not an easy one to adjust; that is, to obtain a satisfactory starting mixture and one at higher and operating speeds.

2227 **Has Puzzling Knock.**

From C. T. Peirce, Virginia.—I have a 1916 Ford that I have been using since August, 1916. It gave me no trouble until June of this year. Since that time it has developed a knock, but only when I advance my spark. Sometimes it is very much worse than other times. I have had an experienced workman to take my engine out and go over every bearing, adjusting them perfectly; also put new wrist-pins in. I inspected the work before closing the engine; everything fits perfectly, as far as we can learn; but still the knock is as bad as ever. My timer rod is not bent just as it has always been. When I retard entirely up, the motor runs perfectly, without a knock, but of course don't develop any power, and heats up. I have been using a Ford for

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about six years, and thought I knew something about them, but this has me stumped. I hope I have made this clear enough for you to help me.

Reply.—Your knock may be due to too early a spark or to mixture. The fact the knock ceases when the spark is retarded indicates too much advance is being utilized. If the timer is that which came with the car and the linkage has not been altered, you should be able to advance the spark as far now as formerly. Has the timing of the engine been changed in the overhaul; that is, have the position of the gears been changed? We would suggest that you check up the timing and make sure that no change has been made, also check the valve timing. As to the mixture, if it is homogeneous; that is, burns rapidly, flame propagation is more rapid. On the other hand, if you have been using a thin mixture, which burns slowly, you would be able to advance the spark much more than with a quick burning mixture.

2228 **It's the Same Old Story.**

From H. I. Woodward, Vermont.—I have a one-cylinder 2 cycle jump spark motor on a railroad track car, equipped with a Schebler carburetor and National magneto. Car is started by pushing it along. All the parts are strictly new and motor is in fine condition, but to start it is a day's job, and a run of at least half a mile. When motor is once started it goes on one cycle for perhaps a mile or two, and then runs fine as it warms up. It is quite evident that the mixture is not right, but on this particular carburetor there is no air adjustment that I can locate. It is primed through a pet cock on cylinder. There seems to be the best kind of a spark and gap on plug is not quite the thickness of a dime. I understand all marine engines are inclined to start hard, but this seems to be an exceptionally hard one. What can you advise me to do?

Reply.—The trouble experienced with your two-cycle motor is due to mixture and is a common fault with the two-cycle engine. If you will start it with a rich mixture and gradually cut it down as the engine warms up you should overcome your trouble. There should be an air valve on the carburetor. If not, increase the amount of fuel by opening the needle valve. Your trouble in starting will doubtless increase with cold weather, and it may take patience to start the engine on a cold day. If you are to operate the engine in cold weather it is advisable to run a pipe or flexible tubing from the air intake of the carburetor to the top or side of the cylinder or exhaust pipe. This heat will assist in vaporizing the fuel but will not help in starting.

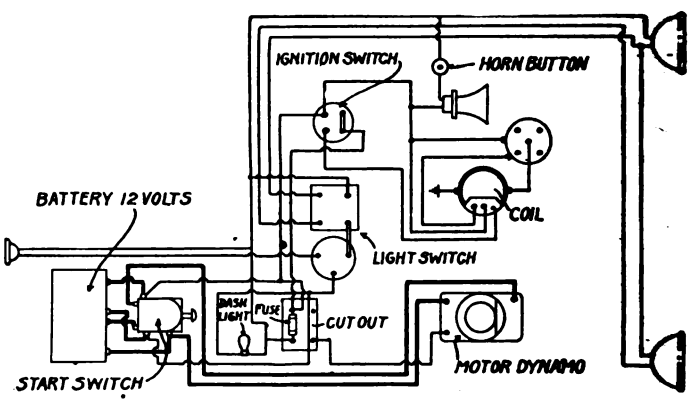
2229 **Some Gear Ratio Questions.**

From Harry H. Brown, Virginia.—Will you kindly advise me where I can purchase sheet asbestos suitable for lining the inside of the hood of my Buick car? On this car the exhaust pipe as it leaves the cylinders is very close to the hood and when the pipe gets hot it blisters the paint. If you can suggest a solution of this problem, please do so. Kindly advise me how the gear ratio of a car can be ascertained other than by counting the teeth in the differential gears. What is the gear ratio on the following cars: Buick C 36, D 55 and 1917 models Marmon and Mercer roadsters? Please advise if car manufacturers change the gear ratios on cars for different sections of the country, say for instance, a city as level as Washington, D. C., or one that is very hilly. If a car can travel at a rate of 38 to 40 miles per hour on the second on the level, how fast should it be in the high gear? This applies to a three-speed gearset. Does the use of ground cork in a gearbox do any harm?

Reply.—Asbestos suitable for the work can be obtained at any wholesale or large retail dealer in paper. Many automobile supply houses carry it in stock and of varying thicknesses. It is best for the purpose you mention. The gear ratio can be determined by methods other than by counting the teeth of the gears. It can be ascertained from the agent or manufacturer and by rotating the crankshaft one complete turn and noting the number of revolutions made by the driving wheel which should, of course, be jacked up. The last named method is not relaible, particularly if the car has seen considerable service as the wear of the gears, universal joints, etc., will prevent accurate measurements being made. The better way is to count the teeth or obtain the data from the maker of the car. The final gear ratios of the Buick C 36 and D 55 are 3½ to 1 and 3¾ to 1. The gear ratio of the Mercer roadster is 3 22/100 to 1, that of the Marmon is 3 69/100 to 1. Insofar as we know ratios are not arranged as you suggest. As to the speed of a car that travels so many miles per hour on the second, its speed on the high gear would depend upon the final ratio, etc. We do not advise the use of ground cork in the gearcase.

2230 **Due to Differential Action.**

From Henry F. Brunker, Michigan.—I have a 1915 four-cylinder Mitchell. In tearing out the wires I got into a nice mess. Will appreciate your sending me a wiring plan as I cannot get the starter to work. I had the rear wheels off to have the spokes reset and when I put them back I found one wheel would turn one way and the other in the opposite direction. I did not touch the differential. There seems to be a loose gear or something.



Wiring Diagram of Starting and Lighting System of 1914 Four-Cylinder Mitchell Car.

Reply.—The wiring plan of the car mentioned is shown herewith. If you experience any trouble in replacing the wires it is best to consult the expert of the service station of the maker of the lighting and starting system unless the car agent has a man who is thoroughly familiar with the system. Relative to the wheels rotating in opposite directions we assume you mean when both wheels are jacked

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free of the ground. If such be the case your wheels will act in this manner and it is due to the principle of the differential gears, not to a loose gear as you imagine.

2231 **Yoke Bushings Worn.**

From J. E. Elder, Georgia.—I have a 1916 model D 45 Buick, and there is a little looseness or play at ends of driving yoke, and I think new bushings are needed. I want you to instruct me just how to proceed to put in these bushings with the least trouble. If the yoke has to be taken off, tell me just how to go at it, and greatly oblige. I wouldn't do without the Automobile Dealer and Repairer for anything.

Reply.—To renew the bushings in the model referred to take out the pins on which the yoke swivels. The universal shaft slides out of joint. The yoke does not have to be removed. The bushings can be secured from the nearest agency, and in putting these in it may be possible that some reaming may have to be done to obtain the desired fit. This is not always necessary but is probable. The job is not a difficult one and you should be able to complete it successfully.

2232 **Bothered with Rusty Water.**

From S. M. Rankin, Pennsylvania.—I have a six-cylinder Apperson car and the water in the radiator and engine passages is rusty. It has been in this condition continuously. Changing the water only helps for a short time. What is the proper remedy?

Reply.—The continued deposits of rust is evidently due to the use of a water containing iron. The average city water has more or less mineral deposits and these are deposited in the cells of the radiator and water passages of the engine. Try cleaning the cooling system with a solution of common washing soda and water using as much soda as the water will dissolve. Follow this, after washing out with clean water, with a 25 per cent. solution of commercial hydrochloric acid. Wash thoroughly after using the acid. If one treatment fails to remove the rust, use the second. After removing the rust and scale use rain water in the radiator.

2233 **Wants to Rebore Cylinders.**

From H. C. Shafer, Kansas.—I have a 32 Hupp and am thinking of having the cylinders rebored and over sized pistons put in. Please tell me if it is advisable and practical.

Reply.—The reboring of the cylinders is practical and will require the use of oversize pistons and rings. The prices for the work vary according to locality. It is advisable if the cylinders are badly worn and, provided of course, that the condition of the other components of the car warrants the expenditure. This is a question best determined by the owner.

2234 **Vibratory Type Is Best.**

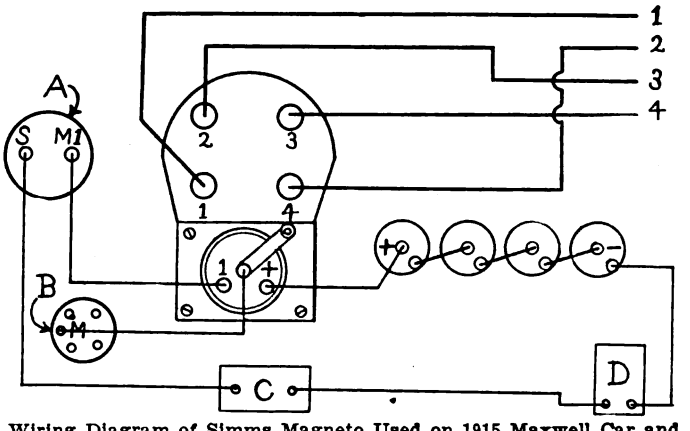
From George McKnight, West Virginia.—I wish to put in a battery charging outfit to handle at least two 12-volt batteries or their equivalent from 110 volt alternating current. Will appreciate your advising me as to the maker of such apparatus and whether you would suggest a rectifier or a generator set.

Reply.—We believe you will obtain more satisfactory and economical results by utilizing a vibratory type. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., produce apparatus of this description and will supply complete details, prices, etc. Address the automobile department of the company when writing.

2235 **Maxwell Wiring Plan.**

From J. D. G., Rhode Island.—Will you publish a wiring diagram of the 1915 Maxwell car? It has a true high-tension Simms magneto but the ignition circuits are mixed with the lighting circuits.

Reply.—In the wiring diagram presented herewith A represents the type D coil, B the lighting switch, C the starter switch and D the fuse block.



Wiring Diagram of Simms Magneto Used on 1915 Maxwell Car and Showing Connections with Switches.

The wiring plan of the magneto and firing order is also included. It is important in rewiring or making any adjustments that the positive and negative connections be not reversed.

2236 **Fuel Line Is Clogged.**

From Frank E. Whittlesey, California.—I am having trouble with my engine stopping at intervals as if out of fuel. I was two hours travelling 2¼ miles recently. Had nine gallons of gasoline in the tank. Pipe from tank to carburetor is clean and there is a free flow of gas to the carburetor. This has got my goat. It happened a week ago and I haven't used my car since. What's the matter?

Reply.—Your trouble is doubtless due to a clogged spraying nozzle of the carburetor. The opening of this device is very fine, so much so, that it is termed a needle valve. When tiny particles of dirt or other foreign elements are in the fuel there is a possibility that the particle will be drawn up into the nozzle, choking it. This may be for a brief period and again the dirt may so clog the nozzle that the engine will not start. Clean the nozzle thoroughly and empty all fuel from the float chamber. But best of all strain carefully all fuel placed in the tank and open the filter line occasionally. The trouble mentioned is a common one and can occur when the fuel is strained with new cars. It is also advisable to clean the fuel line from tank to carburetor, also inspect the needle valve controlling supply to the float chamber.

2237 **Experiences Oil Trouble.**

From H. W. Slawson, Nebraska.—I am going to ask your advice concerning my Ford, which has been the source of considerable expense. If the front

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cylinder in same had been designed to act as an oil pump, it could not have been improved upon, for it was just that from the very first, and when the car had covered about 1,000 miles or a little better, a slight tapping became noticeable only at a certain speed, about 15 miles per hour. Mechanics failed to diagnose the trouble, and when the car had been run about 4,000 miles, and had had three overhaulings trying to locate the knock, we finally decided it must be a piston in the rear cylinder, for by placing one end of a stick about the middle of a cylinder and your ear to the other end, when engine was running, it sounded like a riveting machine working over-time. The front cylinder in the meantime had made such progress that it cost me about as much for lubricating oil as gas, and I could not drive over 25 to 35 miles without cleaning the plug. Feeling that a new engine should not develop piston trouble in the first 1,000 miles, the agent took the matter up with the Ford assembly branch at Omaha. They advised shipping motor to them for inspection, which was done, and in due time it came back, also a bill for four .31 oversize pistons, a new crankshaft, timing gear, etc. When I wrote asking them what they found to be the cause of the trouble, they replied that the crankshaft was worn out of round, but made no mention as to why it was necessary to put in the largest oversize pistons. Since receiving the motor back it has been run about 1,200 miles, but now there are three cylinders that pump oil, and one cylinder has very weak compression. I had valves ground and carbon removed, thinking perhaps a pitted valve was the cause of the weak compression, but valves and springs are all right. The compression must escape past rings. A mechanic who cleaned my car recommends the Inland one-piece ring. This car was unloaded and set up one day and delivered to me the next, and never has been abused or overheated. Will you kindly advise me your opinion as to the probability of leak-proof rings overcoming my trouble, and if this ring I mention, the Inland. one-piece spiral cut, would be as good as any, and would one at the top of each piston be sufficient, or a full set necessary.

Reply.—The fact that the oil works past the rings and pistons indicates probable cylinder defects, that the walls are either scored or the cylinders worn oval or out of true. This can be determined by measuring the cylinders with an instrument designed for this purpose and it will require the services of one familiar with the work to obtain results. Using leak-proof rings will improve the compression and eliminate to a certain extent the passage of oil past the pistons, but one must not expect the rings to overcome the trouble created by faulty cylinders or pistons. It would be advisable to use a complete set of rings on each piston. If the cylinders are not too badly out of true it is possible that by using the rings mentioned and treating the pistons that the trouble may be overcome. The treatment consists of beveling the skirt or lower edge of piston walls and ring grooves and drilling holes of 1/32-inch in diameter from the beveled or chamfered edges. This method is held to be of value in that the surplus oil on the cylinder walls is subjected to a scraping action, and as the lubricant gathers it is forced through the drilled holes and back into the crankcase. There are several methods but the principles are similar.

2238 **Carburetor Information.**

From Adam Miller, Ohio.—Kindly give me the name and address of the maker of the Federal Zephyr carburetor.

Reply.—The carburetor referred to is manufactured by the Federal Brass Works, 362 Twombley avenue, Detroit, Mich.

2239 **Another Charging Question.**

From B. E. Harrington, Maryland.—Will you be so kind as to tell us how we can charge automobile storage batteries from a Fairbanks-Morse outfit, dynamo rated at 9 k.w. and operates at a voltage which supplies the lamps with 30 volts? It is a multi-polar, compound wound machine.

Reply.—A diagram for charging with a bank of lamps for resistance was printed in the August issue on page 56, also in this issue. Complete directions are given for estimating the proper amount of resistance and rate or flow of charging current.

2240 **Won't Remain in High.**

From Albert L. Mowry, Colorado.—I have a 1917 light weight Chandler Six. It has been run about 11,000 miles. It is continually slipping out of the high gear. I cannot see anything the matter with the gears. Sometimes it will run for miles without slipping, other times about 30 or 40 yards. I will be pleased to know just what is the matter with it. I have had it at the local garage but they could not find anything the matter with it.

Reply.—With the selective type of gearset the high is supposed to lock in position automatically. The movement of the gear with its clutch into engagement with the clutch of the constant mesh gear is accomplished by a shifting fork. This fork is attached to a rod called the shifting rod and this rod is provided with what is termed rod locks. When the gearshift lever is moved to the high position the shifting rod actuates a shifting fork and the fork in turn moves the gear with the clutch forward into engagement with the clutch of the constant mesh gear. The tendency of the clutches, called jaw clutches, to disengage is overcome by the shifting rod lock. After considerable wear the lock may not hold, allowing it to jump out of position, or again it may require adjusting. Remove all lubricant from the parts mentioned, and throw the gear into high. Next test for play of the rod and fork, also see if there be undue movement, back and forth, of the high gear. Adjust shifting rod locks above referred to.

Ford Rear Axle Trouble.

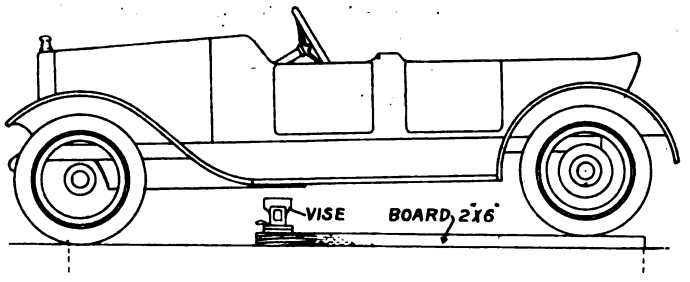
From S. C. Brier, Kansas.—After reading the article by F. H. Shultz of Kansas, in the August issue, I have decided to give my experience. I have had lots of experience along the line mentioned by Mr. Shultz. I find the best way is to remove the wheels and bearings, wash out the differentials with gasoline, having first taken out all of the old grease. Next take small handfuls of waste and insert it in each side of the axle housing, pushing it in with a screwdriver. Insert one or two felt washers and replace the bearings and wheels. Mr. Shultz will not experience any more trouble. His trouble is that he is keeping too much grease in the gearcase. The felt washers will not wear out as the roller

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bearing cages do not turn. The felt washers should fit snug on the axle. I trust this information will be of value to other motorists experiencing similar trouble.

A Question of Law.

From Murphy Smith, Pennsylvania.—Would like to have some information on automobiles passing other conveyances of any kind from the rear. There seems to be a lot of different opinions. Some say the party wishing to pass does so at his own risk, takes all responsibility when he dies. Others claim he has the same right as when coming toward each other. This is for roads not wide enough for three



Suggestion of Reader for Retaining Vise at Pit.

machines to pass at once. Will outline what happened to myself. Was overtaking two horses being led by the heads, and sounded my horn when about two hundred feet away. Was not going over 15 miles per hour at this time. The man leading the horses gave no sign of hearing, but a boy behind the team ran around to the front after looking back. The horses were taking up all of the road from the center to the right. I horned again for passing, this time less than 50 feet behind, got no sign of recognition, so decided to pass, as there was nothing then in sight for at least 200 feet coming my way. A machine was nearly that far ahead going the same way. I had slowed down to 10 or 12 miles per hour by this time. When I was about even with the horses a motorcycle showed up from the opposite direction between my automobile and the one about 200 feet ahead of me. I was giving the horses lots of room. Before I could get back to the right side of the road, ahead of the horses, the motorcycle ran into me head on. The rider received a broken leg and some small cuts and bruises, a wrecked motorcycle and I lost a radiator. Later I asked the rider how fast he was going and he told me about 26 miles per hour. Did I have the right to pass or not?

Answer.—From your statement of the facts leading up to the collision, we would have no hesitancy in saying that the man on the motorcycle was at fault and could not recover for the consequences of the accident. You had a perfect right to pass the horses provided in doing so you exercised reasonable care. The mere fact that you were passing the horses and were on the left hand side of the road would not give the motorcycle the right to run into you. Even if the horses were not there and you were on the left hand side of the road, the motorcyclist would have to use his utmost endeavors to avoid a collision, but in such a case sentiment would be against you, because the rules of the road require you to drive on the right hand side of the road when not passing other vehicles going in the same direction. There is no such rule that one man passing another on the road does so at his own risk. Such a proposition would be ridiculous. The law requires every one on the road to exercise due care for the rights of the other travelers and in closely contested disputes leaves the ultimate decision as a question of fact to be decided by a jury, or if there is no jury, by the judge.

Assuming that the facts you state are true, we have no doubt but that you could recover for the loss of your radiator.

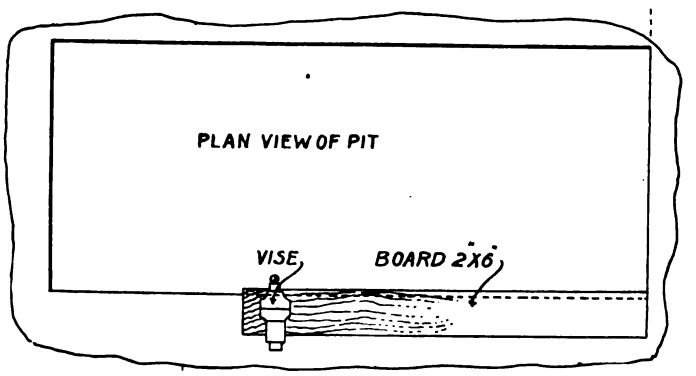
Plowing With a Motor Car.

From M. T. R., New Rochelle, N. Y.—My attention has been called to an article in your September number on plowing by the use of motor cars, and it was stated that by this method a speed of six miles an hour could be maintained. In fact, the article says that 12 miles an hour was accomplished for a period while the experiment was tried. The writer knows a little something about farming, having been born on a farm, and followed oxen for plowing. The man who follows a plow, even drawn by oxen, day after day for several days, is going to be about as tired as he wants to be. It seems to me ridiculous to assert that anybody could follow a plow being dragged by a motor car at the rate of six miles an hour. It takes a mighty good walker to get over the ground at a gait of four miles an hour for several successive hours, though it might be done perhaps faster for a mile or two. Six miles an hour is practically running for any man, and no man can run behind a plow all day long and guide it properly at any such speed. The experiment referred to may have been tried as stated, but it certainly would not be practicable to plow for any length of time in any such way as this.

I should be glad to hear from other readers on this question.

Handy Vise Kink for Pit Work.

In taking up bearings and performing work on the engine with the car over the pit, one frequently



Plan View of Vise and Board and Showing Location at Pit.

has to crawl out to do some work that requires the services of the vise. A repairman, and a reader of the Automobile Dealer and Repairer, sends the following suggestion for holding a vise in place on the edge of the pit and the plan is a most excellent one.

The vise is secured to a 2x6 piece of wood and is laid parallel and flush with the sides of the pit as shown in the plan view. The car is rolled over the pit, and the rear wheel rests on the board carrying the vise. The weight of the machine is sufficient to hold the plank in place. With this arrangement the workman can save considerable time to say nothing of having a vise handy for pit work.

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This department is maintained for the protection of our readers—especially our reckless readers, if we have any.

Objection to it has been made, on the part of those having cars and other things to sell, that a recital of the more or less fatal accidents in these columns is likely to discourage people from buying automobiles.

This view of the matter is, of course, rank nonsense. The place where an automobile accident might interfere with the sale of cars would be in the neighborhood where the accident occurred, and perhaps within the radius of the influence of the local paper in which the affair would be reported. What we see affects us far more than what we read about. The particulars of every such accident are printed in one or more newspapers. The publicity given in the Automobile Dealer and Repairer would reach people far removed from the scene. Manifestly, the fewer accidents there are the less they become an obstacle to sales. This department, by familiarizing its readers with a great variety of accidents, and their causes, enables them to be on their guard against similar accidents. In this way, by reducing the number of accidents, it is a distinct help to every car manufacturer in the country.

The object is to encourage our readers to be careful and avoid acoidents which may lead to mutilation or death. We have every reason to believe that this department has not only averted many serious accidents but probably has saved a good many lives since it was inaugurated. Manifestly, the fewer accidents, the less danger of frightening people who are on the point of buying cars.

Acoidents happen on railroads—lots of them—people are maimed and killed, but nobody stops riding on a railroad in consequence.

People are run over in the streets every day by automobiles, and yet nobody stays at home and refuses to walk in the streets because of the liability of injury in this way. Accidents of one kind and another are happening in all sorts of ways in all walks of life. If we can instil into the average individual a greater degree of caution than he has been in the habit of practising, manifestly the percentage of accidents will be reduced.

A number of the accidents described herewith are said to have been due to the failure of the brakes to grip properly. There is no excuse for faulty brake action. If owners would test their brakes, and by this is meant the emergency as well as the service, it would reduce the number of accidents due to this trouble. The usual number of inexcusable accidents, collisions between trains and automobiles at railroad crossings, are reported. These accidents could be avoided by exercising caution. Skidding continues to be the fruitful cause of accidents.

Cigar Causes Accident.—Two women were severely injured near Baltimore, Maryland, when the driver of a car turned his head to throw away a cigar. The machine jumped the curb when the driver lost control.

Entire Family Killed.—A farmer, his family of four, and a young girl were killed near Williams, California, when the driver of the machine drove directly in front of an express train. The fuel set afire by the collision burned the driver to a crisp.

Man and Wife Killed.—A man and his wife were instantly killed near Dixon, Colorado, when the man attempted to cross ahead of a train at a crossing. The view of the crossing is unobstructed, it is said, and can be seen for nearly a mile in either direction.

Two Dead as Result of Skidding.—The too sudden an application of the emergency brakes caused a car to skid and overturn near Red Bank, New Jersey. Two men were killed.

Careless Driving.—Five persons were injured when a motor car struck a tree near East Stroudsburg, Pennsylvania. The driver of the machine turned his head to speak to a passenger in the rear seats.

Brakes Failed to Hold.—Five persons were injured near Gettysburg, Pennsylvania, when a big touring car crashed into a stalled motor truck. The brakes of the passenger vehicle failed to hold.

Insect Causes Accident.—An unusual accident occurred near Jersey Shore, Pennsylvania, when the driver of a machine loaded with passengers attempted to kill an insect with his foot. The bug was annoying the occupants of the car, but in his endeavor to destroy the insect he lost control. The car went up and over a bank and on its side. The passengers escaped with severe bruises.

Driver Sleeps at Wheel.—A 19-year-old boy fell asleep while making a return trip and after a long drive. He was awakened by the crash of his car turning turtle and pinning him underneath. Several bad cuts, which will lay the careless driver up for some time, resulted from the untimely nap.

Forgot His Emergency Brake.—A driver of a car at Battle Creek, Michigan, and two passengers were badly cut by flying glass when the machine met a street car in a head-on collision. The driver became rattled and forgot he had brakes other than the service members.

Tried to Cross Railroad Tracks.—In an attempt to cross the railroad tracks ahead of the approaching train, eight persons were killed near Saybrook. Connecticut. According to reports the driver tried to cross, or beat out the engine. The engineer slowed down but it is stated the accident could not be averted. The crossing is held to be a dangerous one.

Brakes Failed to Hold.—The failure of both the service and emergency brakes to hold plunged a car over a 40 foot embankment near Le Roy, New York. resulting in the death of two of its passengers and the injury of nine others. The driver in turning the car lost control as the brakes failed to hold.

Stops Car on Track.—The stopping of a car on the railroad track, and failure to note the approach of a train, resulted in the death of four persons near Bellows Falls, Vermont. The driver stopped the machine which was hit by a freight train while the automobilists waited for another train to pass.

Car Slides Down Hill.—While attempting to make a change of gears on a hill, a machine near Singac. New York, got beyond the control of the driver and ran backward until it overturned in a ditch. The brakes failed to hold. One person was killed.

Stooped to Pick Up Glasses, Kills Pedestrian.—A driver near Elberon, New Jersey, stooped to pick up his glasses and lost control of the car which struck a pedestrian who later died of his injuries.

Inexperience Causes Accident.—Inexperience in operating a machine resulted in the driver receiving a broken leg and another passenger being badly cut at Binghamton, New York. The driver successfully passed a team but failed to make a proper turn and crashed into a tree.

Tires Have Gone Up.

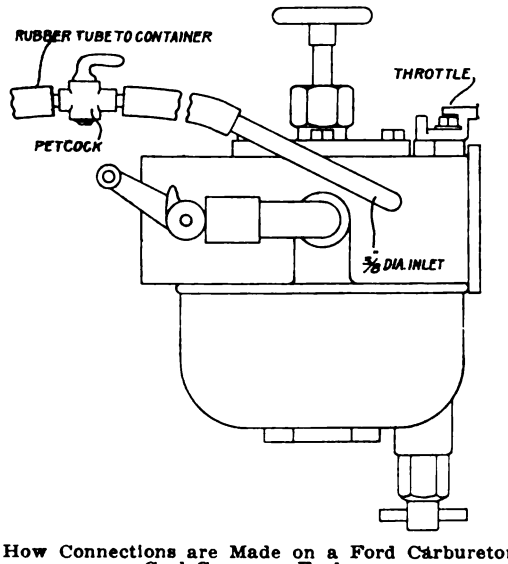
The list price of automobile tires has been advanced by the majority of the manufacturers. In some cases the raise in price has been moderate. Inasmuch as the dealer was advised of the raise before it went into effect, the majority were well stocked and gave their customers the benefit of the old price.

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COAL GAS AS A FUEL.

Three Hundred Cubic Feet Equivalent to a Gallon of Gasoline.

More or less comment is being made in the daily press as to the use of coal gas as a fuel for motor cars in England. The use of a substitute fuel has been necessary, for gasoline last April sold for 68 cents the gallon in England and to-day is 90 cents inclusive of tax. There is nothing new in the use



Showing How Connections are Made on a Ford Carburetor Using Coal Gas as a Fuel.

of coal gas as a fuel; in fact, it is stated that as early as 1896 coal gas was tried out with success. To-day there are numerous concerns engaged in supplying coal gas and the containers.

Storing the Supply.

The containers utilized for storing the gas vary in capacity, are flexible, and are usually mounted on the top of the commercial vehicle, which type of cars utilize the fuel. The container is made up of two layers of cotton fabric with an interposed layer of pure rubber. The last named is applied to the foundation in successive coatings, each about as thick as a cigarette paper, during the passage of the foundation through the steam heated machine. Pressure and heat is held to prevent pores and to impart a waterproof surface to the exterior. The most common type of container or bag is an inverted D. A strip, on the side with eyelets, provides means for securing the bag to the top of roof of the vehicle.

Capacity of Containers.

The capacity of the containers range from 290 to 500 cubic feet, and the feed pipe is generally a one-inch perforated hose, with open mouth lying with the bag, and this pipe is vulcanized in.

Gasoline or special carburetors are used, but the ordinary carburetor and manifold can be utilized with a slight alteration and the gasoline supply can still be available in case the coal gas gives out.

How Gas is Supplied.

In some instances the gas is introduced through a tube inserted beneath the choke tube of the carburetor, with the tube end so treated as to slightly flatten it and decrease the orifice of the tube. This enables the tube to be brought up closer against the jet and more central with the choke tube. The control of the fuel supply is by a stop tap, but objection is made to this method in that there is a loss of gas if the driver does not close the tap when the engine is stopped. The gas escapes because it is lighter than air and rises.

Gas Fuel vs. Gasoline.

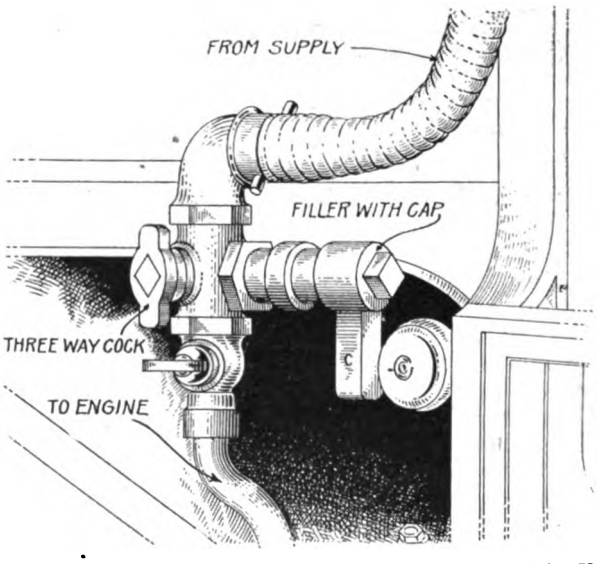
It is held by those who have made a study of the fuel that it is not so efficient as gasoline as the majority of users of coal gas use too rich a mixture, too much fuel in proportion to the air supply. Then again there is trouble if the gas nozzle be not properly set in the choke tube and only when partially inserted the power is apt to be poor. The area of the nozzle seems to vary about .0065 to .0075 square inch for each horsepower of the engine.

How Connections Are Made.

The feed pipe is carried down the front left side stanchion to the dashboard, and brought to a point convenient to the driver of the car, as shown by an accompanying illustration. The fittings to engine and dashboard may be gathered from our illustrations. Upon the dash is a three-way cock to which is attached the armoured hose connection to the gas bag, the engine feed pipe, and a short section of horizontal barrel running towards the edge of the dash respectively. This last-named length forms the connection for charging up. When attached to the main and the cock is moved a free passage for the gas from the main to the container is afforded, communication with the engine being cut off. When the bag is filled another turn of the cock cuts off the connection between the charging end and the gas bag. To obviate escape of gas by the inadvertent movement of the gas-cock, the charging pipe is sealed with a cap.

Fittings Are Simple.

The engine fittings are simple—½ inch barrel with elbow joints—all fittings are standard gas barrel, joints and unions—is run from the three-way cock to the motor, the intake manifold being tapped



Illustrating Gas Connection on an English Motor Vehicle Using Coal Gas as a Fuel.

back of the carburetor, so as to bring the gas feed as near as possible to the inlet valves. Between the dash and the intake manifold a valve is introduced, this being connected up to the ordinary carburetor throttle operated by the accelerator pedal. Thus control of the gas and air is secured. By the arrangement adopted it is possible to run the

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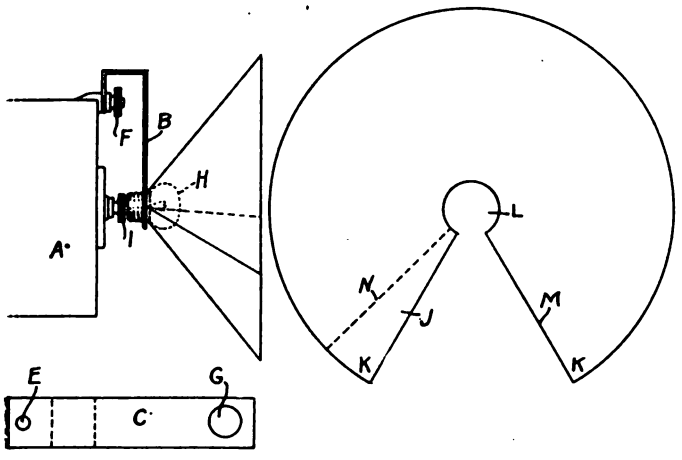
vehicle on either coal gas or gasoline, and to switch over from one fuel to the other as desired without making the slightest adjustment beyond a turn of the gas tap on the dash to prevent the gasoline vapor entering the gas bag and to obviate any mixture of the two gases.

Costs Compared with Gasoline.

A slight leakage is said to take place despite the care taken in constructing the bags. Three hundred cubic feet of coal gas is said to be the equivalent of one gallon of gasoline, and as the gas costs about 48 cents the 1,000 feet this works out to about 14.4 cents to obtain the same results as would be secured were one gallon of gasoline used. The introduction of gas is, of course, due entirely to the war. It is stated that the exhaust is objectionable, that the police object to it and that the army authorities will have nothing to do with coal gas as a fuel.

Home Made Trouble Lamp.

Dry cells are not serviceable for ignition when they read below approximately eight amperes. Generally the cells are thrown away or used on a bell circuit. Use can be made of these cells by making the attachment shown in the accompanying illus-



Illustrating Method of Making a Trouble Lamp and Utilizing Dry Cell for Source of Current Supply.

tration, and the lamp when completed can be utilized as a trouble lamp or for general lighting purposes.

The connections or holder for the bulb are made by taking a half-inch strip of 1/16-inch thick copper and bending it to the shape shown at B. This part is illustrated at C which has two holes, E and G, these being utilized for attachment to the battery terminal at F and to pass the screw part of bulb H through. The fit of the bulb should be snug.

The reflector is shown at J, and is made of a piece of bright tin. It is cut to a circle four inches in diameter, and two inches in circumference is measured off at K K and cut to the shape as shown. The diameter of the opening at L is one-half inch. The reflector is then made by bending the metal into shape and soldering the edge M to the dotted line N. When use of the light is desired the part B is swung until a contact is made at I. A represents the dry cell.

To Use Taxes for Roads.

A system of State roads in Illinois, embracing 4,000 miles, and all hard-surfaced, is to be built exclusively by the proceeds of taxation on automobiles, according to a project to be submitted to the voters of that State next November.

The most interesting feature of the project is the method of raising the money for the work. It is proposed to issue bonds which will be paid off from the proceeds of automobile taxation exclusively. Prolonged study of the use of improved roads has convinced the State officials that such a State-wide system of highways will be used so extensively by automobiles and trucks that the cost of the improvements should be borne by the owners of such vehicles. At present the license fee for cars ranges from $3 for 10-horsepower or less to $10 for 50-horsepower. Next year the taxes will be increased so that the limits will be $4.50 to $20, and in 1920 they will be increased to $6 and $25. The present motorcycle fee of $2 will be increased to $3 in 1918 and $4 in 1920. The fee for electric vehicles up to twenty tons capacity is now $5; this will be increased to $10 next year and $12 in 1920. Electric vehicles of over two tons pay double these fees except in 1920, when the license will be $25.

It is proposed to begin issuing bonds in 1920, putting out $10,000,000 in that year, and to make a similar issue annually until the total bonded indebtedness is $60,000,000. It is proposed to let the first contract in 1920. In that year it is estimated that the license fees will amount to $4,800,000. The State officials estimate that in 1944 the fees will amount to $6,000,000, and both principal and interest will have been paid. The interest rate which is proposed for the bonds is 3½ per cent.

New Books Received.

Acknowledgment is made of the following books and house publications.

How to Run and Install Gasoline Engines. By C. Von Culin. The Norman W. Henley Publishing Co., New York City. This book deals with both the two and four-cycle engines and is very comprehensive in its treatment of the subject. The retail price is 25 cents.

Legal Points for Automobile Owners. By Leslie Childs. J. S. Ogilvie Publishing Co., New York City. This publication gives briefly and precisely the information an automobilist should know, particularly his liability under various circumstances. The book sells for 50 cents.

The Ford Motor Car and Truck and Tractor Attachments. By Harold P. Manly. Frederick J. Drake Co., Chicago. Deals with the construction, operation and care of these vehicles.

Automobile Records and Diary. William Garrison Reed, 108 Water Street, Boston. A neat, cloth bound, pocket size book for entering the records of trips made in the motor car. Pages are supplied for cost data, etc. Room is afforded for entering data as to size of fuses, bulbs, etc., used on the machine. The diary proper can be removed when filled and replaced with a new one. The retail price is one dollar.

Drill Chips. September issue of house organ of Cleveland Twist Drill Co. Contains interesting information as to the use of drills in munitions, etc.

The trouble experienced by some owners in removing spark plugs, a condition referred to by the repairman as frozen, can be avoided by the use of a mixture of graphite and oil. Make a thick paste and smear it on the threads of the plug.

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FUEL CONDENSATION.

Suggestion for Overcoming Troubles Due to Use of Heavy Fuel.

The deposition of fuel particles, commonly referred to as fuel condensation, on the walls of the intake manifold is more prevalent than formerly when the gasoline was more volatile and more easily vaporized. The mising, fluttering and overloading when starting the engine from cold are symptoms with which the average motorist is familiar, particularly the owner of a car that is several years

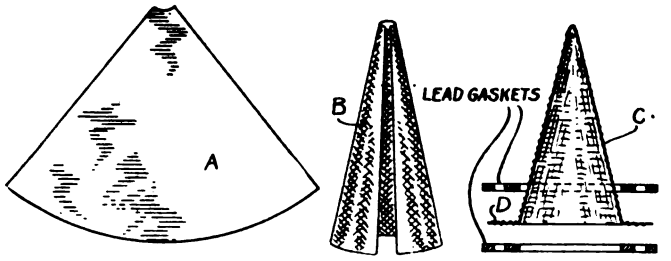


Fig. 1—Preventing Fuel Deposition: A, Pattern for Gauze; B, Cone Rolled to Shape; C, Cone and Flange; D, the Flange.

old and not equipped with a strangling device and means for utilizing the heat of the exhaust. The missing and fluttering disappears after the engine warms up and when the throttle is opened, and cannot be ascribed to the size of or the adjustment of the jets.

Gauze Pulverizes Fuel.

The cure for this trouble, says The Autocar, is the fitting of one or more cones of fine brass gauze No. 80 mesh in some cases, and No. 60 in others. The No. 80 is held to be more effective where it can be used. The cone of gauze, where only one is used, should not be placed, if this can be avoided, in a straight intake manifold, as the wire forming the gauze tends to restrict the area of the passage and results in loss of power at high speeds. It is better that the cone should project into some open space, such as the intake passage in an enbloc cast engine, or in the junction of a Y shaped manifold. In the latter case, however, the stem of the branch must be very short, and the flange quite near to the junction of the arms, as shown in an accompanying drawing.

Two Cones Required.

Where the Y has a long stem it is not possible to fit the cone without throttling the mixture supply, and in a case of this kind it is adviseable to fit two cones, one at each end of the Y branch, with the apexes of the cones projecting into the cylinder casting. Inside the casting there is usually an irregular shaped space from which lead a pair of intake passages directly to the two inlet valves, so that the mixture which passes through the gauze can get away in every direction with ease.

Making the Pattern.

For the benefit of those who have suffered from the trouble mentioned, and who wish to experiment with one or more cones of gauze, a series or illustrations are given herewith showing how the cone should be formed and fitted. It is preferable, in the first place, to cut a paper pattern which, when opened out, will take a form shown at Fig. 1-A. The exact shape and area of the correct pattern will depend upon the diameter of the intake flange to which the cone is to be fitted, and also upon the length the cone is to be made. The cone should be as long as possible, within reasonable limits, and at a point about one inch from its base of the same diameter as the interior of the intake pipe flange.

Shaping the Cone.

After the pattern has been cut, it may be marked off on the gauze to be used. The edges of the latter, after it has been cut out, must be cleaned with fine emery cloth to a width of about a quarter of an inch. These edges should then be "tinned," preparatory to soldering them together after the gauze has been bent over to a cone shape with the edges overlapping to the extent of about three-sixteenths of an inch or slightly less, as shown at Fig. 1-B.

It will probably be found that the apex of the cone cannot be brought easily to a point, but if the cone be made longer than necessary as regards the distance from the apex to the point where the diameter is the same as the flange hole, the top can be cut off to form the correct length of cone plus a quarter of an inch, and this extra quarter of an inch split, turned in, and the pieces soldered together, forming a slightly flat apex.

Forming the Flange.

The extra inch at the base is intended to be split up with a pair of scissors and turned over so as to form a flange, as indicated at Fig. 1-D. At opposite side sufficient of this flange is cut out to allow for the flange bolts of the intake pipe, and one of these clippings should include the lap joint, so far as it is bent over. The flange of this cone will then be of irregular shape, but it should not be trimmed up until it has been secured in position.

The next requirement is a lead gasket, or preferably two of these, shaped to fit the flange of the intake pipe or cylinder casting; that is to say, with a large hole in the center of the same diameter as the hole in the intake passage and two small holes at each side for the flange bolts. If now one of these lead washers be placed at each side of the cone flange, the latter will bed into them when bolted up

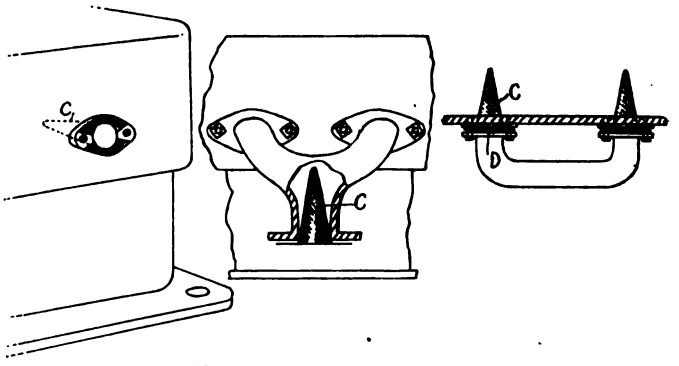


Fig. 2—Preventing Fuel Depositation: C, Cone in Enbloc Casting; Same in Y Type of Intake Manifold; D, Showing Assembly Used with Y Type.

tightly in position, so forming an airtight joint and also a good conductor of heat from the cylinder casting to the intake pipe—a very desirable thing with heavy grade fuels, as vaporization is assisted when the intake pipe is heated.

When the cone, washers and intake pipe have been bolted up tightly, the flange of the cone may be trimmed off neatly. There should be little need to explain the purpose of the cone, but it may be said that when the partially atomized fuel passes through the cone it must be broken up into much

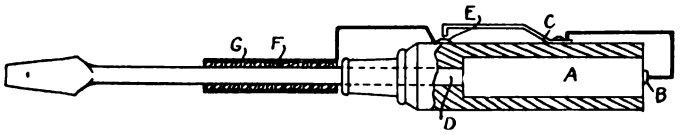
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smaller units, especially as it approaches the inner surface of the cone diagonally.

The fitting of a cone is said to have completely stopped the misfiring and fluttering referred to, and further than this, in several cases it has resulted in a marked increase of power and improvement in fuel consumption. It should be mentioned that the gauze requires cleaning occasionally, as the mesh becomes choked with dust and carbon, and that after two or three thousand miles running it tends to disintegrate and should be renewed.

A Magnetic Screwdriver.

A reader contributes the following method of making a magnetic screwdriver, and states that it can be utilized to advantage in starting very



Illustrating Method of Making Magnetic Screwdriver by Using an Ordinary Flashlight.

small screws and for picking up small particles of metal. The work is accomplished by boring a hole in the handle of the screwdriver and attaching an ordinary vest pocket type of flashlight. A wire is soldered to the terminal B and connected to the contact part C, it being soldered.

The other end of the battery comes in contact with the metal part of the screwdriver D. A small screw or nail E is driven into the handle, a wire soldered to same, and it is connected with the coil F. This coil is protected by a rubber tube. The end of the wire in the coil is soldered to the screwdriver at H. The tool is operated by pressing the spring C, the latter making contact with E. It is stated that this will magnetize the blade of the tool.

"The Quieterion."

As a rule a house organ is a vehicle for creating interest in the product of the manufacturer who pays the expenses of the publication to see the name of his goods in print. The really interesting items generally wind up with some reference to the article made by the manufacturer, and as they say in the movies, "It lacks the punch." Not so with "Quieterion," a monthly publication issued by the Hyatt Roller Bearing Co., Detroit, maker of the Hyatt quiet bearings. Perhaps the editor calls his publication a house organ because he is modest. As a matter of fact it is the best, brightest and most interesting little book that has come to our attention for some time. It will interest every reader, and the only criticism we make is that one is apt to neglect his work until he has read the book from cover to cover. We quote a couple of excerpts to show the "punch" referred to. "That Willys-Overland agent in Paris, Texas, named 'Briscoe Dodge Chandler,' ought to go into partnership with 'A. Ford Carr,' of Chicago. And yet there are those who say there is nothing in a name." Another worth digesting by the employee is, "If your job, even with all its troubles, isn't a Constant State of Happiness, then, for Goodness Sake, change the job." And last but not least we must give the editor credit for not filling his publication with references to the products of the concern employing him. A copy of "The Quieterion" is well worth writing for.

MAKES STARTING ENGINE EASY.

A device for making easy the starting of an engine when cold, and providing the proper amount of mixture when the engine is running very slowly or idling, has been brought out by an English inventor. The device is made to be screwed into a two-gallon fuel can or other similar container.

How Device Is Made.

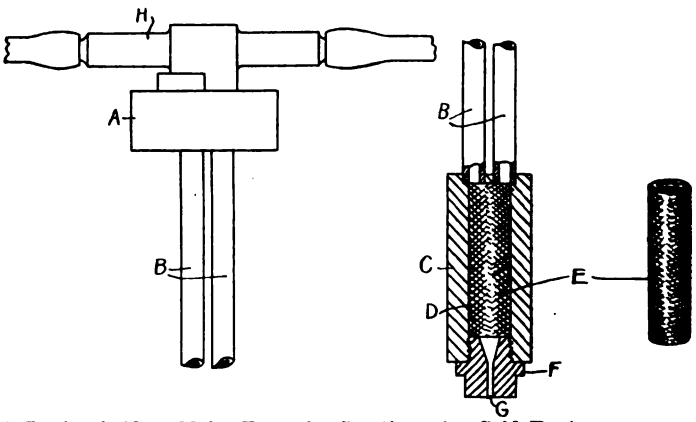
The lettered drawing shows the plan of the device. The threaded cap A below the T-piece is similar to those used on fuel and oil cans; that is to say, it is a large cap. From the cap depend two small brass tubes, B, each having a bore of about ⅛-inch, and secured to the lower end of these is a brass casting C drilled to about ⅜-inch diameter. The cylindrical space D is filled with tight roll of fine gauze E, and the gauze is held in place and the lower end of the casting closed by a screwed plug F.

Control of Fuel.

A small hole G is drilled through the plug, and this hole obtains in effect a jet or limiting orifice, controlling the amount of fuel which can pass from the container. Formed with the cap is a T-head piece drilled at each side so as to communicate with one of the small pipes in the interior of the container. These pipes have a similar bore, but do not communicate with each other except through the brass cylinder at the bottom. One forms the air inlet to the starter and the other forms the mixture outlet, the mixture being carried from one branch of the T-piece, to a nipple screwed into the intake pipe of the engine, by means of a flexible connection, rubber tubing for example.

Operation of Device.

When the throttle of the main carburetor is closed, the suction of the engine takes effect upon the column of fuel standing normally in the two vertical



A Device Said to Make Easy the Starting of a Cold Engine and to Improve Idling and Operation at Low Speeds.

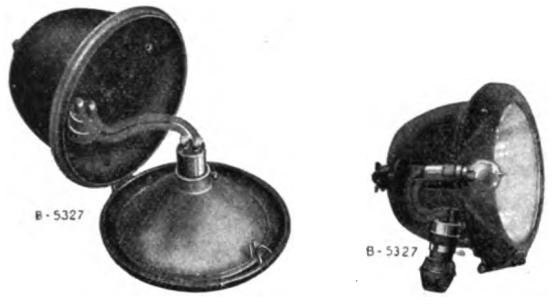
tubes; thus a very rich mixture is provided for the first two or three explosions, after which a suitable slow-running mixture is formed by the suction of the engine drawing air through the closely packed gauze which, in turn, is kept saturated by the fuel finding entry through the gauged hole in the screwed plug. With each fitting it is proposed to supply three sizes of plug, so that the only adjustment necessary when the device is being adjusted is to try first one and then another of the optional plug sizes until the best results are obtained.

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USEFUL WINTER EQUIPMENT.

What the Manufacturer Is Providing for the Comfort of the Mortorist.

With the approach of November the old and experienced motorist formulates plans for placing his car in first class condition and for equipping it with

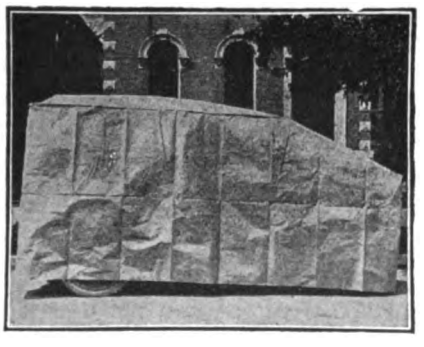


The New Corcoran Side Electric Lamp Can Be Used as a Trouble Lamp.

those devices which make driving a comfort and a pleasure in cold weather. Motoring during the winter is becoming more and more popular each year and the number of owners who store their machines during the winter months is gradually decreasing. There is, as there always will be, certain localities where the use of the automobile is somewhat restricted by climatic conditions but even in these places the car is employed during the greater part of the year.

Improvements in Equipment.

The manufacturer of equipment, and by equipment is meant the hundreds of devices that lighten the labors of the owner, has made wonderful progress during the past year or so in developing his product. The invention of different types of heating apparatus has made possible the heating of the private garage at a minimum cost of upkeep and labor. No longer does the motorist have to struggle with a cold engine for in addition to the garage heating equipment there are numerous devices for starting the engine from cold. The driver today is not obliged to face the discomfort endured by the motorist ten years ago for with the



The Kennedy Auto Storage Cover Is Heavy and Durable and Will Keep Out Dust, Etc.

numerous types of winter enclosures, car heaters, etc., one can drive on the coldest day with absolute comfort.

Despite the shock of the war and scarcity of material there is offered the motorist a large number of new accessories and equipment. These range from devices designed to lighten the work of the owner who cares for his own machine to a heating apparatus operated by the exhaust of the engine.



Freeze-Proof, a Ready Prepared Anti-Freezing Mixture Easily Used and Having High Boiling Point.

For those who store their cars during the winter, and who wish to protect the finish, upholstery, tires, etc., there is offered the Kennedy auto storage cover shown herewith. These are constructed of a very heavy, tough, durable paper which will resist the action of moisture and keep out dust, etc. The covers are made in standard sizes, will fit any automobile and are very reasonable in price. They are manufactured by the Kennedy Car Liner & Bag Co., Shelbyville, Ind.

Novel Combination Lamp.

A novel and practical lamp, one that can be utilized for a trouble or inspection light as well as for a side member, has been brought out by the Corcoran Lamp Co., Cincinnati, Ohio. As may be



Cylinder Head for Ford Car Providing Greater Water Space and Preventing Overheating.

noted by the accompanying illustrations the reflector, instead of being secured in the body, is attached to the door which is hinged at the bottom. When the door is opened it carries the bulb and reflector with it. By raising or lowering the door, the light can be directed downward at any angle desired. This permits use of the lamp for inspecting the engine, tires, etc. There is no rattle as the connection between the door and reflector is solid, and the bulb is always in focus. The lamp is 4¾ inches in diameter and can be used on a three, six or nine-volt circuit. The body is black enameled. The lamp is



The Fire Gun Fire Extinguisher, a Sturdy, Compact Design and Having a Protected Nozzle.

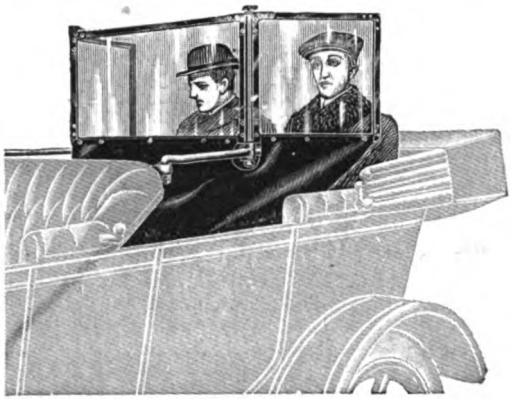
adapted to dry cells, a three-volt equipment operating it with two candlepower lamps. Four candlepower bulbs are used on a battery circuit.

Freeze-Proof Prevents Freezing.

With the approach of cold comes the need of use of an anti-freezing solution in the cooling system of the car. The practical preparation is one that

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does not injure the rubber, is free from electrolytic action and rust, and does not lower the boiling point of the water. S. C. Johnson & Son, Racine, Wis., is marketing a preparation called Freeze-Proof, and as the name implies it prevents freezing of the water

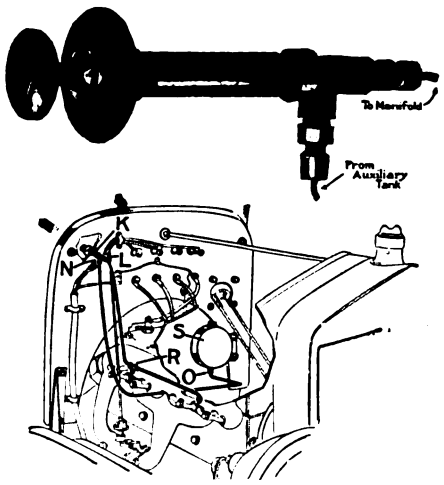


The "J. H." Tonneau Windshield Affords the Convenience of the Open Car with the Comforts of the Enclosed Vehicle.

and is harmless. The boiling point of the solution is from 235 to 250 degrees Fahrenheit, and when it is considered that water boils at 212 it will be seen that the solution can be utilized in mild weather. The preparation is easily used, being poured into the radiator where it dissolves. The solution can be so used as to prevent freezing at very low temperatures. One application is held to be sufficient for the winter as its efficiency is not affected by heating.

New Ford Cylinder Head.

A new cylinder head for the Ford car and which is said to resemble to a great extent the cylinder head of the Hudson car has been brought out by the Green Engineering Co., 48 St. Clair Street, Dayton, Ohio. The head is constructed with an extra large water jacket holding about half a gallon more of cooling fluid than the Ford design, and this water jacket entirely surrounds the spark plug openings, a method increasing the efficiency of the spark plugs. Another feature is that the greater part of the combustion chamber is directly over the valve while the inside of the head is perfectly smooth. The new



The Imperial Primer Is Improved by Use of a Special Tank for Storing a Highly Volatile Fuel for Priming.

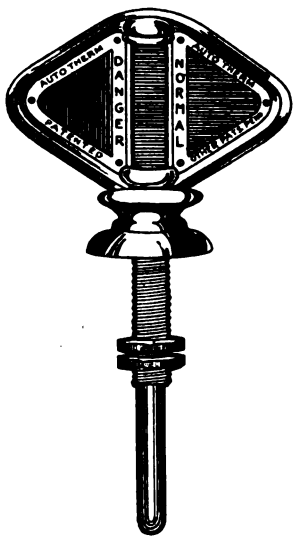
head is adapted to the use of the standard S. A. E. spark plugs and can be installed easily and quickly as there are no special connections, etc.

The Fire Gun.

That it is good insurance to equip the car and garage with a fire extinguisher has been frequently demonstrated. The Fire Gun Mfg. Co., Inc., 17 Battery Place, New York City, is marketing the Fire Gun Fluid Extinguisher which discharges a liquid which when striking the heat, vaporizes into a heavy gas which forms a blanket and extinguishes the flames. The device or container is a positive double acting pump having a capacity of 1¼ quarts. It is held that the contents can be very quickly discharged, that the container is so sturdily made that it will withstand severe abuse, and the nozzle is protected from injury by flanges. The extinguisher comes in two sizes, 1¼ and 1¾-quart capacity, and both can be easily and quickly recharged after use. The extinguisher comes complete with bracket. It is non-freezing and has been approved by the National Board of Fire Underwriters, etc.

"J. H." Tonneau Windshield.

Those who prefer the conveniences of the open touring car with none of its discomforts will find the "J. H." Tonneau windshield of interest. This invention completely protects the occupant or occu-



The Auto Therm Indicates to Driver by Means of Wide Ribbon of Color the Temperature of Water.

pants of the rear seat from wind and back draughts, and one of the several commendable features of the construction is that the glass panels can be arranged or placed as desired. The mounting of the shield is such that it can be easily and quickly swung and folded. As may be noted by the accompanying illustration the shield includes a form of boot or robe-like cover which thoroughly protects the passengers. The "J. H." Tonneau windshield not only affords protection but is easily installed. It is marketed by the "J. H." Tonneau Windshield Co., 1777 Broadway, New York.

New Priming Method.

The use of a highly volatile fuel makes starting a cold engine easy and to permit use of the fuel th Imperial Brass Mfg. Co., 12 West Harrison Street, Chicago, Ill., has brought out an improvement to its well known priming device. It consists of an auxiliary tank located as shown at P in the illustration, and this is employed to carry the supply of high test gasoline. Formerly the main fuel supply line was tapped to obtain the fuel. The new method is a big improvement in that it permits of the use of the highly volatile fuel for starting an engine

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in cold weather. The pump and connections of the primer are practically the same. The device sprays fuel into the intake manifold and is made for all types of cars.

Heating Indicating Device.

The temperature of the cooling fluid in the radiator indicates whether the engine is operating efficiently as well as denotes overheating and too low a temperature. The H. & M. Mfg. Co., 16 Mulberry Street, Newark, N. J., has brought out a device termed the Auto Therm, a heat indicator which operates directly in contact with the water in the radiator, and when the temperature of the fluid rises above normal a danger signal is flashed by means of a broad ribbon of colored fluid contained within the device. The Auto Therm is attached to the radiator cap, is easily and quickly installed, and is made for all standard cars. It also comes supplied with fraternal or patriotic emblems at an additional cost.

The Utility Heater.

The Hill Pump Valve Co., Archer Avenue, Chicago, Ill., maker of the well known Utility heaters for motor cars, has brought out a greatly improved

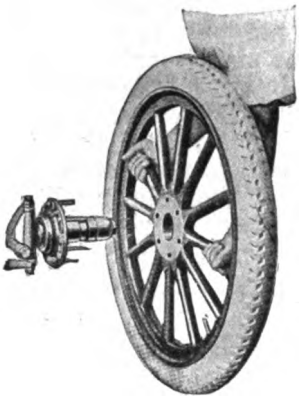


The Utility Heater Provides Comfort in Cold Weather and a Design Is Now Made for the Front Compartment.

design for the coming season. The same principle as formerly, that of using the heat of the exhaust, is employed, but a new exhaust pipe has been added and which fits several different sizes of pipes. The company is also marketing a new design called the Utlity Jr., protected heater, a type made especially for providing comfort for the driver and which is located in the front compartment. This design can also be used in the rear of the Ford, Chevrolet, Maxwell, etc. The heater differs from the Utility in that it is 17 inches long instead of 29. The same workmanship and material are included. The heater includes a foot rail which radiates the heat which can be regulated as desired by a valve.

Demountable Wheel and Carrier.

The changing of a tire in cold weather is not an agreeable task. This is made easy when the car is equipped with demountable wheels. The J. P. Gorham, Co., 47 West 42d Street, New York City, is marketing a demountable wheel for Ford cars called the Anthony that has several commendable features. It permits of making a tire change by removing six nuts, slipping off the wheel, and replacing it with the spare member with its tire. This can be done in a few minutes. The old wheels are utilized and none of the Ford parts are changed. New flange segments



The Anthony Demountable Wheels and Wheel Carrier.

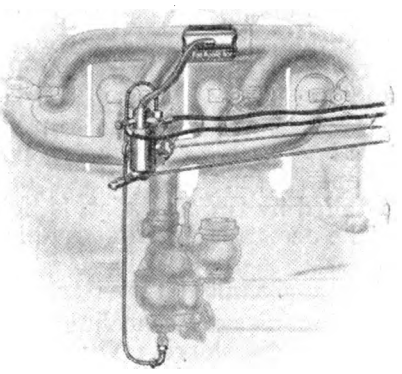
are installed, and the outfit includes four wheel changes, an extra wheel, spare wheel carrier and wrench. The carrier locks the extra member, preventing theft of the shoe.

Vitalizer Heats Fuel.

It is a well known fact that in cold weather the fuel will vaporize much more quickly if heat is utilized. This makes starting a cold engine an easy matter. The American Spring Tire Co., 30 West Lake Street, Chicago, Ill., has brought out what is termed the Perfection Five-in-One Vitalizer which can be installed on any engine. It combines an electric heater, primer, accelerator and decarbonizer, and the temperature of the fuel is quickly raised by the electric heater which is controlled by a switch. Not only does the device make starting easy but it is claimed that greater mileage and increased power are secured.

Bill Spark Retarder.

The Bill Mfg. Co., La Porte, Ind., is marketing an automatic spark retarder which avoids the possibility of a backfire through an advanced spark. The operation of the device is simple. When the starting crank is engaged the spark is automatically retarded, but after starting and disengagement of the



The Vitalizer Combines a Number of Useful Devices Including Means for Electrically Heating the Fuel for Starting.

starting crank, the spark is advanced to that position obtained by the original setting of the spark lever on the quadrant of the wheel.

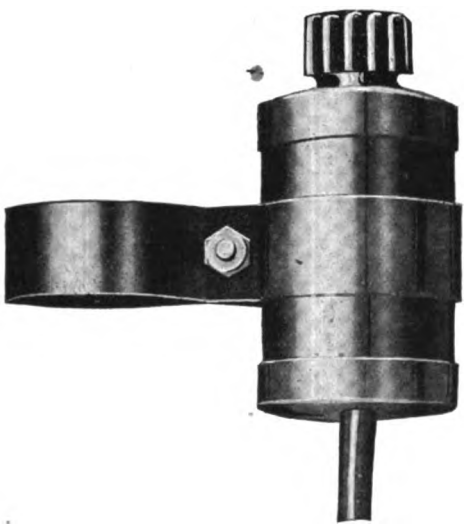
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Copley Primer.

The Copley primer marketed by the Bay State Pump Co., 100 Purchase Street, Boston, Mass., differs from the usual primer in that use is made of the principle of a small stream of air travelling at high velocity to pulverize the fuel. The fuel is taken from the main supply line and the pulverizing action occurs in the intake manifold. This action is continuous until the pull knob controlling the device is released. It is claimed that the success of the primer does not depend upon the carburetor; in fact, it is stated that the primer will supply the engine with fuel without the carburetor.

Lite-A-Ford.

Made by the Hastings Mfg. Co., Hastings, Mich., and distributed by the Zinke Co., 1323 Michigan Avenue, Chicago, Ill., the Lite-A-Ford for providing the maximum of light from the headlights will interest Ford owners. By turning a knurled knob any variation of light may be obtained. The dimming feature is secured by a series of resistance coils, but at low engine speeds when the maximum light is desired, the light is made brilliant through the use



The Lite-A-Ford, a Combination Dimming Device and Voltage Regulator at Low Engine Speeds.

of the device. The Lite-A-Ford serves a dual purpose and both are exceedingly useful.

Kickless Crank.

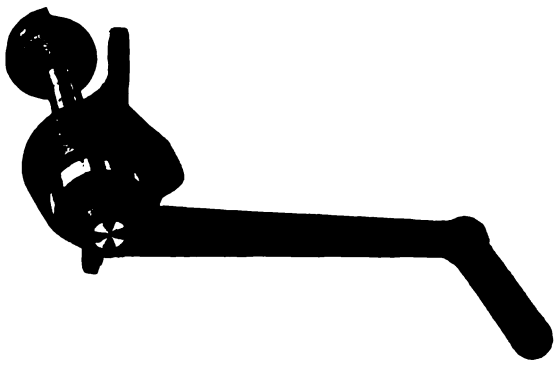
A new device which avoids the possibility of accident when cranking the engine by hand is being marketed by the Carson Mfg. Co., Richmond, Va. It is termed the Kickless Crank and is sold under a forfeit of $100 if the user is injured by it. The construction is simple, has very few parts and these are of hardened steel. The device can be easily and quickly installed by the motorist, is light, and nicely finished. The design is patented and is made for the Ford car.

Celluloid Cleanser.

After continuous service celluloid windows, etc., become dim and discolored. The Celluloid Cleanser Co., 6 Michigan Boulevard, Chicago, Ill., is marketing the C-E-Z celluloid cleanser which is a chemical preparation that is said to restore celluloid. The company is also making Glassocar for treating the glass of the windshield and windows. It is held to prevent frosting of the glass as well as to provide a clear vision in rain, snow, etc.

French Using Alcohol.

According to advices received from France, experience has demonstrated that when alcohol is used in the ratio of three parts to one of gasoline, a very satisfactory mixture is obtained, one that affords flexibility and makes starting a cold engine as easy



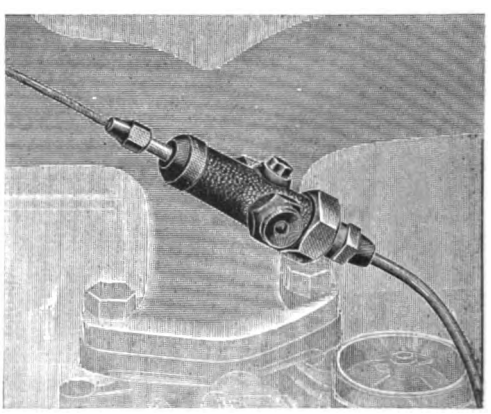
The Carson Kickless Crank for Ford Cars.

as with a gasoline mixture. Although the alcohol-gasoline fuel does not require an increase in the oil supply, its use does necessitate that the lubrication system be carefully watched; that is, with the splash or combination splash and force feed that the maximum level be constantly maintained.

Big Tire Mileage.

Among the many creditable tire mileage records which Goodyear cord tires have established, the one which is reported by J. W. Dieffenderfer, of Collingswood, N. J., is of special interest. He states that he has run his Hupmobile car 8,050 miles in a period of two years with no tire mishaps, other than a puncture from a roofing nail, on the 5,200th mile. The other three tires have not been off the wheels or deflated.

Dates for the Chicago show have been set for the week of January 26 to February 2, 1918. As in the past, the second of the big national displays will follow the New York show after an interval of two weeks. Delay in making the announcement was



The Copley Primer Makes Use of a High Velocity Stream of Air for Pulverizing the Fuel in the Intake Manifold.

due to some question of the possibility of securing the First Regiment Armory in Chicago, in addition to the Coliseum, but it is said that arrangements have now been completed for housing the show in the two big buildings as usual.

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GENERAL NEWS OF THE AUTOMOBILE INDUSTRY.

The next Boston show, which occurs March 2-9, will carry with it the sanction of the Motor and Accessory Manufacturers. This is the first time since 1913 that any show other than at Chicago and New York has been sanctioned by the accessory manufacturers.

This sanction means that any accessory manufacturer may exhibit on the same basis as at New York and Chicago. It also means that the M. A. M. is behind the exhibit at Boston. As a result there will be considerably more exhibits at the Hub next March.

No other sanctions of dealer shows have been issued by the M. A. M. and it is stated that if any are to be issued, they will have to be taken up individually as it would not be possible to issue a blanket sanction for all shows. Without the sanction of the M. A. M., accessories can be exhibited in dealer shows only by jobbers or dealers, the manufacturer being prohibited by the M. A. M. rule from doing so.

S. A. E. Plans Winter Activities.

The indications are that the Society of Automotive Engineers will have an unusually busy winter. Among the new moves is the contemplation of winter meetings in Chicago, and presumably at show time, January 6 to February 2. A professional session will be held during one day, and in the evening there will be a "Patriotic Dinner."

Wednesday and Thursday, January 9 and 10, will be the dates of the meetings in New York and during the show week. Wednesday will be "Standards Day." On Thursday there will be three gatherings which will be followed by a dinner in the evening. There will be two special meetings of the society, these to take place during the aviation and motor boat shows. At the present time the membership of the S. A. E. is 2,775. At the next meeting 200 names will be acted upon.

Ford Accessory Show a Success.

The Ford Accessories Exposition, held under the auspices of the National Exposition for Ford Accessories, Inc., at Chicago the week of September 22-29, created considerable interest and was an unqualified success. A large volume of business was transacted by the manufacturers who exhibited, and one of the factors making for success was that a concentrated effort was made to reach dealers, and get them to attend. Nationally known manufacturers were among the exhibitors. It is understood that the show is to be made a permanent and annual feature.

Hyatt Has Record Month.

The demand for bearings is held by some to be a true barometer of business conditions in the automobile industry. The Hyatt Roller Bearing Co. indicates the prosperous condition of the country as this concern had the best month in the history of the company in August.

Will Produce Trucks.

The Amston Motor Car Corp., Amston, Conn., has purchased the assets of the Sterling Automobile Mfg. Corp. of New York, and will build and market a line of commercial cars at the plant at Amston, Conn. The concern will build primarily a 1,000-pound capacity delivery car which is to sell at from $900 to $950. The company will also build a line of roadster, touring and enclosed passenger vehicles. Charles M. Ams is president and general manager of the new company.

Closed Car Shows Popular.

The increasing demand for the enclosed motor vehicle has resulted in a number of dealers' associations deciding to hold an enclosed car show. The Boston Automobile Dealers' Association is arranging for an exhibit, and it will probably be held at the Mechanics' Building or other similar structure. In former years these shows have been held at the Copley Plaza, an arrangement not pleasing to the dealers and makers of custom-made enclosed bodies.

Moon Takes Over Buggy Co.

The Moon Motor Car Co., St. Louis, Mo., has taken over the plant of the Joseph W. Moon Buggy Co. The factory of the Moon company now occupies an entire block and was necessary to complete the plans calling for a production of 20,000 six-cylinder cars which are to be known as the "Thousand Dollar Six."

Denver Space Is Taken.

All space for the show to be held November 12-18 at Denver, Col., under the auspices of the Automobile Trades Association has been contracted for. Forty-five passenger dealers will display as will 33 accessory concerns. Dealers will feature commercial cars during the show week by holding special exhibits at their display rooms.

Raise Price of Fords.

According to advices from Detroit the Ford Motor Co. has raised the price of Ford cars by $5 by making an additional charge of this amount on all machines for delivery. This increase has been made to dealers, who in turn extract the five from the purchaser.

New Goodyear Record.

A new record was established by the Goodyear Tire & Rubber Co., Akron, O., for business transacted during the month of August. It was the largest for any one month, it amounting to $12,577,000. Officials of the company predict the year's business will total $100,000,000.

Ford Tractors Delayed.

Owing to the large contract with the English government Henry Ford & Son will be unable to supply the American market for some time. The first tractor to be produced in this country will be sent to Luther Burbank in California.

A Hustling Concern.

To make deliveries within three months after organization is the record of the Carlisle Cord Tire Co., New York City, this company having begun deliveries from its factory in Andover, Mass.

A Chevrolet Tractor?

According to advices from Washington the Chevrolet Motor Co., Flint, Mich., is to engage in the production of tractors. The government is to allow certain parts made in the Canadian factory of the company to be admitted free of duty in this country.

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WHAT IS TAKING PLACE IN THE COMMERCIAL CAR FIELD.

Freight conditions throughout the country have handicapped the railroads to a great extent and this congestion will grow worse as the plans for the final mobilization of the army for oversea service are completed. Lack of transportation facilities has forced shippers to use other means than the railroads, and in their urgent need they have turned to the motor truck as the only available medium for relief. The economic demand for food conservation has led to the greater use of the commercial car through the release of horses and mules, as it takes the produce of 37,000,000 acres of land to support the horses and mules in this country.

Due to the war all these things are being brought to light and are pointing the way to wider uses to which motor trucks can be put and the numerous other conditions that will be relieved through their use.

With the proposed use of trucks the natural question of cost of operation enters into the discussion. How well and easily this question can be solved is best illustrated by the following instance:

The Cheyenne Creamery Co., Cheyenne, Wyo., have until recently been using horses to do their hauling. Through actual experience and statistics kept over a long period of time their records show that their horses cost them exactly $44 a month. This was due to several reasons, principally the high cost of feed. One day they were prevailed upon to purchase a Smith Form-a-Truck. Since that time they found that the truck could do the work in a quarter of the time that it was possible to do it with horses and could relieve the driver for other work. The actual net upkeep of the truck has been less than $14 a month, showing a net saving of $30 a month in addition to many other advantages.

It can be seen from this that in spite of the many other reasons for an increasing wide use, the cost of operation alone is sufficient reason for anyone to change to motorized delivery.

New Army Motor Kitchen.

A New Haven, Conn., hotel man has invented and constructed a kitchen for service on a motor truck, and the equipment was given a thorough test recently when the members of a regiment were fed. It is stated that 6,000 meals a day are possible with the kitchen, and that it has a coffee capacity of 1,000 cups every 10 minutes.

The kitchen consists of a ten-horsepower boiler, two 90-gallon stew, soup or pot roast kettles, and two 50-gallon coffee urns. The vertical boiler utilizes wood, coal, oil or wood. The entire equipment was designed for speed. The kettles and urns are steam jacketed, and in a test recently 50 gallons of coffee were made in nine minutes. Not only is steam utilized for cooking, but it is also employed for sterilizing the mess tins of the soldiers.

The body consists of a roof and flare boards which drop down to serve as a platform. The outfit is mounted on a four-ton Riker truck chassis. Over good roads the estimated speed of the unit is fifteen miles an hour. Weight is about nine tons.

The unit is designed to accompany or precede a battalion on the march. Hot food is ready when the battalion halts, as the food can be cooked while the unit is moving to the place selected for the stop. When the battalion entrains the kitchen is put on a flat car and is just as serviceable there for cooking as on the road. The invention has been given the name of the Taft Army Field Kitchen.

Getting Ready for Jersey.

Forms and printed matter to be used in connection with placing the new laws controlling the use of commercial cars in New Jersey, and which goes into effect January 1, are being circulated among the trade and owners. Greater fees and a drastic regulation of tires are among the features of the bill. It is rumored that motor truck interests are not satisfied with the law and that the next session of the legislature will see an attempt made to modify some of the objectionable sections. A strong and active organization of truck users, owners, dealers, etc., has been formed to combat adverse legislation and as the membership is over 1,000 it is reasonable to assume that results will be obtained.

There have been several conferences between the representatives of the motor truck interests and Commissioner Dill of the Motor Vehicle Department of New Jersey. The strict enforcement of the new tire requirements at one time threatened to result in a serious controversy, but it was averted by Commissioner Dill ordering that all trucks now in service be exempted from the section.

Eliminate Local Delivery.

So rapidly has business increased that the express companies of New York City have been forced to do away with the greater part of their local hauling or delivery. This condition is largely due to the demands created by the war, and delivery from one section of the city to another has been taken over by local express companies. Those concerns owning commercial cars are reported to be doing an enormous business and are able to obtain record prices because of the existing conditions. This has boomed the sales of trucks in New York.

New Truck Unit.

A recent entrant in the commercial car field is Graham Bros., Evansville, Ind., which concern is marketing a complete truck attachment unit called the Graham Bros. All-3 Unit-Cab-Body. It fits the Ford chassis and comes complete for attachment, and choice is given of either an express or stake body. The wheelbase is increased to 125 inches, the carrying capacity is 2,000 pounds and the weight without body is 2,150 pounds. Drive is by chain. The road speed is from 12 to 20 miles. Special bodies are supplied.

Will Build for Government.

According to advices from Indianapolis, Ind., the Premier Motor Corp., has received a contract to build $15,000,000 worth of four-wheel drive trucks. The cars will be built under license from the Four-Wheel Drive Co., Clintonville, Wis.

Steam Trucks Planned.

The Doble Laboratories, San Francisco, Cal., is completing for production a two-ton Doble steam truck. This model will be followed by a 1,000-pound utility chassis and a 3½-ton truck.

To Use Continental Engines.

The Muskegon factory of the Continental Motors Corp. is to construct two sizes of truck engines and in accordance with the standardized government specifications for trucks of the United States army.

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Natural Gas as a Fuel.

Among the sources of fuel supply, and one that is not generally known to the average user of gasoline, is natural gas. This industry is one of considerable size, having contributed something like 104,212,809 gallons of fuel in 1916. It has increased its production over 59 per cent., or in other words, 38,848,144 more gallons were produced than during 1915.

The amount produced or raw gasoline extracted from natural gas, includes that produced by the compression and absorption methods, as well as that obtained by the use of vacuum pumps and recovered as drips from gas transmission lines. The quantity of commercial gasoline represented by this output of raw casing-head product, though not susceptible of actual determination, was probably more than 200,000,000 gallons.

To obtain the fuel above referred to required 208,800,000,000 cubic feet, and it is estimated that the average recovery of gasoline per 1,000 cubic feet by all methods in practice is about half a gallon. Other statistics of this industry are interesting. For example: There are now 594 plants engaged in this work; that is, there were that many at the end of 1916. This represents a gain of 43 per cent. The average daily capacity of all plants, combined daily capacity, has increased about 108 per cent., or from 232,336 to 484,448 gallons. From these figures it is very evident that the natural gas gasoline industry is a factor in the production of fuel for internal combustion engines.

To Display Fuel Prices, Etc.

When the New York State Automobile Association held its convention recently it adopted a resolution recommending legislation compelling dealers to post conspicuously the price, quality and make of all gasoline offered for sale.

Other proposed legislation approved would make it impossible for road contractors to close roads without first having provided convenient and suitable detours, provide that both sides of a highway may not be covered with oil at one time unless that oil is suitably covered, render it impossible for any cities or incorporated village except New York City to adopt local speed ordinances, or provide for the licensing without examination or fee of all automobile drivers and make it obligatory for the names and addresses of automobile owners to be furnished by the Secretary of State and the police to automobile clubs when request is made through proper authorities.

The convention also recommends that the State police be called upon to enforce the law requiring all vehicles to display lights at night.

Calls Off Used Car Show.

The Automobile Trade Association of Washington, D. C., has called off the proposed used car show. This is due to the fact that dealers report they have been unable to keep a sufficiently large supply of used machines to enable them to hold a show.

Now It's Connecticut.

It appears that Connecticut is to enforce a law compelling motorists to carry mirrors or reflectors when the top of the car is raised or the machine has an enclosed body. The Commissioner of Motor Vehicles has called the attention of the police to the violations of the law, but the police are in doubt as to the exact meaning of the law passed at the last legislature and which applies to mirrors on motor cars.

City Tests Lamps.

The officials of St. Louis, Mo., believe in co-operating with the motorists in the matter of proper lighting equipment. The street commissioner has invited motorists to visit the City Hall and have their lights tested. All approved lamps are to be marked with a small red disc pasted on the glass of the lamp, and the disc is to be varnished over. The city officials are to do away with glaring lights and laws are to be strictly enforced.

Fuel Supply Sufficient.

The supply of crude oil for the production of gasoline and lubricating oil is sufficient for the next five years, providing the production of crude is kept up as at present, but while the situation with regard to the gasoline supply or the crude either is not grave, it does demand very serious consideration, says A. C. Bedofrd, of New York, president of the Standard Oil Company of New Jersey.

Cars Increase in Wisconsin.

Wisconsin has issued 160,000 licenses up to September 1, which is 10,000 in excess of the highest estimate made at the beginning of the year. The gain over last year is 40 per cent. There has been a corresponding increase in the number of licenses issued to dealers despite the fact that agency lines have been more strictly drawn everywhere.

Republic Trucks Increase.

Indicating the increasing demand for commercial vehicles is the report of the Republic Motor Truck Co., Alma, Mich. The company disposed of 12,917 cars for the year ending June 30, an increase of 3,851 over the preceding year.

Sweden Conserves Fuel Supply.

Sweden has issued a royal decree in order to conserve the supply of fuel. According to this decree permission must be obtained from a commission before use can be made of gasoline in any motor vehicle or motor boat.

COMING EVENTS.

Los Angeles, Cal., November 12-17.—Pacific Coast Show, Los Angeles Motor Car Dealers' Association.

Denver, Colo., November 12-18.—Automobile and Accessories Show, Automobile Trades Association of Colorado.

Springfield, Mass., December 3-9.—Show, United Shows Co.

New York, N. Y., January 3-4, 1918.—Quarterly Meeting, Automobile Electrical Association.

New York, N. Y., January 5-12.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.

New York, N. Y., January 11-16.—Meeting of National Association of Automobile Accessory Jobbers.

Washington, D. C., January 11-18.—Carnival and Open House Week, Automobile Trade Association of Washington.

Montreal, Can., January 19-26.—National Motor Show of Eastern Canada, Montreal Automobile Trade Association.

York, Pa., January 21-26.—Automobile Show, the York Auto Dealers' Association.

Chicago, Ill., January 26-February 2.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.

St. Louis, Mo., February 11-16.—Show, St. Louis Automobile Manufacturers' & Dealers' Association.

San Francisco, Cal., February 16-26.—Second Annual Automobile Show, San Francisco Automobile Dealers' Association.

Boston, Mass., March 2-9.—Automobile Show, Boston Automobile Dealers' Association.

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New California Trailer Fees.

After January 1 the California motor vehicle law will have several changes. A charge of $2 is to be made for number plates for trailers. Where more than one is used only the rear one need carry a license plate. Trucks over 9,000 pounds with load are limited to a speed of 25 miles per hour and to 15 miles when the load is 1,200 pounds. When the load is over 24,000 pounds the speed is limited to 10 miles. Trucks using metal tires must not exceed a speed of six miles per hour.

Will Increase Fuel Supply.

Gasoline production in the United States is expected to be considerably increased by a decision of the Standard Oil Company of Indiana to permit unrestricted use of its Burton refining process. Heretofore only the Standard companies and a few independents have been allowed to use it.

The Standard's action was prompted by the present great demand for gasoline, which threatens soon to overtake production. With the Burton process almost twice as much gasoline is obtained from crude oil as under other refining methods.

Conducts Service School.

The importance of service is noted in the plan of the Federal Motor Truck Co., Detroit, Mich., which concern is conducting a three-day school at the factory and teaching service men the fine points of commercial cars.

Portland Welcomes Motorists.

Up in Portland, Ore., the police and traffic officers have been appointed a special committee to welcome automobilists from out of town. If you happen to drive to Portland and an officer stops you as you enter the city limits, do not be afraid. He will merely bid you welcome, offer you information and present you with a convenient map of the city. Other cities please copy.

NEW AND INTERESTING THINGS IN MOTORDOM

A Natural Tightener for Loose Wheels.

A half day in the creek used to be necessary occasionally for loose wagon wheels. Automobiles, however, cannot be given such treatment. So American inventive genius has discovered Spoktite, a preparation that will do the work better and keep the wood swelled longer



A Can of "Spoktite."

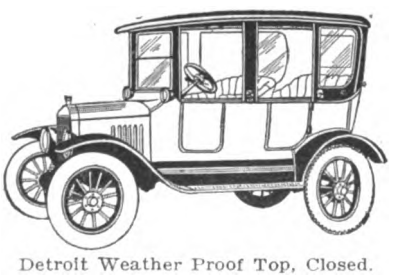
than water and yet do it just as naturally. Motorists will not have to make a mechanical repair of loose spokes. Neither will the car have to be laid up for a day in a blacksmith shop or repair shop. Anyone can tighten loose, rattling spokes in a short time by simply injecting a little Spoktite at the hubs and felloes into the cracks caused by shrinkage. It doesn't take long for Spoktite to penetrate to the core of the wood and it expands every fiber. And it is something that will not evaporate quickly under the hottest sun. This popular preparation is made by the Liquid Wheel Tightener Co., Modesto, California, who state that Spoktite will tighten wood of all kinds and in all places. It will tighten loose furniture, floors, tool handles, implements, etc. And one of its best features is its ability to stop body squeaks for vehicles of all kinds. There was a great demand for it last summer, but the manufacturers expect it to be many times larger after the first time buyers have used it successfully on household articles as well as auto wheels. Spoktite is sold in containers of four different sizes. The ½-pint can, selling at a dollar, is enough to tighten four wheels. It has a handy spout attached for application. The other cans hold respectively, one quart, a half-gallon, and a gallon. The Liquid Wheel Tightener Co. will be pleased to answer any inquiries about Spoktite. Most of the garages, hardware stores and auto supply stores carry it in stock ready for use.

New Era Removed to Grand Rapids.

The New Era Spring & Specialty Co. is discontinuing its main sales office at Detroit, Michigan and establishing its general headquarters at their Grand Rapids, Michigan, factory. This will enable them to keep in closer touch with manufacturing conditions at the plant.

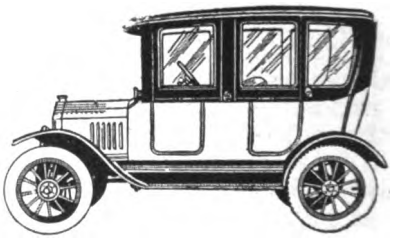
Detroit-Weatherproof Detachable Top.

This top which is illustrated herewith is manufactured by the Sharer Patent Top Co., 239 W. 56th Street, New York City. Motorists nowadays demand equipment that is available and suitable twelve months out of twelve. Inclement weather conditions must be overcome and



Detroit Weather Proof Top, Closed.

protection is demanded against rain, storm and cold. The two illustrations show this top open and closed. The manufacturers claim that this is the only all-weather top that entirely eliminates the objectionable features of a detachable top and affords the car owner an enclosed or open body at a yearly low price. The specifications of this top include patented flexible sliding doors which disappear instantly into the roof with no glass to rattle or break. Thus any amount of desired ventilation can be secured with full freedom for traffic signaling. All four of the doors can be opened in a few seconds. The Detroit Weatherproof Tops are extremely light, weighing only approximately 50 pounds. They are absolutely non-rattling and can be attached while the driver waits and they do not deface or mar the car when



Detroit Weather Proof Top, Open.

detached. These tops are exceedingly well finished, the exterior being of a strong, durable, long-wearing special material and the interior lining and trimming of durable limousine cloth. These tops are also low in price and easily within the reach of any car owner. They enable the Ford owner to convert his car into an all-year-round automobile, neat and handsome in appearance. For prices and full particulars, write direct to the manufacturers, the Sharer Patent Top Co., 239 West 56th Street, New York City.

Keeping Tab on Dealers' Sales.

The Tuthill Spring Co., of Chicago, Illinois, have an interesting way of calling their jobbers' attention to the business they are doing on Tuthill springs. Each month they send them a "graph," which tells at a glance the business done and how it compares with the monthly records of the previous year and a half. This is a system which jobbers could use in keeping track of their dealers' business and which other manufacturers could use to a good advantage.

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Two-Three Tire Carriers.

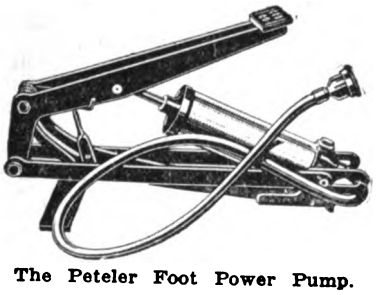
A new line of tire carriers will be placed on the market for the season of 1918 by the International Stamping Co., 400-412 North Leavitt Street, Chicago, Illinois. This company calls special attention to what they call their Two-Three tire carrier, which will enable any car owner to carry all the extra tires desired as a regular proposition or for special trips only. Assuming that the car owner has provision for one extra tire, this carrier rests upon and is supported by tire No. 1, it in turn will support tire No. 2 and No. 2 will support another carrier for tire No. 3, thus making it possible to carry almost any number of extra tires. Readers who are interested should write for full particulars direct to the manufacturer.

The Knudsen Packless Swivel Joint.

There has recently been placed on the market a new swivel joint for use in steam, air, gas and ammonia lines, requiring no packing because the cast iron spring (cast iron being used in this case as it is for the manufacture of piston rings) permanently seats the joint and therefore eliminates the cost and annoyance of repacking the joint. It follows, of course, that the cost of rubber or metallic hose serving as a conduit for steam, air, gas and ammonia is cut down in proportion to the cost of a permanent iron pipe line. That the Knudsen packless swivel joint makes it possible to use common iron pipe for a permanent and flexible line is now illustrated in hundreds of installations in various branches of industry. This specialty is made by the Universal Valve Co., Burlington, Wisconsin.

Peteler Foot Tire Pump.

This excellent device for pumping tires is illustrated herewith. This pump is sound in construction, is extremely simple in design, and anyone who has pumped up tires by the old hand method, knows how much easier it is to do this pumping with the foot, as of course, the weight of the foot assists materially in the operation, where foot power is used

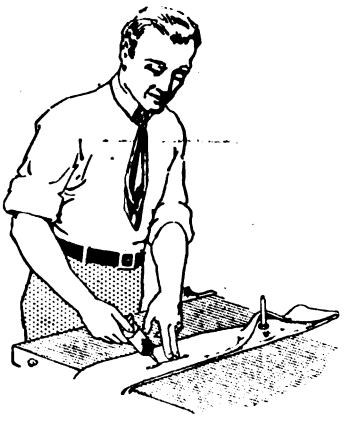


The Peteler Foot Power Pump.

instead of hand power. No loss of efficiency can occur in the Peteler foot tire pump, owing to its peculiar construction. This pump is guaranteed to be made with best workmanship, extremely durable, and guaranteed to give 100 per cent. efficiency. Readers who are interested should write direct to Moreau & Pratt, Inc., 1834 Broadway, New York City.

Para Rubber Products Company Specialties.

The Para Rubber Products Co., 27 William Street, New York City, is manufacturing several valuable specialties for the tire trade and for the use of car owners in the care of their tires. They call special attention to the self-vulcanizing material which they manufacture. The product of this company called Vulcanizit will form a tough elastic rubber weld over cuts, tears and holes in inner tubes. Another compound manufactured by the same company called Kutfiller is designed for use on automobile shoes to fill cuts, tears and sand blisters. If used in time, Kutfiller will prevent blowouts. It can also be used to cement down a torn flap. Both Vulcanizit and Kutfiller come conveniently packed in



Method of Applying Vulcanizit.

collapsible tubes and the illustration shows a workman using Vulcanizit for the repair of an inner tube. The same company also manufactures Tiretrim, a liquid rubber tire dressing, and Toptrim, a dressing for mohair tops and cushions which renders any fabric top absolutely water-proof. The dealers, repairmen and garage owners who may be interested in this product should write for prices and full particulars to the Para Rubber Products Co., 27 William Street, New York City.

Kimball Tires.

Dealers throughout the country are taking considerable interest in the new Kimball tires, which are marketed by the Kimball Tire & Rubber Co., Dept. 18, 1473 Michigan Avenue, Chicago, Illinois. The line of Kimball tires includes the Kimball button-grip, the Kimball bar-grip and the Kimball cord-type tire. Good quality together with low prices have made these tires a quick selling proposition. Dealers should consult the price list published by this company in their attractive full page advertisement in this issue.

Steer Warms for Winter Driving.

Dealers who are considering quick selling winter specialties should not forget the very clever device called Steer Warms, an invention for enabling drivers to be comfortable in severe winter weather. Every one who drives a car knows that the hands get very cold and stiff even if the mercury is only a little below freezing point, and in zero weather the trouble from cold hands is almost unbearable. Steer Warms are applied directly to the steering wheel at the points grasped by the driver and a uniform heat is furnished, making driving just about as comfortable as it would be in summer. Steer Warms are not expensive. For all gasoline cars the price is $7.50 per pair, and in Canada $11.00; and special Steer Warms for Ford cars sell in this country for $5.00 and in Canada for $7.25. The wholesale price on Steer Warms is such that any dealer can make an excellent profit, and the manufacturers also furnish advertising aids and practical sales suggestions to dealers, which make it easy to sell the goods. Readers who are interested should write for prices and full information to the manufacturers, the Interstate Electric Co., 845 Perdido Street, New Orleans, Louisiana.

Wayne Enlarges Plant.

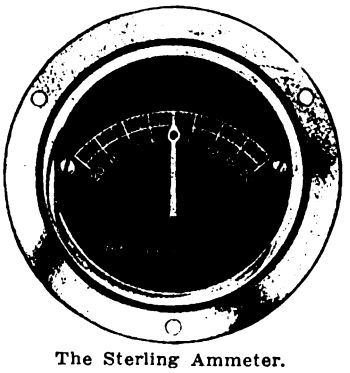
The Wayne Oil Tank and Pump Co., of Ft. Wayne, Indiana, is greatly enlarging its plant. Three additions have just been completed, doubling their present floor space. Four acres have recently been purchased immediately west of the main office building and will be used for an addition to the heavy metal tank shop. J. B. Beall, formerly factory sales manager, will have charge of a new branch office at Cleveland, Ohio; and J. D. Rauch, formerly treasurer of the American Steel Dredge Co., of Ft. Wayne, is the new factory sales manager. Both changes became effective September 1st.

Continental Accessories.

The Continental Auto Parts Co., of Knightstown, Ind., makes a line of specialties which are very attractive. This line includes the Continental foot rest, the Continental motor stand for repair shops and the Continental steam vulcanizer for car owners. This is a quick selling line which ought to interest a great many of our readers who should correspond directly with the manufacturers, who will gladly furnish literature, prices and full particulars in regard to all these specialties.

The Sterling Ammeters.

This instrument which is illustrated herewith is especially constructed for automobile use. It is of the permanent magnet and moving vane type having a wide, clearly defined dial and broad pointer. It is beautiful, accurate and



The Sterling Ammeter.

durable and is described by the manufacturers as the latest product of 11 years of successful meter making experience. Readers should write for prices and particulars to the Sterling Manufacturing Co., 321 Frankfort Avenue, Cleveland, Ohio.

Lite-A-Ford.

In calling attention in our last issue, on page 80, to Lite-a-Ford, giving some particulars concerning it, the address of the manufacturers was inadvertently omitted. This article is manufactured by the Hastings Mfg. Co., 209 Michigan Avenue, Hastings, Michigan.

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JOHNSON'S CARBON REMOVER

Cures 80% of Engine Trouble

A dose of Johnson's Carbon Remover—The Engine Laxative—will make your motor run like it did the first 500 miles—quietly and full of "pep"—And your gasoline consumption will drop from 12% to 25%. You will save from $3.00 to $5.00 over any other method.



You Can Take the Hills on High Without a Knock

if you will keep your motor free from carbon with

JOHNSON'S CARBON REMOVER

That knocking in your engine—difficulty you have climbing hills—poor pick-up—pre-ignition and lack of power will all be overcome.

You Can Do It Yourself

For 25c—five minutes' time—and with no labor, you, yourself, can remove all carbon deposits. Pour an ounce of Johnson's Guaranteed Carbon Remover into each cylinder—allow it to remain two to twelve hours, then drive your car 10 or 15 miles. Results will surprise you.

Use It Every 1,000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will eliminate most valve trouble and your engine will always be at its highest efficiency.

If your dealer cannot supply you with Johnson's Carbon Remover, use attached coupon.

Write for our folder "Keeping Your Car Young"—it's free.

$1.00 Special Offer $1.00

S. C. JOHNSON & SON, Dept. AD10, Racine, Wis.

I enclose $1.00 for which please send me by prepaid express enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four-cylinder motor four times.

NAME.....

ADDRESS.....

CITY & STATE.....

MY DEALER IS.....

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JOHNSON'S PREPARED WAX

Now Made in Liquid Form

We are now making Johnson's Prepared Wax in ***Liquid Form*** as well as Paste—so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is exactly the same as our Paste Wax except that it is a liquid. Apply with cloth, brush or spray.

Is Your Car Dirty, Grimy and Unsightly?

DO you know that you, yourself, can make it look almost like new and save the cost of revarnishing? All you need is Johnson's Cleaner and Johnson's Prepared Wax ***Liquid.***

JOHNSON'S CLEANER

entirely removes all stains, scum, road-oil, tar and grease from body, hood and fenders. It doesn't injure or scratch the finest varnish—simply cleans and prepares it for the Wax polish.

Absolutely Dust-Proof

Johnson's Prepared Wax Liquid gives a hard, dry, glasslike polish which does not collect or hold the dust. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches—prevents checking and cracking—sheds water and makes a "wash" last twice as long.

Johnson's Prepared Wax Liquid is very easy to use—it polishes instantly with but very little rubbing. You can go over a good sized car in half-an-hour.

Quarts.....$1.40 Pints.....$ .75
East of the Rockies

If your dealer cannot furnish you with Johnson's Automobile Products, we will pay the expressage to any point in the United States east of the Rockies.

Write for our folder "Keeping Your Car Young"—it's free.

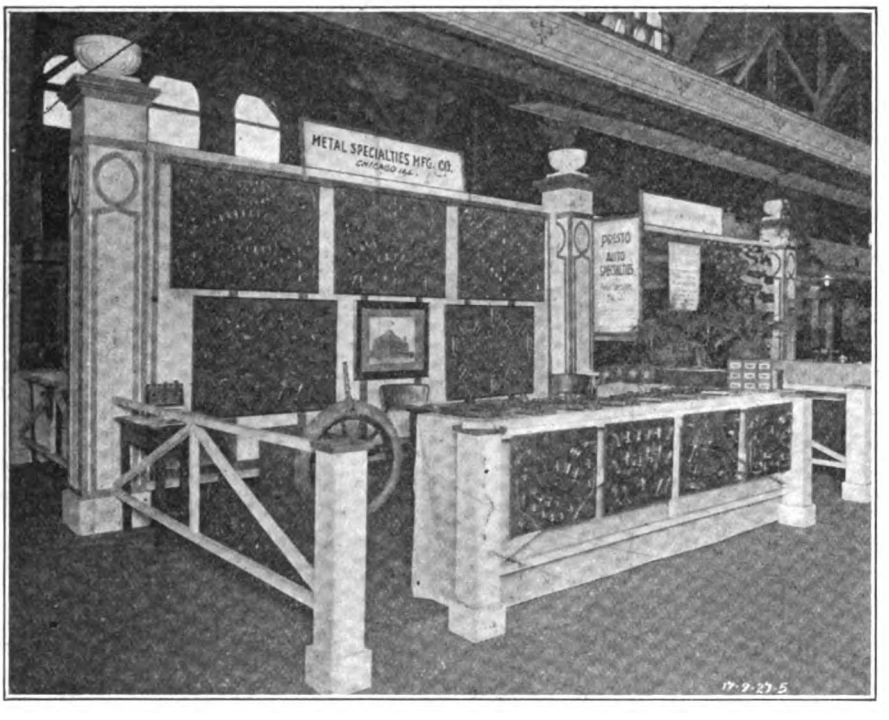
S. C. JOHNSON & SON, Dept. AD 10, Racine, Wis.



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Presto Display Wins Blue Ribbon.

The Metal Specialties Co., Chicago, Illinois, manufacturers of the Presto line of accessories, was the winner of the Blue Ribbon, the highest award at the National Exposition for Ford Accessories, for the "most complete and easily understood exhibit." The articles were grouped in a comprehensive and attractive manner, on wooden and plush panels, which made a handsome background and gave clear prominence to the various accessories. The articles that were closely related to each other were displayed upon the same panel. The cigar lighters and the inspection lamps were exhibited together. The dash lamps and cowl lamps were shown in a careful and pleasing design. The electric engine, radiator and carburetor heater occupied a panel on the counter, and the allweather protector and tire tool were given places of prominence by themselves. Great care was expended in arranging each panel and when the individual board had been worked out into an attractive design the whole series was arranged in an excellent picture. The thoroughness, the beauty, and the ease with which the display could be understood, earned the Presto exhibit the highest honor. The value of such a display was proven by the Metal Specialties Co., for they had the distinction of making the first sale at the Exposition, an order amounting to $1,000. There were many interesting and beautiful exhibits, but it was agreed by authorities that the Presto display fulfilled all requirements for the Blue Ribbon.



Blue Ribbon Winning Exhibit at Accessory Show.

Largest in the West.

Indianapolis, Indiana, is able to boast of the largest cylinder regrinding establishment in the Middlewest, the Butler Mfg. Co., of 1124 E. Georgia Street. This concern is not only the largest of its kind in its own section, but the new equipment which it is installing this fall will make it the second largest in its field in the whole United States. This company is growing not alone because of the excellence of its service, but because the regrinding of automobile cylinders and the fitting of new oversize pistons is a rapidly growing practice. This regrinding of the cylinders changes an engine which is a weakling, one which is losing power and wasting gasoline and oil, into an engine which is practically new; that is, insofar as the cylinders and pistons are concerned, with an abundance of compression and pep, and a noticeable decrease in operating expenses. Butler Mfg. Co. is not a local concern. During the last week in July it shipped out orders to ten different states in the union, not including shipments to a large number of points within Indiana itself, and in addition, shipments to Canada and for export. Inquiries for information and prices have come from as widely scattered places as Japan, New Zealand, South America and Europe. All of the work of Butler Mfg. Co. is done to its own standards, all of which have been developed and tested through years of patient study. Freak ideas are avoided and sound progressive lines alone are adhered to. Complete measurement records are kept of all orders of cylinder, piston and wristpin work, so that information can be furnished, or duplicate parts promptly supplied to the customer. The company believes in giving honest, intelligent service, and its wide clientage proves that it lives up to its belief.

A Live Proposition for Dealers.

The Krom-Nik Gear Company, 910 S. Michigan Ave., Chicago, Illinois, is sending out a circular to call the attention of live dealers to the advantages of selling M. & S. differentials for replacement on Ford and Chevrolet cars. Nearly every day a customer is likely to come along who wants a gear replacement; and the dealer and repair man who is in a position to supply this demand is sure to make considerable extra money. The Anderson rolled gears made by this company are guaranteed to fit Ford cars. They are also guaranteed in a general way as to workmanship and material and the manufacturers claim that they will actually last longer than cut gears. The M. & S. differentials for Ford rear axles have deservedly received much attention from the trade and there is a large sale on this specialty throughout the country. This differential meets Government specifications. There is nothing freakish in its construction, as it is a true differential with spiral gears which all engineers agree are necessary for differentiation of power, and which can only be secured through a series or chain of gears. It is claimed that the installation of this differential on a Ford car will eliminate all future repair expense to this portion of the car. Readers who are interested should write to the main office of the Krom-Nik Gear Co., 910 S. Michigan Ave., Chicago, Illinois, for prices and full particulars also terms to dealers. Many of our readers should be interested in these quick selling specialties.

New Demountable Felloe Band.

The Hood Tire Co., Inc., Watertown, Massachusetts, will place on the market for the season of 1918, a new demountable felloe band for solid rubber tires. Every truck owner knows the loss of time incurred when his truck must be laid up to change tires. The trips to and from the service station and the time necessary to change the tire represent to the truck owner time wasted. With this new self-contained demountable felloe, the truck driver can change his own tires just as a pleasure car owner changes his demountable pneumatic tire rims. This change can be easily and quickly made, anywhere and at any time, without removing the wheels. Such an invention will undoubtedly be greatly appreciated by truck owners; and we believe this device will command a large and ready sale in the trade.

Automobile Reference Books.

We wish to call the special attention of our readers to an excellent reference book on automobile engineering which is published by the American Technical Society, Dept. A-7557, Chicago, Illinois. This work is in five volumes, containing a total of 2400 pages of reading matter and 2000 illustrations, tables and diagrams.. This book is exceedingly useful for every dealer, garageman, repairman or car owner. The volumes are flexibly bound in genuine morocco leather, gold stamped. There are almost two entire volumes devoted to ignition, starting and lighting systems, with a great many wiring diagrams. Every conceivable mechanical subject is treated in this work, and it is sold on a basis of 50 cents per week until the entire price of $17.80 for the five volumes has been paid. This work will also be sent for seven days free examination to any reader who will fill out and send in the coupon which appears in this issue attached to the advertisement of the American Technical Society.

Removal Notice.

The Hartford Tire & Rubber Co., well known New York tire dealers, has moved from 149 West 51st Street to a much larger and better store at 238 West 56th Street. In the new store this company will have 3000 square feet of floor space right in the automobile center.

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Cork Inserts Stop the Slip



ADVANCE
CORK INSERT
TRADE MARK REG. COPYRIGHTED 1917
TRANSMISSION LININGS FOR FORDS

They Stop the FORD Jarring and Chattering

They make the Ford Brake BRAKE!
They outlast 3 sets of ordinary linings

When Cork Insert Transmission Linings go on a car, smooth, positive, quiet transmission action begins. They end those noisy, chattering stops with the car shaking like a tree in a gale. They stop those jarry, jumpy get-aways. They eliminate those lurchy reverses.

Here's why: the jumping, chattering, lurching, is caused by faulty transmission linings. Ordinary transmission linings soon get hard and smooth in service. Then they slip when brought into use. That grabbing and slipping causes all the jerking, sets up the noisy chattering, makes the braking action uncertain and slowly but surely junks the car.

Cork Insert Transmission Linings eliminate the slipping—the rattling—the jerking. The corks never get hard or slippery. They give a better driving, better braking car and a lining that greatly outwears ordinary lining.

$3 for set of 3 — Outwear other linings 3 to 1

Order From Your Jobber

Order at least a dozen sets of Cork Inserts next time your jobber's salesman drops in. Cork Inserts mean better profit for you—better service and satisfaction for the user. They are the livest line in the field. Strongly advertised. Your customers know about them. Stock them and they'll move fast. Send coupon if your jobber can't supply you, and get started selling them.

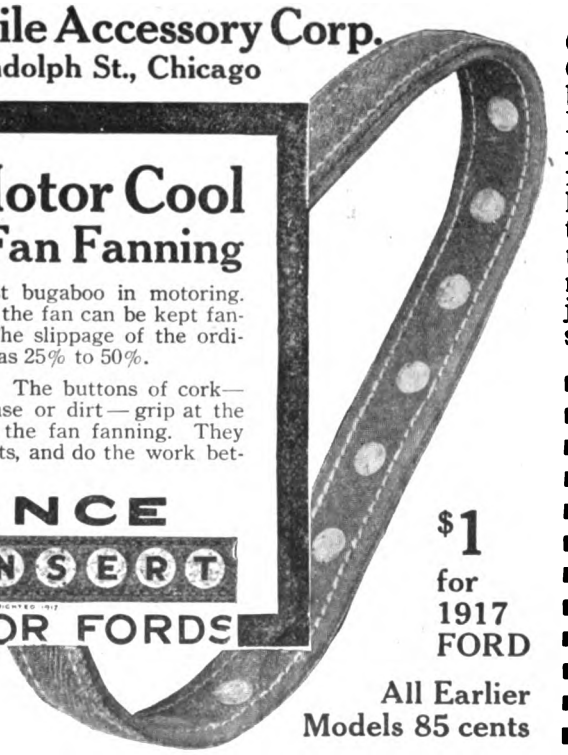
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Dept. J5-1 56 East Randolph St., Chicago

Keeps the Motor Cool by keeping the Fan Fanning

Overheating—that's the biggest bugaboo in motoring. Overheating is largely avoided if the fan can be kept fanning by a belt that don't slip. The slippage of the ordinary Ford fan belt runs as high as 25% to 50%.

Cork Insert Fan Belts don't slip. The buttons of cork—unaffected by water or oil, grease or dirt—grip at the first turn of the motor and keep the fan fanning. They outwear several ordinary fan belts, and do the work better as long as they last.

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CORK INSERT
TRADE MARK REG. COPYRIGHTED 1917
FAN BELT FOR FORDS



$1 for 1917 FORD

All Earlier Models 85 cents

Dealer's Coupon Check and Mail Today

Advance Automobile Accessories Corp.
Dept. J5-1 56 East Randolph St., Chicago

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[ ] Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.
[ ] Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford.
[Regular dealer discounts to apply.]

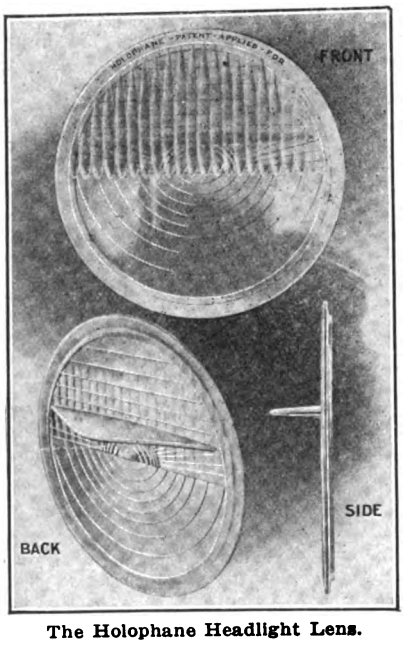
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Holophane Non-Glaring Headlight Lens.

A glareless headlight lens built on the prismatic principle, with the addition of a diffusing shelf or fin, is being manufactured by the Holophane Glass Co., 340 Madison Avenue, New York City. This lens has been designed to comply with the strictest laws, not losing sight of the fact that it is as important to have enough light for the driver to see the road clearly as it is to prevent glare in the eyes of the approaching driver.

As can be seen from the illustration, there are three general types of prisms in addition to the fin. The horizontal prisms at the top bend the light down below the horizontal so that the rays that would usually go up and be wasted, are thrown down on the road. The prisms radiating from the center, bend a portion of the beam down sharply for lighting a wide road area at a distance. Thus, by having prisms designed to



The Holophane Headlight Lens.

do a specific part of the work, a higher efficiency is obtained and results secured that extended investigation into the requirements of scientific lighting, have shown to be necessary.

One exclusive feature of the design is the addition of the diffusing fin that projects back over the bulb and so thoroughly diffuses the direct light from the bright filament, that the glare therefrom is completely eliminated. This method of reducing the glare is most economical, as the thin fin does not interfere with the rays of light coming from the reflector. The manufacturers claim that by keeping the beam of light low (below the 42-inch line) there is no back reflection from rain or dust so that the road can be seen under all conditions. They have been approved by a number of states as complying with the regulations.

Repairing Magnetos.

The magneto can hardly be properly repaired in an ordinary shop. Special technical experience is required for this work, which is exceedingly delicate Hechts Magneto Exchange, 230 West 49th Street, New York City, makes a specialty of this work; and this company may be regarded as the pioneer concern in this line, as they have been repairing magnetos for satisfied customers for several years. This company has just completed its electric starting and generator department by equipping it with the finest Weston electric testing instruments. The agency for the Swiss and Berling magnetos has also been taken over by this Company, and a mail order business is carried on in repairing magnetos. Dealers, repair men or car owners requiring work of this kind should correspond with the Hecht's Magneto Exchange as they may be assured of careful work and reasonable prices.

New Construction of Ez-E-Kleen Spark Plug.

The perpetual Spark Plug Co., Inc., 328-334 E. Drinker Street, Dunmore, Pennsylvania, announce that they have materially changed the design of their Ez-E-Kleen spark plug; also the "Manufacturers Special" plug, the object of the change being to make the spark plug compression tight when heated by the engine. This result is obtained by making the recess of the key-seat inside the metal shell and on the outside of the insulator, locating it close to the soft joint, so that no metal is between the key-seat and the soft joint, to expand from the heat of the motor; thus making a compression-tight spark plug when heated by the motor, as well as when the spark plug is cold. Readers who are interested should write direct to the manufacturer for a complete description of the new plug.

An Improved Magneto and Generator Coupling.

The Climax Motor Devices Co., 5209 Prospect Ave., Cleveland, Ohio, is placing on the market an improved type of magneto and generator coupling in which without disturbing the simplicity of the regular coupling, several additional features have been incorporated which add to the usefulness of the device. This coupling is now doubly universal and flexible, and is designed to allow for every shaft misalignment, whether direct or otherwise. It is also absolutely foolproof as there are no nuts or bolts to be tightened. Readers who are interested should write for free circular, direct to the manufacturer.

"Red Devil" Pliers.

There is no tool which is needed more around an automobile than a good pair of pliers. Smith & Hemenway Company, Inc., 83 Coit Street, Irvington, New Jersey, manufacture the "Red Devil" pliers, a tool which is made of the best material by skilled workmen and one which will appeal to every car owner or automobile repair man. "Red Devil" pliers are made in over 100 styles of drop-forged steel and are stocked by all jobbers. Readers who have not already obtained the catalog issued by this company, should send for one, as it is free for the asking to any dealer or repair man.

The Rex Gasoline Hose.

This is an excellent hose which will appeal strongly to the trade and car owners on account of its peculiar construction. This hose has a core of asbestos packed steel tubing, covered with gasoline proof gum, over which is woven a cotton jacket. This hose is recommended for use in connection with measuring pumps for gasoline and oil, and to those who require service and satisfaction. The couplings are of the compression type, especially designed so that they cannot leak or pull off, also giving full flow without any back pressure to pump. Couplings and hose to fit all pumps are made in several sizes, ¾

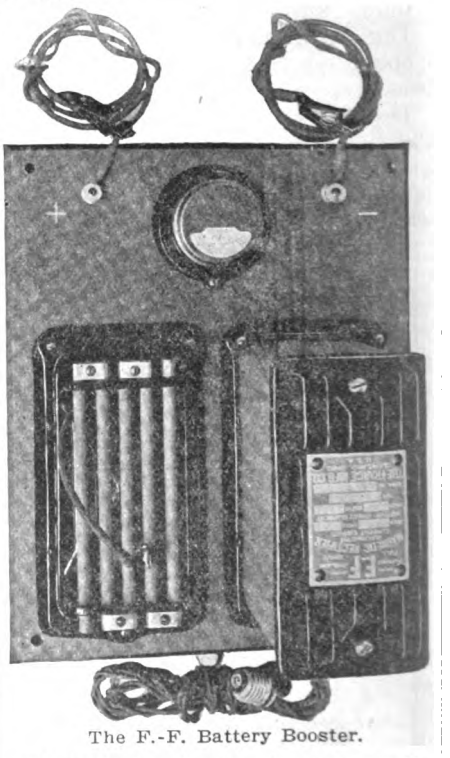


The Rex Gasoline Hose.

inch, 1 inch and 1¼ inches and in any length. Packless Anti-Drip Nozzles are also furnished with this hose which is manufactured by the Chicago Tubing & Braiding Company, 216-224 N. Clinton Street, Chicago, Ill.

New Electrical Specialty.

We illustrate a new electrical specialty made by the France Mfg. Co., Cleveland, Ohio. It is called the F-F Battery Booster, with new rheostat control mounted on a panel. The variable carbon resistance unit is a departure from older forms of rheostats and the combination allows all capacity batteries, from the smallest hand lantern and motor-



The F.-F. Battery Booster.

cycle batteries to the largest starting batteries, to be charged at anything from a very low rate up to the maximum output of rectifier of 10 to 15 amperes with 6-volt batteries. The outfit as shown sells for $28.00. If desired the resistance unit is sold separately at $5.00 to be used in connection with the portable type rectifiers, made by this company.

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Many Positions Open.

The United States Civil Service Commission announces the following open competitive examinations for positions in the several ordnance establishments of the War Department or in or under the office of the Chief of Ordnance, War Department, Washington, D. C. The salaries named are for entrance.

Mechanical engineer, artillery ammunition, $3,000 to $3,600 year.

Mechanical engineer, experimental work, $2,500 to $3,000 year.

Mechanical draftsman, $1.000 to $1,400 year.

Apprentice draftsman, $480 year.

Inspector of artillery ammunition, $1,500 to $2,400 year.

Inspector of field artillery ammunition steel, $1,500 to $2,400 year.

Assistant inspector of field artillery ammunition steel, $3.50 to $5 day.

Inspector of ammunition packing boxes, $3.52 day to $1,800 year.

Inspector and assistant inspector of powder and explosives, $1,400 to $2,400 year.

Inspector of ordnance equipment, $1,500 to $2,400 year.

Assistant inspector of cloth equipment, $80 to $125 month.

Assistant inspector of leather, $100 to $125 month.

Assistant inspector of small hardware, $80 to $125 month.

Assistant inspector of textiles, $80 to $125 month.

Assistant inspector of leather equipment, $100 to $125 month.

Clerk qualified in business administration, $1,200 to $1,500 year.

Index and catalogue clerk, $1,000 to $1,200 year.

The examination for index and catalogue clerk is open to both men and women; the other examinations are open only to men.

The Government urgently needs men for the work above indicated, and qualified persons are urged, as a patriotic duty, to apply for examination. Until further notice applications for the positions named will be received at any time by the United States Civil Service Commission, Washington, D. C. Papers will be rated promptly. Applicants will not be required to appear at any place for examination, but will be rated principally upon the elements of education, training, and experience, as shown by their applications and by corroborative evidence.

Full information concerning examinations, application blanks, etc., may be obtained by calling in person upon the secretary of the local board of civil service examiners at the postoffice in any city in which city delivery of mail has been established, or by communicating with the United States Civil Service Commission, Washington, D. C.

A new owner who equipped his car with a certain form of demountable wheel, was observed trying to remove a wheel because of a puncture. The wheel refused to budge until a puller was brought into play. An inspection of the wheel indicated rust. If wheels of this type are treated with graphite not only will rust be avoided but the work of displacing them made easy.

Deskroom in a large, modern office automobile can be secured at a very moderate price.

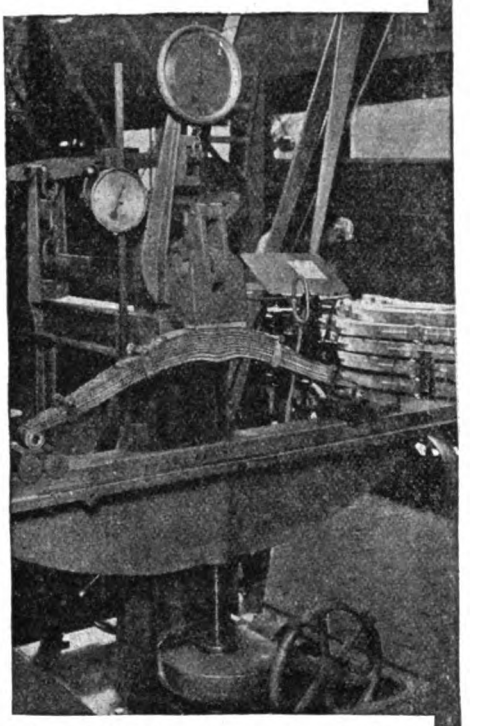
They Stand the Test for Strength

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Tuthill Titanic Lubricated Springs

are guaranteed forever against center breakage—guaranteed at all points and in every respect for one year.

No weakening center bolt — no center nib —but a patent flawless arch makes Tuthill Titanics strongest at the center. Easily adapted to any type of axle construction without extra expense. **More replacements are made with Tuthill Titanics than all other makes put together.** A special Tuthill Titanic Front Spring for Fords is now made — carries same guarantee. Get our attractive dealer proposition, and 1917 Price List.

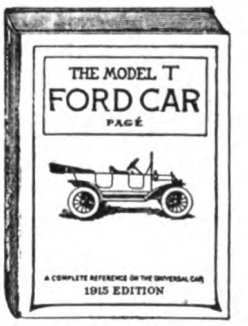


Tuthill Spring Co. (Established 1880)
760 Polk Street Chicago, Ill.

A NEW, COMPLETE BOOK
FOR EVERY FORD OWNER, DEALER, SALESMAN and REPAIRMAN

THE MODEL T FORD CAR

ITS CONSTRUCTION, OPERATION AND REPAIR



By VICTOR W. PAGÉ

Member of the Society of Automobile Engineers,

Author of "The Modern Gasoline Automobile," etc.

300 (5x7) Pages

Over 100 Specially Made Engravings

AND TWO LARGE FOLDING PLATES

Price $1.00

This is the MOST COMPLETE and PRACTICAL instruction book ever published on the FORD CAR. Illustrated by specially made drawings and photographs. All parts of the Ford Model T Car are described and illustrated, in a comprehensive manner—nothing is left for the reader to guess at. The construction is fully treated and OPERATING PRINCIPLES MADE CLEAR TO EVERYONE. Complete instructions for *driving* and *repairing* are given. Every detail is treated in a non-technical yet thorough manner.

Sent postage prepaid on receipt of Price

Address MOTOR VEHICLE PUBLISHING CO.,
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The Permatex Automobile Products.

Constant A. Benoit, M. S., of Sheepshead Bay, New York, manufactures a line of automobile products which must be of interest to a great many of our readers. This line includes Permatex heat resisting gasket cement, which is



Permatex Products, as Put Up for Dealers.
Made by Constant A. Benoit, Sheepshead Bay, N. Y.

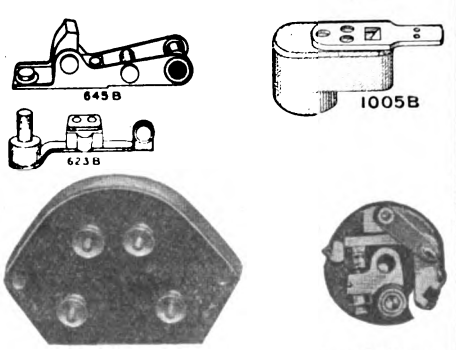
used by many of the manufacturers of automobiles, engines, motorcycles, airplanes, marine and tractor engines in the connecting of various flanged surfaces, such as cylinder heads, carburetors, manifolds, crank cases, etc. This product is guaranteed to be gasoline, oil and water proof. It has no injurious action on the engine and is used on all kinds of paper, asbestos, felt, rubber and metal gaskets, producing a pressure-tight union. It is claimed that this cement will stand five times the temperature that shellac will, and at this time, when shellac is so costly, it not only is an advantage to use this product, as far as results are concerned, but it is a means of economizing. The same manufacturer makes a large line of other products, under the trade name of Permatex products. This is a quick selling line for dealers and anyone interested should write for prices and full particulars direct to the manufacturers.

How Dixon's Helped Chevrolet.

A hot pace was set by Louis Chevrolet when he drove his Dixon's lubricated Frontenac flyer around the 100-mile Harkness cup course at Sheepshead Bay track on Saturday, September 23rd. Before 40,000 spectators he sped over the course in 54 minutes and 20 seconds, making the distance in 2 minutes and 30 seconds less than the dare-devil Dario Resta, another Dixon disciple, had previously covered this distance. The famous French upholder of the Frontenac colors took the lead in the first five miles and except for a short interval was never headed. One of the things which helped him win the race was, naturally his immunity from trouble. Old man friction always has a front seat at the big speed tournaments and is one of the most troublesome jinxes that must be headed off by the driver who would be successful. Not only must the winner in such close competition have great skill as a driver but he must also be far-sighted enough to be prepared to discount trouble. It was far-sightedness more than fortune that helped Chevrolet win out for he had been far-sighted enough to choose Dixon's graphite automobile lubricants. His past experience and the record of scores of other noted racing drivers were recommendation enough to Chevrolet. So it should be to every professional driver, pleasure drivers, or those who use motor cars as a business aid.

Guaranteed Magneto Parts.

Too much emphasis cannot be laid upon the importance of using nothing but the highest grade parts, guaranteed goods, when making replacements to the magneto, coil, timer-distributor, starting motor or lighting generator. The proper functioning of the ignition system, starter or generator is too important to impair their efficiency by the use of cut price goods, products that are costly and expensive in the long run. The manufacture of magneto, coil, distributor, motor starter and lighting generator parts requires years of experience and as well as a thorough knowledge of each particular make of magneto, etc., of which there are a large number on the market. This knowledge and experience has been acquired through an experience extending over fifteen years on

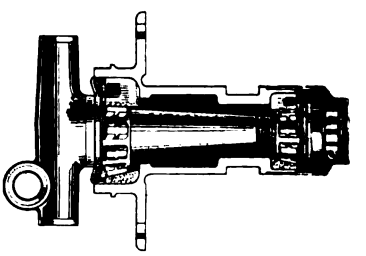


Illustrating Some of the Magneto and Timer-Distributor Parts Carried by the Guaranteed Magneto Parts Corp.

the part of the Guaranteed Magneto Parts Corp., 1765 Broadway, New York City. This concern produces and carries in stock a most comprehensive line of parts for all standard makes of magnetos and timers and distributers of the battery system of ignition, also for starting and lighting systems. Not only is the company prepared to ship at short notice any of these parts but it maintains one of the best equipped repair shops in the country and which is devoted to the expert repairing of all makes of magnetos, generators and motor starters. The facilities of the company are such that work is returned the same day the job is received, a service that appeals to both owners and garages. The Guaranteed Magneto Parts Corp. issues a very comprehensive catalogue describing and illustrating magneto, coil, generator, starter parts, etc., and it will be sent free upon request. This book should prove a valuable addition to every garage and repair-shop. As each part illustrated is numbered, it is a simple matter to order correctly any desired part.

The Trojan Roller Bearing.

The Ahlberg Bearing Co., 2636 Michigan Ave., Chicago, Illinois, and its branches are distributing the Trojan roller bearing for Ford and Chevrolet 490 front wheels. This bearing is a high grade tapered roller bearing made to take the place of the regular cup and cone bearings which are furnished with the Ford and Chevrolet cars. No changes whatever are needed in the present hub and spindle. It is only necessary to knock out the old bearings and insert the Trojan bearings in their



The Trojan Roller Bearing.
For Ford and Chevrolet Front Wheels.

place. Several thousand bearings have been in service for a considerable length of time and they have proved entirely satisfactory to the users.

The Halladay Line.

The Halladay Line, made by L. P. Halladay Co., Chicago, Illinois, for the coming year will include a number of new bumpers especially designed to meet the requirements of new car models, the construction of which necessitates a bumper of special design. It is the policy of the Halladay Co. to keep their line of bumpers so complete that there is a bumper for every car on the road no matter how new or old. Among the new patterns for front and rear are several with hinge adjustments and a new spring bar of entirely new design. The Halladay Flexlevers, both Ford and heavy car types, retain their popularity and will be continued without change in detail. Other items in the line include the Halladay can tipper, tilting steering wheel, side and rear tire holders and several items of minor importance. The Halladay Company is getting ready to produce several new accessories which will be announced in the near future.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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S. O. S. Storage Batteries.

The following letter from Barney Oldfield, the celebrated racing driver, will interest many of our readers:

"The Crown Hotel,
Providence, R. I., July 23rd, 1917.

Victor Storage Battery Co.,
Moline, Ill.

Gentlemen:

The battery which you put in my 6-cylinder Packard about two years ago I used for 48,000 miles, and never had it overhauled. My only regret is that when I sold my old car I neglected to keep the battery for my new Twin Six Packard.

You know me,
BARNEY OLDFIELD."

There could hardly be a stronger testimonial than the above. It would be a remarkable thing for a battery to give two years service in driving 48,000 miles, even at normal speeds, but to give such service on a car driven by Barney Oldfield is of course even more wonderful. The S. O. S. battery is adapted for all extremes of heat or cold, and the manufacturers state that the wonderful service and long life given by these batteries is only made possible because the plates will not buckle or sulphate. The S. O. S. battery plates are now supplied as replacements for the plates in other popular batteries. Dealers should write for price list of these plates and any who are interested, should write for their pocket battery guide to the manufacturers of S. O. S. batteries, The Victor Storage Battery Co., 701 Fourth Avenue, Moline, Illinois.

Incorporation of Essex Motors.

Announcement has just been made of the incorporation of Essex Motors, with an initial capitalization of $500,000, all paid in; and with the following officers, W. J. McAneeny, President; R. B. Jackson, Vice-President; A. Barit, Treasurer; J. L. Vette, Secretary. The Board of Directors includes, in addition to the above officers, R. D. Chapin, F. O. Bezner and O. H. McCormack. The announcement is of particular interest to the automobile trade and to the public generally because of the fact that all of the officers and directors are at present associated with the Hudson Motor Car Company. When interviewed on the subject, an official of the Hudson Motor Car Co. made the following statement:

"The organization of Essex Motors will not result in any change in the present very definite policies of the Hudson Company, but will provide for the development of a car for which we anticipate a strong demand in a price field not competitive with Hudson. It was for the purpose of producing such a car that certain of our stockholders formed the Essex Motors. There is no connection whatever between Essex Motors and the Hudson Motor Car Co. aside from the fact that these stockholders and directors are interested in the Essex Motors as individuals. Essex Motors is a separate and distinct organization and will be operated as such."

Naturally there is much speculation and there are many inquiries regarding the design of the Essex car, but officials of the Essex Motors decline any detailed statement in that direction for the present.

Kellogg Pump for Every Car.

The Kellogg Manufacturing Co., Rochester, New York, announces the enlargement of their production to such an extent that they are now able to supply any and all makes of automobiles with the Kellogg engine driven tire pump. This pump is being adopted by many manufacturers as standard equipment which is in itself a great compliment to the merit of the product.

The "X" Radiator Liquid.

This is a scientific preparation for mending leaky automobile radiators without metal or fire. It is claimed that this compound will absolutely make new radiators leakproof, rustproof and scaleproof. It contains no cement, powder or meal and cannot clog the radiator. It will not injure metal or rubber. This compound will not evaporate, freeze or lose its qualities with age. The big "X" on the can is a special trade mark which identifies this compound. Readers who are interested should write for prices and particulars to the "X" Laboratories, 630 Washington St., Boston, Massachusetts.

"Business Is Not as Usual."

"I should say that business is not at all as usual," said W. O. Duntley, president of the $14,000,000 Chicago Pneumatic Tool Company, which make the Little Giant line of trucks.

"Indeed, the motor truck business is better than it has been in some time. Our current sales have topped all previous selling peaks.

"The campaign for economy now being so forcefully carried on by many agencies, and in particular the newspapers, has brought home in striking fashion the assured economy of motor transportation.

"Business executives are recognizing it as part of their duty to retire their horses, which eat up uncountable acres

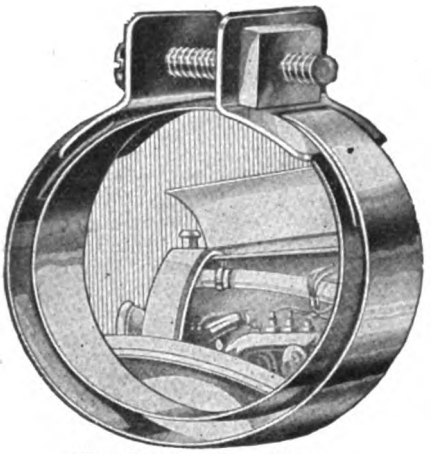
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of food that should feed human beings. In addition to this need and endeavor for national economy, personal economy also dictates that as the price of food is constantly rising, the work horse must be retired because he is too costly a transportation unit.

"And everywhere, and in greater numbers than ever before, the efficient, economical motor truck is displacing the traditional weary-eyed, ever-eating horse."

The Cooper Patented Adjustable Hose Clamp.

This is a new hose clamp which is mechanically correct in every detail. The inside surface of the strip is perfectly smooth. There are no laps or seams, no roughness in the stripping to cut, bruise, friction, or otherwise damage the hose. No feature of the clamp has been sacrificed in making it adjustable. This clamp circles the hose twice, giving it unusual strength of grip. It is locked firmly at all times and the nut cannot be loosened from the bolt nor the strips from the head without the use of a screw



The Cooper Hose Clamp.

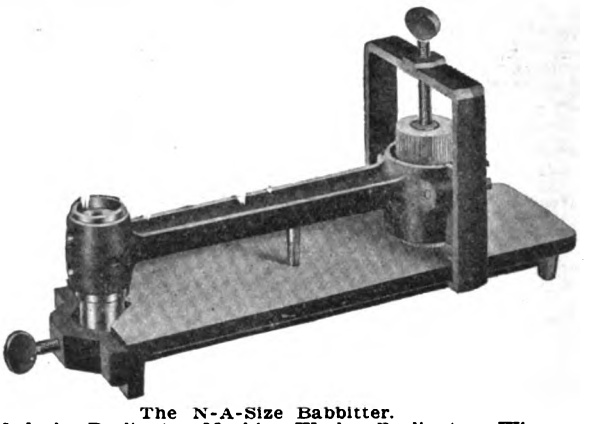
driver. It is simple in construction, making it easy to remove or replace. For dealers, 100 Cooper patented adjustable hose clamps are packed, unassembled, in a neat, substantial telescope box. Each box bears a label giving the few necessary directions for assembling and adjusting to any size hose. Full particulars will be gladly furnished by the manufacturer, Otis-Flagg Corp., 53 Hope Street, Brooklyn, New York, to whom all inquiries may be addresed.

Wagner Auto Engine Cleaner.

This is a very handy device for cleaning the motor of any automobile. One quart of kerosene and six pounds of air pressure with the use of this device, will remove all dirt, grit and grease from your engine. This engine cleaner will prevent wear and pays for itself many times over by eliminating repair bills. It is easily used, is economical and thorough. It is a valuable addition to the equipment of any repair shop. Write for price and particulars to the Wagner Specialty Co., 1902 Broadway, New York City.

The N-A-Size Babbitter.

We illustrate an excellent device for babbiting any size of automobile engine connecting rods, which is an exceedingly useful tool for any repair shop or garage. With this device, the automobile owner can have his rod bearings made at once, and will not have to have his car laid up for days or weeks waiting for new bearings from the factory. The repair shop can also use this machine for making extra bearings, and a bearing cast solid in the rod will give better service, thus holding satisfied customers and getting new business and more money for the repair men. The cost of this machine is $7.50 and the price of the machine will be paid back to the operator on the first set of four connecting rods finished. Such a needed device certainly should be in every up-to-date repair shop. This machine is manufactured by the Burlington Machine Works, Burlington, Iowa, to whom all inquries should be addressed.



The N-A-Size Babbitter.
Made by Burlington Machine Works, Burlington, Wis.

Change of Name.

This is to advise that the American Brass Foundry Co., of Milwaukee, Wisconsin, has changed the firm name and will hereafter be known as the American Metal Parts Co. There will be no change in the policies of the firm and there has been no change in the personnel of the firm except that S. A. Fulton, president of the Fulton Co., Milwaukee, Wisconsin, has purchased an interest in the business and is now an officer and director of the company. The entire sales of American bumpers and other products will be handled exclusively by the Fulton Company, and all sales correspondence, inquiries and orders should be directed to the Fulton Co., 726 National Avenue, Milwaukee, Wisconsin. All remittances and correspondence relative to accounts should be directed to the American Metal Parts Co., 1916 St. Paul Ave., Milwaukee, Wisconsin.

Raybestos Brake Lining.

The Raybestos Co., Bridgeport, Connecticut, manufacturers of the Raybestos brake lining, in marketing their product, always arrange to co-operate with dealers warmly by providing suitable equipment for the sale of their product. We illustrate herewith the equipment which is provided for dealers to contain the Raybestos brake lining. The company has also arranged recently to put up Raybestos brake lining for Ford cars in special boxes for the trade. Each box contains three pieces of brake lining and the necessary rivets for attaching to the brake band. Raybestos product is of standard quality and so well known to our readers that further description is hardly necessary. Dealers who are interested should communicate directly with the manufacturer at Bridgeport, Connecticut.



Handy Rack for Raybestos Brake Lining.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

AFFA SPECIALTIES

For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

AFFA SPECIALTY COMPANY
34 SOUTHBRIDGE ST. WORCESTER, MASS.

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

BLOW-OUT PATCHES

ANY SIZE 22c. each in quantities
INTERSTATE RUBBER CO., 259 W. 15th St., PHILADELPHIA

We Still Have a Few 100-lb. Box Assortments

BOLTS, NUTS, SET SCREWS, RIVETS, FILISTER HEAD SCREWS, KEY STOCK, ETC., ETC.

$5.00 per 100 lbs.

We carry large stock piston rings, plain, also Inland patent rings, cork composition packing.

MAGNETO BALLS, $6.00—100 ASSORTED
Write for prices. *Anything required.*

WESTCHESTER ACCESSORIES CO., Inc.,
1777 BROADWAY NEW YORK

Magnetos and Batteries

Hecht's Magneto Exchange

Dealers in Magnetos of all Makes.
Lighting Systems and Self Starters.

Expert Repairing of All Makes.

Express your Magneto, Starter and Generator to us Same will be repaired and returned same day as received.

Distributors and Service Station for
BERLING SWISS, NATIONAL and MICHIGAN MAGNETOS
— Also —
Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos

230 WEST 49th STREET NEW YORK CITY

USED MAGNETOS

Bosch High Tension, $15 up
Save 50% to 75%
Herbert Aucock, 222 Columbus Ave., Boston, Mass.

Cylinders Reground

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

Radiators and Lamps

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.
HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
BRANCH: 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATORS REPAIRED

We also make and repair
FENDERS, HOODS and TANKS of all kinds.
DAVIS & SCHEGG CO., 2124 Broadway, New York

Tires

DOUBLE TREAD TIRES

—GUARANTEED—

Size	Plain	Tubes	Size	Plain	Tubes
28x3....	$5.00	$2.00	35x4....	$9.75	$4.25
30x3....	5.25	2.25	36x4....	10.00	4.35
30x3½..	7.00	2.50	34x4½..	10.50	4.50
32x3½..	7.50	2.90	35x4½..	10.50	4.50
34x3½..	8.00	3.00	36x4½..	11.50	4.75
30x4....	8.25	3.25	37x4½..	12.00	4.90
32x4....	8.50	3.30	35x5....	12.00	5.00
33x4....	9.00	3.75	36x5....	12.50	5.25
34x4....	9.50	4.00	37x5....	13.00	5.50

For (Non-Skid sizes) up to 30x4, 50c Extra.

All other sizes $1.00 Extra.

Examine your worn tires when taking them off, and if the bead is not cut, ship them to us. We will remake them into a GOOD Double Tread Tire at 60% of the above prices.

When ordering, be sure to state what bead tire is required. Whether Q. D. Clincher or Straight Side.

10% Deposit required on C. O. D. orders.

SPECIAL Offer to Agents

Write for Catalogue

Get our special price on new tires.

M. Liben & Co.

205-A West 48th St. New York City

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$5.00	35x4	$9.00
30x3½	5.50	36x4	9.50
32x3½	6.50	36x4½	10.00
32x4	7.00	36x5	10.00
33x4	7.50	37x4½	10.00
34x4	8.00	37x5	10.50
34x4½	8.50		

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.

236 WEST 48th STREET, NEW YORK

Bearings

Eastern Distributors

for

Warner Gear Company
MUNCIE, IND.

Transmissions, Clutches and Steering Gears

We maintain complete service for all Parts.

Hartford Auto Parts Company
HARTFORD, CONN.

Manufacturers of

Universal Joints and Cone Clutches

We maintain complete service for all Parts.

Mayer Carburetor Co.
BUFFALO, N. Y.

Carburetors To Fit All Cars

Special Carburetors for Ford Cars.

Spicer Manufacturing Company
SOUTH PLAINFIELD, N. J.

Universal Joints For All Cars

Bulletin No. 31

Jos. C. Gorey & Co.
354 West 50th St. New York

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Tires

SPECIAL SPRING OFFER
—ON—
DOUBLE TREAD TIRES
AT A SAVING OF 75%

A Special Discount of 5% When Cash Accompanies Order. **We Also Give Special Discount to Dealers**

The following are our net prices on Doucle Tread Tires and New Tubes of Standard Makes kept on stock:

Size	Plain	Non-Skid	Tubes
28x3	$4.50	$5.00	$1.95
30x3	5.50	6.00	2.05
30x3½	6.60	7.35	2.40
32x3½	7.00	7.70	2.55
34x3½	7.70	8.25	2.70
31x4	7.70	8.25	3.15
32x4	7.70	8.25	3.35
33x4	8.80	9.50	3.45
34x4	9.90	10.50	3.60

Size	Plain	Non-Skid	Tubes
35x4	$9.00	$10.00	$3.70
36x4	9.00	10.00	3.80
34x4½	10.00	11.00	4.40
35x4½	10.00	11.00	4.50
36x4½	10.00	11.00	4.60
37x4½	10.00	11.00	4.75
35x5	11.00	12.00	5.35
36x5	11.00	12.00	5.45
37x5	11.00	12.00	5.55

For retreading your old tires, prices on request.

Make sure when ordering tires to state whether Q. D., Straight bead or Clincher type.

We carry a full line of New First and New Second Tires at a big saving. Write for prices mentioning sizes. Prices upon request.

TERMS: 10% DEPOSIT, BALANCE C. O. D.

I. JAFFESS

Two Stores, 1319A Fifth Avenue, 241 West 54th Street, NEW YORK CITY

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
37x5	5.00	9.00	12.00

Ship Your Old Tires by Prepaid Express

McDANIEL RUBBER CO.

613 Ohio Street **Cairo, Ill.**

CHEAP DOUBLE TREAD

NEW AND SECOND HAND

Tires and Tubes

Write for Prices

JAFFE BROTHERS

260 West 54th Street **NEW YORK CITY**

TIRES Fresh Stock
ALL NON-SKID

Our Guarantee—4,000 Miles

30x3½	$11.00	34x4½	$23.65
32x3½	12.50	35x4½	24.75
33x4	17.18	36x4½	25.25
34x4	19.00	37x5	29.75

All Standard make Firsts at fair prices.

10% deposit required, 2% off if cash accompanies order.

Proposition to Dealers

LEON JAFFESS, Inc.

252 West 55th St., New York City **6106 Euclid Ave., Cleveland, O.**

INSYDE TYRES,

inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.

AMERICAN ACCESSORIES CO., Dept. AD3, Cincinnati, Ohio

SPRING REDUCTION ON
DOUBLE TREAD TIRES AND TUBES
GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
28x3	$4.00	$1.75	36x4	$9.00	$2.90
30x3	5.00	1.75	32x4½	9.00	2.75
30x3½	6.00	2.10	34x4½	9.00	3.00
32x3½	6.50	2.15	35x4½	9.00	3.00
34x3½	7.50	2.25	36x4½	9.00	3.10

Sizes	Tires Plain	Tires Tubes	Sizes	Tires Plain	Tires Tubes
30x4	7.00	2.50	37x4½	9.00	3.10
32x4	8.00	2.75	34x5	9.50	3.25
33x4	8.00	2.75	35x5	10.00	3.25
34x4	8.00	2.75	36x5	11.00	4.00
35x4	9.00	2.90	37x5	11.50	4.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.

For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street **NEW YORK CITY** **112-A East 100 Street**

THE HOME OF DOUBLE TREAD TIRES

Tires

CUT PRICES
On Seconds and Factory Blemished Tires of Standard Makes

Prices You Won't Find Equalled Anywhere

Our Business is Done on Straight, Clean Cut Methods

OUR TIRE VALUES STAND RIGID COMPARISON

You May Return Any Tires Bought from Us if Not Sold within Thirty Days.

We Are Sole U. S. Agents for Mastic Strain Proof Red Inner Tubes. Guaranteed for One Year.

Write for Prices. We Sell Only to Dealers.

MANUFACTURERS SURPLUS TIRE CO.

788 Seventh Avenue, New York

ADVANCE TIRES
Most Mileage Per Dollar

FULLY GUARANTEED **HONEST ADJUSTMENTS**

Write for Prices. Wonderful Opportunity for Dealers. Just what you have been looking for.

ELY AUTO EQUIPMENT CO.

1902 BROADWAY **NEW YORK**

DEALERS AND BUYERS

Send for prices on Good Factory Seconds.

STAR RUBBER COMPANY

1781 Broadway Tel. 123 Columbus New York City

We make liberal allowances for old tires

—— TO APPLY ——

On Purchasing Tyrian Tires

Guaranteed 4000 Miles.

Any 3 in. tire, regardless of condition, we allow $3.50

Any 3½ in., $4.00 4 in., $6.00

" 4½ in., 7.50 5 in., 10.00

Write us for price and full particulars

General Automobile Supply Company

1671-1673 Broadway **New York City**

Miscellaneous

COUPON Books for gasoline and supplies. Samples free. J. P. Forbes, Coshocton, Ohio.

IF YOU OWN A FORD CAR—Have some spare time and want to make money, write the Smith-Wilde Mfg. Co., 78 Clinton St., Newark, N. J. We can show you something

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Help Wanted

SALESMEN WANTED

Live men to sell a profitable and quick selling Automobile Accessory

SELLS ON SIGHT TO WISE DEALERS

Address SALESMAN

P. O. Box 654 NEW YORK CITY, N. Y.

SALESMEN CALLING ON RETAIL HARDWARE AND AUTO ACCESSORY TRADE TO TAKE ON COMMISSION BASIS, AS A PROFITABLE SIDE LINE, A NATIONALLY ADVERTISED AUTOMOBILE ACCESSORY WITHOUT COMPETITORS. VERY LIBERAL SELLING PROPOSITION. GOOD SELLING HELPS FOR DEALERS. EXCLUSIVE TERRITORIES GIVEN. TO RECEIVE ATTENTION YOUR ANSWER MUST STATE WHAT TERRITORY YOU COVER AND HOW CLOSELY, AND WHAT LINE NOW CARRIED. FULL PARTICULARS. ALCEMO MFG. CO., DEPT. L, 12 BRIDGE ST., NEWARK, N. J.

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Great Sale of Auto Bodies

An Opportunity for Live Dealers

We announce one of the most important sales of new and rebuilt auto bodies that we have ever inaugurated. Every type of body is included and the list includes many fine examples of the coach builders' art, at the lowest prices ever quoted.

Touring Bodies **Raceabouts**
Roadsters **Landaulets**
Coupes **Sedans**
Limousines

Prices as low as $5.00—values that mean big profits to dealers. If you can drop in we will be pleased to show you the full line and quote you prices. Out-of-town dealers will receive full information on request. Let us know your requirements. We can save you *money*. Large stock of windshields, racing seats and tanks.

THE JANDORF AUTOMOBILE CO.
763 Broadway New York, N. Y.

Gears and Parts

STODDARD DAYTON PARTS and GEARS FOR ALL MAKES OF CARS SEND IN YOUR OLD ONES
These parts are new parts.
THE DAYTON AUTO PARTS CO.
351 West 52nd Street, New York City — 1623A McGee Street, Kansas City, Mo.

COIL AND MAGNETO PARTS
Platinum—Tungsten
H. & L. MFG. COMPANY
33-35 Liberty Street NEW YORK

SAVE 50% TO 75% ON PARTS—Parts for Pope-Hartford, Columbia, Reo, Buick, Overland, Chalmers, Mitchell, Thomas, Oldsmobile, Maxwell, Stoddard-Dayton, Stevens-Duryea, Corbin, Cadillac and all others. Eiseman, Splitdorf and Remy magnetos, $5.00 to $10.00. Bosch high tension magnetos, $15.00 to $25.00. Also the Mea, Connecticut National, U. & H. and K. & W. magnetos in stock. Springs, wheels, axles, etc., for all cars. Connecticut Auto Parts Co., Inc., 1070 Main St., Hartford, Conn.

Patents

IMPROVEMENTS WANTED—Send for free bulletins and advice. Book "INVENTIONS—PATENTING and PROMOTING" Free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Piston Rings

PISTON RINGS

QUALITY SUPREME
PRICES RIGHT

All sizes in stock

Interesting proposition for agents

Houpert Machine Co.
355 West 52nd Street
New York, N. Y.

Rectifiers

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

For Sale

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each.. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

FOR SALE—Gasoline tank and pump, 2" retreading moulds and cash register. Vanderpool Co., Springfield, O.

FOR SALE—Make money easy. While business is good. Vulcanize tires. Our book tells you how. $1.00. Vanderpool Co., Springfield, Ohio.

FOR SALE—14 in. x 6 ft. Plain Turning Lathe, weight, carriage good condition, $100.00; 20 in. x 10 ft. Lathe and Morse Screw Cutting Lathe, weight, carriage good order, $175.00; Back geared manufacturing milling machine complete, with vise, arbor and counter, $90.00. Send for photo. Lucas & Son, Bridgeport, Conn.

FOR SALE—1913 Michigan "40" four-cylinder, five-passenger touring car. Continental motor. Bore 4¼; stroke 5¼. Car painted brown and upholstered in brown leather. Electric lights and self-starter. Mohair top with side curtains and slip cover. Wheel base 118 inches. Four forward speeds and one reverse with direct drive on fourth speed. New non-skid tires 35x4½. Only driven 10,000 miles. Perfect condition. Cost $1,750. You need not ride in a cheap car when you can buy this big powerful "Mighty Michigan" for $600. Charles D. Sherman, 50 Windsor Avenue, Hartford, Conn.

FOR SALE—"Self-vulcanizing" rubber, 25 cents; luminous paint, 25 cents (prepaid). Crown Chemical Co., Anderson, Indiana.

FOR SALE—Well established garage business in thriving Montana town. Sell or rent building. Bargain if taken at once. Mrs. F. E. Hoskin, Harlem, Mont.

FOR SALE—Garage, 1845 N. 19th—Must be sold, examine, make offer. Isen, 1902 N. 8th Street, Philadelphia, Pa.

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For Sale

FUR LINED OVERCOATS

Black wool kersey cloth, lined with selected muskrat skins, beautiful blended muskrat shawl collar, double breasted, length 50 and 52 inches. Sizes 36 to 44 ready for delivery. An exceptional opportunity to secure a handsome garment. Price

$39.50

Usually retailed at $75. Direct from Manufacturer. You save all middlemen profits, and take no risk.

Sent for Examination

Examine and try on before paying. Write today stating chest measure, height and weight. Enclose $1 for express charges only, and coat will be sent at once.

E. HART, Dept. B, 518 West 134th St., New York

Cylinders Reground

CYLINDER GRINDING

GREATER EFFICIENCY
QUICKER WORK
LOWER PRICES

are the result of specializing in a single line By taking advantage of our service, you can have cylinders reground or rebored and fitted with new cast iron pistons and individually cast rings, at the finest equipped plant, *specializing exclusively* in this line. We guarantee absolutely every piece against poor workmanship. 20 years' practical experience is back of us. Write for prices.

BRIDGEPORT PISTON RING CO.
Connecticut Ave. and 3rd Street
BRIDGEPORT, CONN.

WORLD'S LARGEST CYLINDER REPAIRING COMPANY
Over Sixteen Thousand Satisfied Customers

SCORED
(Porous and sand hole)
CYLINDERS

Repaired with Silver-Nickel Alloy

Fused Electrically by the "Lawrence Patent Process."
BEWARE OF IMITATION WORK

No Warping or Enlarging of Bore

Same Pistons and Rings Used—All Work Guaranteed for Life of Car

Reshipped 24 hours after received. Tested and approved by most motor manufacturers.
Write for Pamphlet.

L. LAWRENCE & COMPANY
(Established 1862)
—PLANTS AT—

Detroit, Mich.....1244 East Jefferson
Chicago, Ill .....1520 Michigan Avenue
New York..... 546 West 45th Street
Cincinnati, O..... .....410 Richmond Street
Newark, N. J.....290 Halsey Street
Cleveland, O.....1810 Prospect Avenue

ATTENTION

Auto Owners, dealers and repair men. Highest grade plain ground mitre, or step joint piston rings for every make of motor 30c. to 40c. each. Piston pins in standard or any number of thousandths oversize for every model and make of motor, in stock, lowest prices. Light grey iron pistons standard and oversize for every make of motor, same price as heavy type. Leakless rings, the best rings today, no advance in price.

McCADDEN MACHINE WORKS, Inc.,
ST. CLOUD, MINNESOTA

CYLINDER REGRINDING PISTONS, RINGS and PINS

Quality work. Get our prices.

BUTLER MANUFACTURING CO.
ESTABLISHED 1897.
1121 EAST GEORGIA INDIANAPOLIS

Tire Repairing

TIRE SPECIALTY CO.
EXPERT TIRE REPAIRING
Guaranteed Work Moderate Price
757 Seventh Ave. 'Phone, 528 Circle. New York City

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Welding

ACETYLENE WELDING
New Process—Brazing of Aluminum Crank and Gear Cases
GIVE US A TRIAL
DAVIS & SCHEGG CO., 2124 Broadway, New York

Victor Heater for Ford Cars.

We illustrate herewith a new heater especially designed for Ford cars. Many owners of the Ford who live in cold climates, are compelled to discontinue motoring for several months in the extreme cold weather, but the Victor heater is intended to obviate this difficulty. The manufacturers state that this heater really heats the car within a half a minute after starting the engine, and gives a plentiful supply of warm, fresh air. This heater is built exactly on the same principles as the hot air furnace, circulating fresh air over a heated drum and sending it upward. The drum of the Victor heater runs lengthwise, at right angles to the exhaust pipe. The exhaust coming direct from the engine, is turned into the drum. The fresh air circulating around the outside of this drum, is heated by the hot gases inside, and rises into the car. As you sit in the car all that can be seen of the Victor heater is a handsome black-enamelled grill, flush with the floor. No metal or heated parts are inside of the car, and there is no danger of scorching the clothes or burning the soles of the shoes. This heater is being placed on the market by the Crew-Levick Co., Philadelphia, Pennsylvania, to whom all inquiries should be addressed.

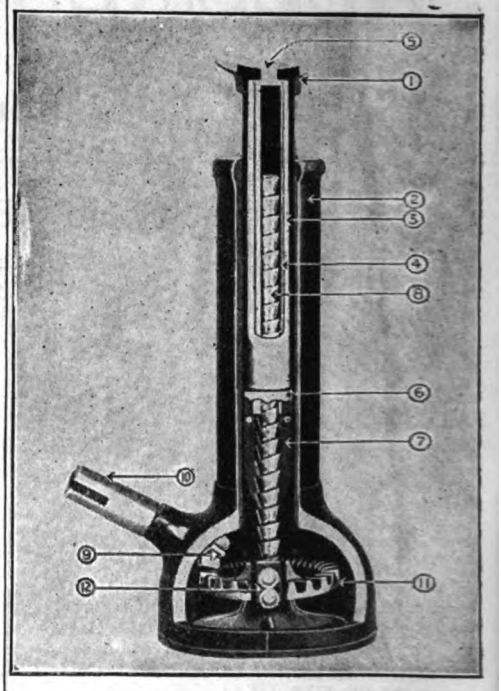


Victor Heater for Ford Cars.

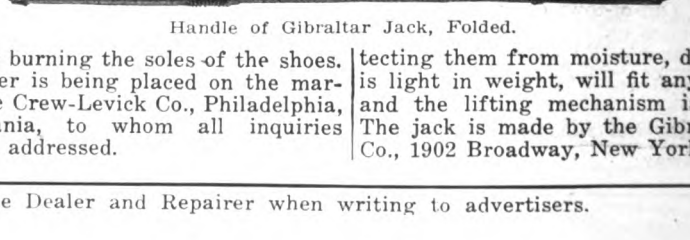
The Gibraltar Automobile Jack.

We illustrate this new jack and the cut clearly shows its interior construction. A spiral screw engaging with dogs on the lifting bar is turned by a gear and pinion. This mechanism rests on end-thrust ball-sockets, which carry the entire weight of the car and reduce friction to a minimum. This jack is operated by a long folding handle; and by this means the jack may be placed in any position under the car and operated and removed without soiling the hands or clothes. The folded handle is shown herewith.

The jack is said to be remarkably fast, and all working parts are enclosed, protecting them from moisture, dirt, etc. It is light in weight, will fit any tool box, and the lifting mechanism is of steel. The jack is made by the Gibraltar Jack Co., 1902 Broadway, New York City.



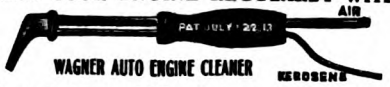
The Gibraltar Jack.



Handle of Gibraltar Jack, Folded.

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CLEAN YOUR ENGINE REGULARLY WITH A



One qt. kerosene and 6 lbs. air pressure cleans all dirt, grit and grease from engine. Prevents wear, actually saves half the usual repairs. Quick, economical, thorough, easy and cleanly to operate. Necessity for repair shops.
Wagner Specialty Co., 1902 Broadway, New York City

Lazco Products — Dealer' Profits

Vulcanizers, Spring Lubricators, Engine Trouble Detector, Fire Extinguishers, Etc.
Get our quotations.
THE LAZARUS MANUFACTURING CO.,
752 Prospect Avenue, Dept. R, Cleveland, Ohio

TIRE-DOH

Thousands of dealers recommend it for repairing punctures, blowouts and inner tube tears—it will fix torn-out valve stems and do other difficult jobs —without the need of heat or tools.
See Your Dealer, or Write Us.
ATLAS AUTO SUPPLY CO., 616 W. Austin Ave., Chicago, Ill.

Pathfinder Company Organized.

The Pathfinder Company of America has been organized to succeed the Pathfinder Company, Indianapolis, Indiana, with a capital stock of $2,000,000.

The new company will continue the manufacture of Pathfinder pleasure cars without change, in larger volume than before, and will also enter the commercial truck field.

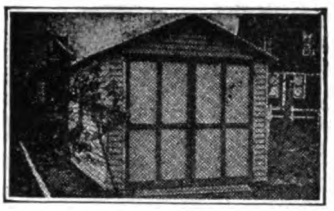
The officers and directors of the new company are: President, Charles McCutcheon, Indianapolis; vice-president, Fred C. Dorn, Cleveland; secretary and treasurer, Paul N. White, Indianapolis; directors, the officers and C. J. Root, Terre Haute, chairman; A. C. Brown, St. Louis, president of the Hamilton-Brown Show Company; William A. Umprey, Indianapolis, vice-president Weidley Motors Company; Paul N. White, Indianapolis; Charles McCutcheon, formerly president of the Jackson Gear Company, Jackson, Michigan, and George L. Mosher, capitalist, Los Angeles.

The officers of the former company were William C. Teasdale, Jr., president; W. E. Stalnaker, vice-president; Wayne K. Bromley, secretary-treasurer. Karl Felicke, the chief engineer, remains.

The enlarged plant for the manufacturing of pleasure cars and commercial trucks will be at the present site, 1136 Division street, Indianapolis, Ind.

The Dearborn Truck Unit.

The Dearborn Truck Co., 1250-64 S. Campbell Ave., Chicago, Ill., are placing on the market a Dearborn Truck Unit of one and two-ton capacity, for Ford cars. This unit is practically the rear half construction of a standard truck, though it is built with a full length frame, and when attached to a Ford chassis converts it into a one or two-ton truck. The Ford-Dearborn gives the purchaser an economical, quick delivery truck with the great strength united with the efficiency, simplicity and economy of the regular Ford power plant. This is a quick selling specialty for dealers and readers who are interested should write direct to the manufacturers as we understand that there is considerable open territory on this specialty.



HOMES FOR AUTOMOBILES
$60 UP.
Portable or Permanent Buildings, Steel, Wood or Concrete Garages, Toolhouses, Boathouses, Bungalows, Storehouses, Factories, Office Buildings, Etc.
DESIGNERS AND CONSTRUCTORS OF BUILDINGS.
HOBOKEN GARAGE MFG. CO.,
'Phone 618. **74 Bloomfield Street, Hoboken, N. J.**

STOP THE SPRING BREAKAGE.



It's a poor policy to risk repeating the annoyance of a broken or weak spring—and the delay—by saving only a very little in buying or selling a *cheaper* spring instead of a "NEW ERA *BETTER* SPRING."
Don't replace a broken spring with one no better.
Wise dealers—sell only the best—
New Era "BETTER" Springs are the oldest and largest used line for replacement—at same price as from car factories. Made for all cars, GUARANTEED one year against breakage or sagging, graphited between leaves for two years' lubrication.
Write for complete line, discounts—or state requirements and class of business.
NEW ERA SPRING & SPECIALTY CO.,
1171 Hamilton St., Grand Rapids, Michigan.

LECTROFLATER
ELECTRIC AIR PUMPS
Costs 1/10 of a cent to pump largest size tire. Cheapest, handiest, for garages, service stations, tire dealers, repair shops. Either direct or alternating current. Automatic lubrication. 125 lb. air pressure guaranteed, without heating. Prices, $45 to $160. F. O. B. Baltimore. Including gauge, hose, plug, coupling and electric cord.
THE BLACK & DECKER MFG. CO.
121 So. Calvert St., BALTIMORE, MD.

Will dissolve in the water and stop that leak in the Radiator or Water Jacket
SE-MENT-OL
Ask your Dealer or write direct.
MANUFACTURED ONLY BY
THE NORTHWESTERN CHEMICAL CO., Marietta, O.



HAND-I-WASH
COMBINATION
Water-Soap-Towel
All in one, ready for use. Every motorist should have one. At your dealers or direct, $1.00 prepaid. Refillers 50c., (tube of liquid and roll of paper towels,) 2c. a wash. Weight 29 oz. Size, 11x3½".
TAY-MILLER MFG. CO., Inc.
1714 Cherry Street PHILADELPHIA, PA.

MASTER CALORITE SPARK PLUGS
The Highest Achievement in Spark Plug Construction—
Master Calorite Spark Plugs ultra sturdy will endure the severest requirements of legitimate service—
They anticipate the possibility of mechanical carelessness—
Generously guaranteed.
Send for Jobbers' and Dealers' proposition
Manufactured and Guaranteed by
HARTFORD MACHINE SCREW COMPANY
514 Capital Avenue Hartford, Conn.

POWER



The two-horse-power Benninghofen Engine offers even economical power for every purpose. Many new, exclusive features, including "auto throttle governor," not hit and miss governed. Surprisingly low cost. Burns kerosene or gasoline. Runs machinery, pumps water, saws wood, runs separator, churns, etc. Catalogue and details free.
C. BENNINGHOFEN & SONS, Dept. 1140, Hamilton, O.

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WITTE Kero-Oil ENGINES

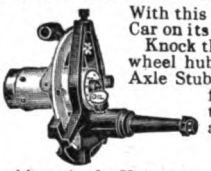


Immediate Shipment
Direct from Factory—**SAVE $15 TO $200**—Simple in construction, strong and powerful, few working parts--easy to understand, easy to operate, easy to own. Buy practically on your own terms--Cash, Payments or No Money Down. 90-Day Trial--5 Year Guarantee. Write for latest prices.--ED. H. WITTE,
WITTE ENGINE WORKS
2497 Oakland Ave., Kansas City, Mo.
2497 Empire Bldg. Pittsburgh, Pa.



New DOVER Two-In-One Offset Funnel
For all cars with Rear Tanks.
New Braced Spout.
Spout removable, forming a regular Funnel.
(6) *Send for 1916 Catalogue.*
Dover Stamping & Mfg. Co., Cambridge, Mass.

EKERN'S EMERGENCY AXLE No. 3 FOR FORD CARS.



With this device you can place the Ford Car on its own wheels in two minutes. Knock the broken axle stub out of the wheel hub, place wheel on Emergency Axle Stub and hook the Device on the flange of the Axle Housing and the Ford can be pulled in at any speed desired with safety. Weight 8 lbs.
Sent Express Prepaid to any address in the United States for $4.90. Cash with order.
EKERN BROS. MFG. CO., Flandreau, SOUTH DAKOTA

HIGGINS QUALITY SPRINGS—For Replacement
No hole. No Bolt. No hump. No jolt. No center breakage. Guaranteed alike, tall points. Out-serve and out-sell all others. Immediate shipment.
Write for Catalogue C-1917 and Dealers' Discounts.



Higgins Spring & Axle Co.
Dept. 14, Racine, Wis.

Lock Your Car with a
WALKER-KE-LES LOCK
Cut off battery, magneto and starter circuits, also gasoline. No key to lose—no keyhole to find. Over three thousand five hundred in use for three years—and not one car stolen. Write for information and price, giving name of your dealer.
WALKER KE-LES LOCK CO.
Dept. G, Chicago, U. S. A. Factory: Aurora, Ill.

THE MANLEY "JILITE" PORTABLE CRANE
Is easier handled and stronger, and less liable to upset than other cranes.
Built in one, one and one-half and two ton capacity.
Write us today for catalog.
THE UNITED ENGINE & MFG. COMPANY
HANOVER, PA.

MOSCO Three Motor
SPECIALTIES
TIMERS
WHEEL PULLERS
MOTOR SPECIALTIES CO., *Manufacturers*
Waltham, Mass.

BEARINGS SERVICE COMPANY
Nation-wide Service on Bearings
Timken—Hyatt—New Departure Bearings for All Cars
Branches in All Principal Cities
BEARINGS SERVICE COMPANY
General Offices, Detroit, Michigan

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IT FITS 90% OF THE CARS

It is no longer necessary to carry ten or twenty styles of bumpers in stock in order to fit the majority of cars.

This new Universal Bumper can be clapped right onto 90% of the cars as fast as they drive into your place. By specializing on the

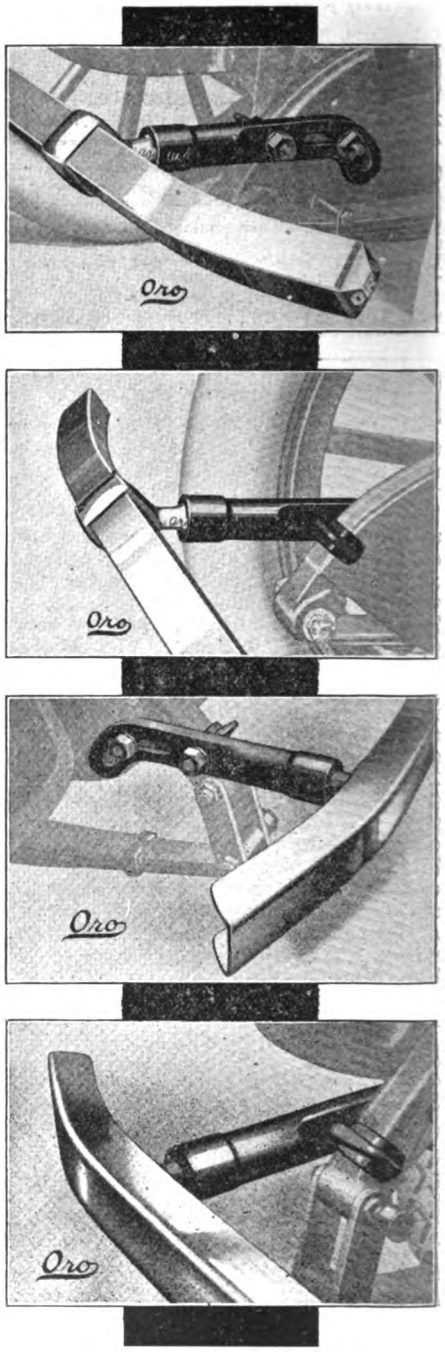
Oro
GOOD as GOLD

you tie up less money in stock, use less display space, spend less time in closing sales, and make more profit.

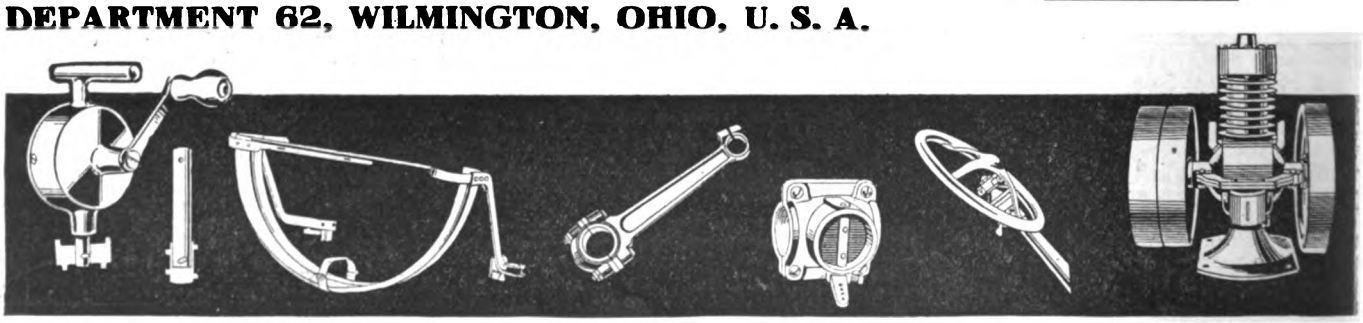
The illustrations show how the same clamps can be adjusted to fit different types of cars. Width between chassis members, presence or absence of mud aprons, location and style of fenders are immaterial as far as this bumper is concerned. No holes to drill, no bolts to remove—a wrench is the only tool required.

You will find the same tough material and good workmanship in this new bumper that you have found in the other accessories of the high grade "Oro" line.

Write for the "Oro" catalog and order the new Universal Bumper from your jobber today.

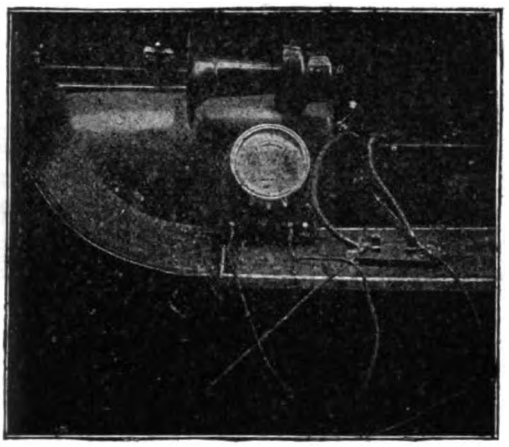


THE AU-TO COMPRESSOR CO.
DEPARTMENT 62, WILMINGTON, OHIO, U. S. A.



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THE LOGICAL STEP



How AMBU Attaches to Battery

in making your repair department more prolific and more efficient in Electrical Starting and Lighting repairs is the adoption of—

AMBU
TRADE MARK

Ambu Electric Trouble Shooter is an instrument which automatically detects and locates accurately and quickly trouble in any American made starting and lighting system used as standard on any American made cars—and shows you what the trouble is and exactly how to repair it—

Autolite, Remy, Bijur
Rushmore, Delco, Westinghouse
Dyneto, Entz, Gray & Davis,
Splitdorf, Apico, North East,
U. S. L., Wagner, Ward Leonard,
Adlake, Deaco, Disco,
Allis-Chalmers, Bosch, Jesco,
Esterline, National
Leece-Neville, Simms-Huff

AMBU SERVICE

Ambu service consists of Ambu wiring diagrams—showing the exact layout of every electrical system as applied to automobiles; covering 400 or more cars.

Ambu Repair Charts—giving concise and practical working information and complete instructions on how to make repairs quickly and positively.

Ambu Service Bulletins keep you posted on all changes, additions and improvements which may be made in the various systems.

Ambu Engineering Advice—to help you out of any unusual difficulties.

The complete Ambu Service contains information impossible for you to obtain in any other way—viz., showing internal hidden wiring connections rarely shown by the makers themselves—classified, systematized, readily accessible, and filed in a handsome, substantial metal case with lock—a compact authoritative service.

Ambu Endorsed by Big Men in Automobile Business

Big men seriously endorse Ambu because they quickly see its wonderful value—

We have scores of enthusiastic letters from owners and users of Ambu,

the seal of approval from men who know and who are making their shops more prolific—more efficient and reaping a nice income—

We will gladly supply their names and facsimile copies of their letters if you desire that evidence.

And remember—our interest does not stop with your purchase, it centers in you as long as you are in business and are using Ambu—we show you the way to more and better business—

It's the step from a perhaps limited Electrical knowledge from guess work, from searching all over the car in a half blind way to the possession of an accurate complete knowledge and definite assurance of a quick successful repair job every time you tackle one—

And a good price for the work, too—because you and the car owner know it's right.

Ambu enables you to make your Electrical repairs more prolific and more efficient.

Ambu puts you—no matter where you are located—in the same class with the best informed starting and lighting repair men in the country—

With Ambu you become expert—quick, an authority—a prolific producer—

Because — you know where the trouble is—after making 3 short tests with Ambu—what it is—and you quickly and efficiently repair it—

It takes less time—if you use Ambu to make authoritative and lasting repairs than by the old methods, so you can do more jobs each day—better work—quicker work—more work — satisfied car owners.

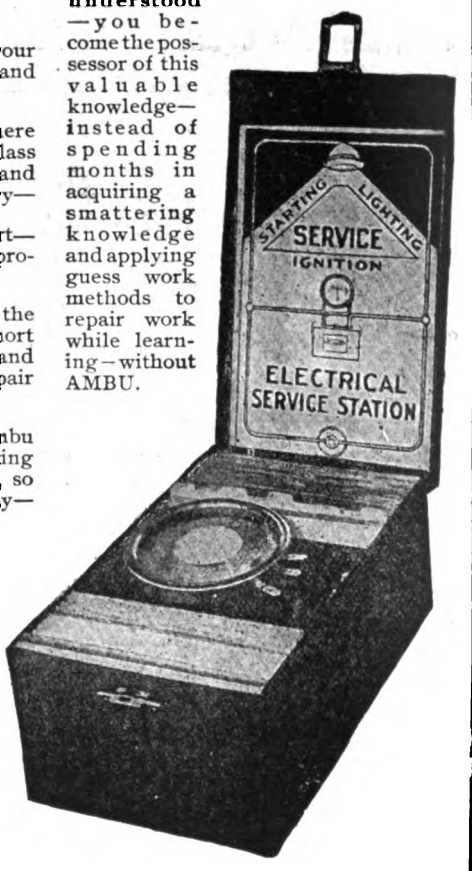
That's the result of the possession and regular use of Ambu—

If you knew all about all the many makes of starting and lighing systems—if you knew the wiring and adaptations on every make of car you would not need Ambu—

But it's humanly impossible for you to know all this—there are too many and you have not the time or opportunity to master this overhelming detail.

So you do need **AMBU**

Because Ambu knows and by the simple operation of buying the instrument — wiring diagrams — charts and instruction book — simple, specific and easily understood —you become the possessor of this valuable knowledge—instead of spending months in acquiring a smattering knowledge and applying guess work methods to repair work while learning—without AMBU.



AMERICAN BUREAU OF ENGINEERING, Inc.

Automobile Department

1018-28 So. Wabash Avenue **Chicago, Illinois**

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By This Brand You Know Them!

L P H

HALLADAY BUMPERS

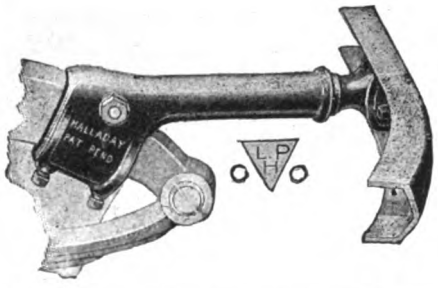
No Matter What Car You Sell or Use

In the HALLADAY LINE

There is a Bumper to Fit it—Front and Rear

Accessory dealers who carry this line are in position to control the Bumper Business in their territory.

Halladay Quality is known thruout the trade as highest attainable and **Halladay Design** is invariably up to the minute and always ahead of the others.



Here is an example of the new

HALLADAY Side Connection Bumper

for cars with expansion aprons or splash pans covering the entire inside of the frame extension.

Adjustable to any frame curve or angle and quickly and solidly attached without cutting or marring the frame or apron.

This is the most nearly universal bumper ever made.

A FEW OF OUR PROFIT PRODUCERS

Halladay Bumpers, Front and Rear for All Cars
Halladay Shock Absorbers
Halladay Flexlevers for Heavy Cars
Halladay Flexlevers for Ford Cars
Halladay Tire Holders
Halladay Tilting Steering Wheels
Halladay Jacks and Halladay Can Tippers
Halladay Luggage Carriers

SPECIAL BUMPERS

For **Cadillac, Cole, Chevrolet, Franklin, Ford, Packard, Pathfinder, Saxon "6", Briscoe, Dodge and others**

SPECIAL REAR BUMPERS

For **Buick, Cadillac, Mitchell, Overland, Saxon**

Send for Complete Information

Our catalog in your hands will be of mutual benefit. Pin this advertisement to your letterhead while the spirit moves you, send it to us and we'll see that you get a catalog

L. P. HALLADAY Company.

Streator, Illinois

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Kimball Button-Grip Tire Kimball Vacuum Bar-Grip Tire

I See you're Anchored RIGHT



"YES—I'M BACKED BY KIMBALL TIRES"

Any "Kimball" dealer—anywhere—will tell you that the prices he is able to buy "Kimball" Tires and Tubes for are the foundation of his success. Of all the things that go to make a tire shop profitable and prosperous, nothing is so important as having an attractive and durable tire at attractively low prices.

You keep the confidence of your customers by becoming an authority on Tires as soon as you touch the Kimball product, for their popularity is sweeping the country.

Kimball's idea of a good Tire is the best yet—and the dealer who looks at an idea to see if he can use it, and not to see if he can get along without it—is the man who will soon be looking for larger quarters to accommodate his growing business. Write quickly—for your territory.

KIMBALL TIRES—NON-SKIDS ONLY

Are Always in Demand by Users and Dealers Alike

Kimball Tires	Non-Skid	Tubes	Kimball Tires	Non-Skid	Tubes
30 x 3	$7.55	$1.90	35 x 4	$17.35	$3.30
30 x 3½	9.85	2.15	36 x 4	17.65	3.35
31 x 3½	10.30	2.20	34 x 4½	20.75	4.00
32 x 3½	11.55	2.25	35 x 4½	22.65	4.10
34 x 3½	13.35	2.35	36 x 4½	23.75	4.15
31 x 4	14.25	2.95	37 x 4½	26.60	4.25
32 x 4	14.75	3.05	36 x 5	27.20	4.95
33 x 4	15.75	3.10	37 x 5	27.60	5.05
34 x 4	16.35	3.20			

Do You want Clincher or Straight Side?



"Straight-Side" Type as pictured. Made also in Clincher Type

Place Your Order at Once. Prices Will Positively Be Advanced November 5th, 1917

Any order you care to send us will be cheerfully accepted and handled with all the enthusiasm that is accorded the many large stock orders that come every day. It will pay you to order in large quantities on account of the saving to you in express charges.

All orders must be accompanied by deposit of at least 25% or no attention will be paid to same. In order to insure quick delivery, CASHIER'S DRAFT on Chicago or New York Banks, Express or Money Order in part or full MUST accompany Order. Allow us first and second choice on our Bar-Grip, Button-Grip, or Cord Type Tires, in order to receive immediate shipment.

The Kimball TIRE & RUBBER CO.

Dept. 18, 1469 Michigan Ave., Chicago

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IF YOU GET STARTED RIGHT—



You Can "Put It Over"

No doubt your product has merit—we believe it. We share your opinion that you have a sure winner.

Even if this is so, and your friends are slapping you on the back, this does not indicate for one single minute that you have entered your product in the race.

There are hundreds of good inventions—splendid products in this great land, which today are smothered—actually smothered under tons and tons of indecision—vacillation, weak-kneed intention, blue-mold of apathy—call it anything you like—it's the direct opposite to what progress demands from the successful manufacturer or true merchant of today.

If at the present time the world at large knows little or nothing about your product, you are at that crucial point where you've either got to "put your good thing over" by the use of good advertising copy in a good medium or let it die of dry rot.

Our "put it over" department will train and whip your copy into splendid shape for the race. Your product, of course, has the quality—our copy department will develop its staying power.

Tell us what you know about your product and we will introduce it to the "medicine ball," which will build up the many good points that may have been overlooked, until the copy for advertising your product is ready for the shower-bath of criticism given by the copy masseurs and rubbers of this department. Then your copy, in the pink of condition, steps forth to conquer.

SELECTING THE RIGHT TRACK FOR THE RACE— THE MOST IMPORTANT POINT OF ALL

As you step out on the field and into the track, you can hear the thunderous applause of the great and enthusiastic audience—all members of the "start right club"—subscribers and readers of

The Automobile Dealer and Repairer

32,000 STRONG

A Carefully Selected List of People Who Are Going to Appreciate Your Endeavor and Help You Win the Race

It is not a question of having big capital—it's a matter of spending what capital you have with the right medium—and the right medium is always the one which shows tangible results—not merely vague, general publicity.

In our "put it over" department we create advertising ideas, draw pictures, border designs and lay-outs which attract the reader's attention—holding, at the same time, the proper commercial value.

We write advertising that will boost your product—bring it from obscurity and through our medium, put it into the markets of the world. We call it result-producing copy, but do not forget this important point—the best piece of copy ever written will not produce good results unless it is placed in a good medium.



YOU CAN "PUT IT OVER" IF YOU GET STARTED RIGHT

For *sure, tangible, satisfactory returns,* place your advertising in

The Automobile Dealer and Repairer

71-73 Murray Street, New York City

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A MASTER'S TRIBUTE TO

TRADE MARK **S.O.S** REGISTERED

STORAGE BATTERIES

THE CROWN HOTEL,
Providence, R. I., July 23rd, 1917.

VICTOR STORAGE BATTERY CO.,
MOLINE, ILL.

GENTLEMEN:—The battery which you put in my 6 cylinder Packard about **two years** ago I used for **48,000 miles,** and never had it overhauled. My only regret is that when I sold my old car I neglected to keep the battery for my new Twin Six Packard.

You know me,
BARNEY OLDFIELD.

A battery that will give two years' service in driving 48,000 miles at normal speeds is unusual. But a battery that will give two years' service and 48,000 miles as Barney Oldfield drives is wonderful.

Yet this is no unusual service for S. O. S. batteries. In the remote places of the world where the service station is unknown, where a battery stands or falls on its merits as a battery, S. O. S. batteries are giving the same wonderful service. In far South Africa, on the other side of the Equator, where Hupmobiles are preferred in Government service, S. O. S. batteries are preferred for Hupmobiles. In the plains of Nevada, subjected to extremes of heat and cold, S. O. S. batteries are preferred for railway signal work. And in thousands of farm homes they have proven themselves the most dependable and fool proof storage batteries yet produced.

The wonderful service and long life that S. O. S. Batteries give is only possible because the plates will not buckle or sulphate, and this is guaranteed.

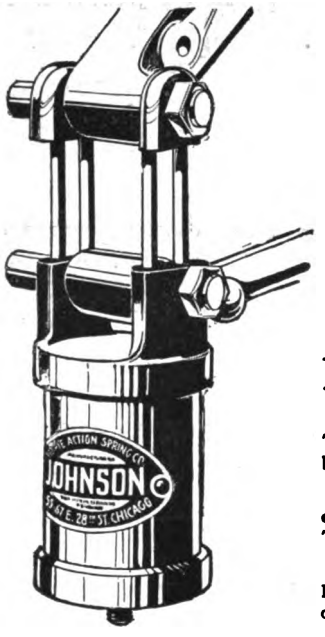
S. O. S. Storage Batteries **cost no more** than **ordinary batteries.** Yet their worth would justify a higher price. They are made for all makes and models of cars, for Farm Light Plants, and other isolated installations. Our **Pocket Battery Guide** shows the proper battery for all cars. A postal brings it.

S. O. S. battery plates are now supplied as replacements for the popular makes of batteries. **Dealers:** write for price list of these plates.

VICTOR STORAGE BATTERY COMPANY

701 FOURTH AVENUE **MOLINE, ILLINOIS**

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Temme

SPRINGS FOR ALL CARS

DO all the lame cars drive to *your* door for Temme Springs and other things?

In most good towns, Temme Springs and Temme's Triple Action Service are known to be *as good as gold.*

Hundreds of repairers, who have "banked" on Temme and never lost, are putting up Temme highway signs today.

These signs *will* bring in business. Temme has tried them, so he *knows.* And now he offers *you* what won for him.

Temme Springs *"for all cars"* means just what it says—for all cars *since 1902.* Test us by naming the spring you need. Temme Triple Action Service will have it on the way to you the same day.

"For all cars" means *designed* for all cars to factory specifications. And so good are Temme Springs—so prompt the service—so fair the prices—that dealers in *all* cars now buy from Temme *in preference* to the car maker.

You need these springs, this service, these signs. They will make you money, bring new business, help you build the good reputation you are after.

If you delay you may lose this exclusive proposition. Write or wire us now, saying: "Send Temme Spring Service Station proposition at once."

JOHNSON
Shock Absorber

This is to remind you of the new model of the famous Johnson Shock Absorber—made by us. The only cure for a hard riding car is a pair of Johnsons. Temme Spring Service Stations make good money on them. Write now for our new proposition.

TRIPLE ACTION SPRING CO., 79 East 28th Street, CHICAGO

900 Pages instead of 824 **1918—SIXTH EDITION** 3362 Illustrations instead of 2000

STILL $3.32 prepaid **Dyke's Auto Encyclopedia.** STILL $3.32 prepaid

Entirely re-written, hundreds of illustrations and many new subjects added. Practically a new book. A non-technical treatise with simplified illustrations on Constructions, Operation, Repairs and Adjustments, Cares and Troubles of the Automobile.

There are 50 **Instructions**—Simplified and practical.

3362 **Illustrations**—the kind you understand at a glance.

2 **Supplements**, parts printed in colors, treating on the construction operation, repairing and adjusting of the **FORD** and **PACKARD**—tells how to make a Ford do 60 miles per hour; how to get more mileage per gallon; how to convert into a truck, racer, fine point adjustments, etc.

775 illustrations and 279 pages on **Electric Ignition, Electric Starters** and **Generators**, etc.

51 pages and 254 illustrations on **Adjustments, Tests**, etc., of leading **Electric Systems.**

154 pages and 1189 illustrations on **Repairing.** Oxy-Acetylene Welding, and subjects as Repairs on all types of Axles, Differentials, Steering Devices thoroughly covered—as well as all parts of the Engine.

27 pages and 180 illustrations on **Tires** and **Tire Repairing.**

44 pages and 119 illustrations on **Carburetion.**

89 pages and 291 illustrations on **Engine** and **Parts.**

16 pages on **Digest of Troubles.**

6000 lines to the **Index.** This is a feature worth noticing, as it means a ready reference on everything pertaining to motoring. **Index** begins on **colored** paper, easy to refer to.

Dictionary is also included, which gives the meaning of motoring terms.

Inserts: There are five—printed in colors. New features you never before saw or heard of in one of the inserts.

You must see this SIXTH Edition in order to appreciate just how complete a book it really is—Order N-O-W.

Price—Although a much larger and better book the price for the present remains **$3.00** (or **$3.28** prepaid, express).

How to Become an Expert Automobile Mechanician

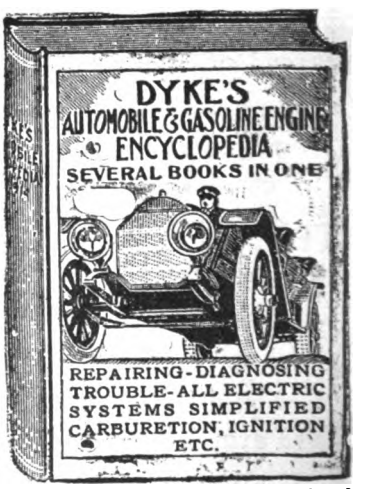
The quickest and cheapest, but BEST way, is by studying Dyke's Automobile and Gasoline Engine Encyclopedia.

It is a practical, simplified instruction on everything you want to know and OUGHT to know about motoring.

First you learn the principle of construction of each and every part of a car and engine—then the variance of construction—then the adjustments and repairs.

You learn how to diagnose troubles in a scientific manner. Step by step you advance until you are a *real expert* on timing the valves and ignition, repairing and adjusting. You learn the carburetion subject so thoroughly, you can adjust any make.

You will like this book, in fact we will guarantee you would not sell it for three times its cost if you could not get another.



It's worth ten times its cost if only placed on the shelf and used as a reference.

You will also understand Aviation, Truck and Tractor Engines as well as Auto Engines when you complete this book.

Beware of Imitators—this is the *original, simplified* book on REPAIRING, ELECTRICAL SYSTEMS, TROUBLES, Etc. It is the only book in the world combining all these subjects under one cover. Why get three—or four books?

Mr. Dyke published the first practical Automobile Book in America.

Address all Orders to

AUTOMOBILE DEALER & REPAIRER
73 MURRAY STREET, NEW YORK

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WE BEAT THEM ALL



Why Patronize the Speedometer and Horn Trust?

We can furnish you with Repairs and Repair Parts for all makes of Speedometers, Horns and Clocks.

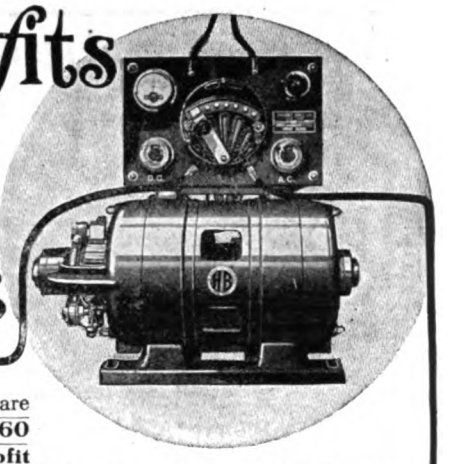
Our prices are from 25% to 50% cheaper than manufacturer. We specialize in the following work: Stewart-Warner, Jones, Hoffecker, Johns-Manville, Sears-Cross, and Standard Speedometers—Klaxon, Newtone, Sparton, Long, and Stewart Horns.

Official Service Station

Van Sicklen Speedmeter — **Corbin Brown Speedometer**

GENERAL SPEEDOMETER REPAIR CO.
51 West 63d Street New York City

Big Profits in H-B Battery Charging



H-B Battery Chargers are making **$20 to $60 a month extra profit** for H-B owners everywhere. One garage cleared **$139.50** the first month. You too can make **big profits.**

The H-B Charger is a full 500 Watt equipment, guaranteeing quick charging and quick profits. City current operates or belt-driven equipment can be furnished. Recharges one to seven batteries at one time, at cost of 12c. to 15c. per battery. Customer pays 75c. to $1.50. At least $4.50 profit each capacity run.

$15 Puts This Money-Maker in Your Garage

Balance in 8 monthly payments of $20 each. Machine quickly pays for itself and makes good profit besides. Tear out this ad. and mail for further particulars or send $15 initial payment with trial order. Money-back guarantee. Don't wait. Do it today.

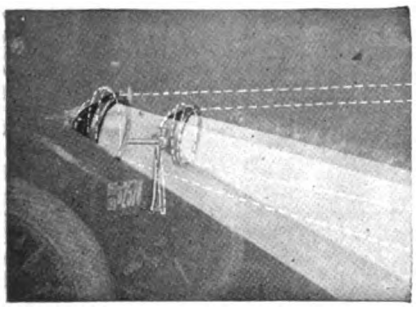
HOBART BROTHERS CO., Box 210 Troy, Ohio

GENUINE
Armstrong Stocks and Dies



FOR THREADING PIPE OR RODS
HINGED PIPE VISES PIPE CUTTERS
Manufactured by
THE ARMSTRONG MFG. CO.,
335 Knowlton St., Bridgeport, Conn.

The Pennock Headlight Tilter



Operated from the seat, best covers all the conditions of city and country driving with 40 to 300% more light than other devices.

Don't cover up your light with lenses, you need it all. **Don't turn out your light with dimmers,** when you need it most.

Tilting **increases** the light in proportion to the decreased distance lighted, **absolutely eliminates glare** and is legal everywhere. Fits electrically lighted, gas lighted or Ford cars. Retails at $5.00 the set. *Write*

THE SPECIALTY MANUFACTURING CO., Minerva, Ohio,
for Circulars or Sample Sets.



PEDEX

The Adjustable Pedal Extension

eliminates the driver's clumsy cushion and gives the correct leverage to insure greater control, safety, comfort and convenience.

PEDEX clamps on backs of pedals leaving them free for use when desired.

Retails at $5 Per Set

When ordering name *make, model* and *year* of your car.

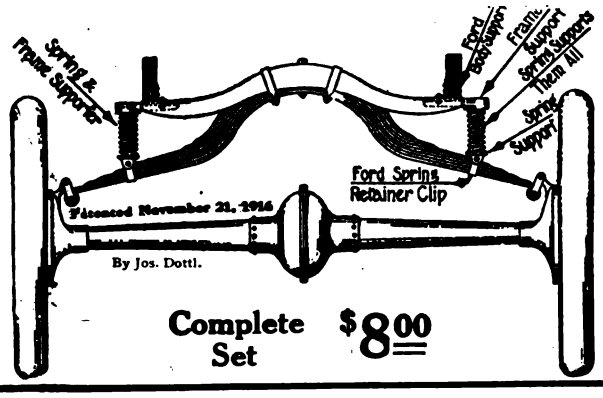
DEALERS—Write for our interesting trade offer.

SLOCUM, AVRAM & SLOCUM LABORATORIES, Inc.
American Car Accessories—Dept. B
531 WEST 21st ST. NEW YORK, N. Y.

2

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Ford Relief Spring *and* Frame Supporter Makes the Ford Perfect



Complete Set $8.00

An Economical, Effective and Valuable Device.

Will double the capacity and prolong life of Ford Cars.

CARRY ONE TON IF NECESSARY

Prevents striking and breaking housing, axle and Fenders, overcomes shearing of center bolt, sagging springs and tilting bodies. Supports frame, improves appearance and riding qualities. Saves the Tires. Acts as an Ideal Shock Absorber.

MADE IN TWO WEIGHTS

No. 1 Pleasure Cars, Carrying up to 800 lbs.
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GUARANTEED, AND MONEY REFUNDED IF FOUND UNSATISFACTORY.

To Strengthen Running Boards and Fenders. Send for Truss Rod Literature.

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BRAENDER
TIRES and TUBES
Are Cheapest on Mileage

They are strictly high grade—built to outlast all others, and they do it. Ask any user.

Send for particulars about BRAENDER Bull Dog Non-Skid—the Fastest, Safest, Smoothest-Riding Tire Made.

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BRAENDER Bull Dog Non-Skid

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SEE THAT GROOVE CONTROLLING THE OIL?



LISTEN!
The groove full of oil forms a dam. Gas cannot get down, oil cannot get up. That's why motor has more power, no carbon.
ISN'T THAT A REASON?



"NO-LEAK-O" RINGS GUARANTEED SATISFACTORY, OR MONEY BACK
Don't rebore cylinders.
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Write for booklet A2. Ford size or under, 50c. Discount to the trade.

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Represented by: AUTO APPLIANCE CO., 110 W. 34th St., New York; H. G. PARO, 1414 S. Michigan Blvd., Chicago; J. W. VAN DE GRIFT, 627 Charles Bldg., Denver; I. E. CRUMBLEY & CO., Nashville, Tenn.

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We don't know of any better book than this on the market. It is bound in flexible cloth, and comprises road maps of the following states:

All of the New England States	Pennsylvania	Virginia
New York	Maryland	West Virginia
New Jersey	Delaware	District of Columbia

These states are largely patronized in the Summer by tourists from all over the country, who like to visit the Catskills, the Adirondacks, and the White Mountains. The "RED ROAD BOOK" also gives maps of that portion of Canada reached by routes from Northern New York, Northern New England and Northern Maine.

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Reading route matter in connection with the principal routes is tersely told, and will be printed in black, and their reverse routes printed in red, to avoid confusion.

The aim in the production of this work is simplicity. Too many automobile route publications attempt so much, that in their efforts to be "complete" they become "confusing." The publishers of this work say that many years of motor travel and the observations of others lead them to the opinion that once out of the confusion of a city's streets, on the broad highway, the need is less for the detailed, must-be-closely followed printed words, comments and instructions of the path itself, but rather the need is for the accurate knowledge that the road to town A and thence to town B is of "automobile goodness," and that it proceeds via this and that village, this or that side of a lake or a mountain, with crossing railroads, or paralleling trolley lines, as a check on location.

Thus is one free to carry out his original purpose; namely, to see the country, with this instruction book.

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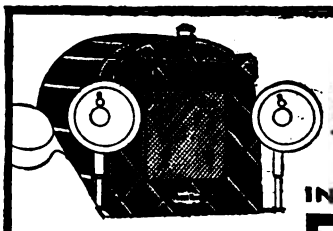
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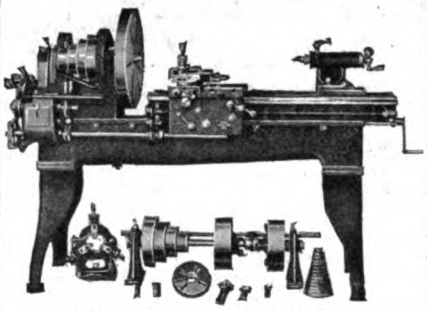
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Saves investing in a large expensive lathe. Swings 14½ in. over top bed and 24 in. through gap. The 7½ ft. machine takes 8 ft. between centers.

Cuts right or left-hand threads, and can be furnished with transposing gears for millimeter threads.

Taper attachment, milling attachment, and other accessories if wanted.

Machine is strong, rigid and accurate, has 2¼ in. spindle with 1⅛ in. hole through same. There are six quick change geared feeds and other new features. Great range and value at a reasonable price.

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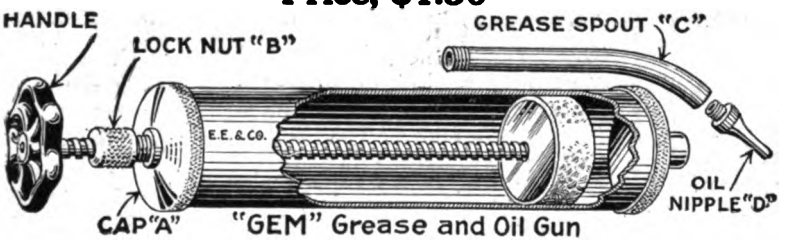
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Price, $1.50



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Length of Barrel, 7 in.; Diameter of Barrel, 1¼ in.; Capacity, 8 oz.; Weight of Gun, 18 oz.

We call attention to the improved features of this Gun, such as the **quick change adjusting nut,** which enables an immediate change from grease to oil, and vice versa. Also, the hydraulic cork plunger, which will last forever. The spout has a removable Oil Nipple. The barrel and end caps are made of extra heavy steel, heavily brass plated. The handle, stem and spout parts are made of brass, highly polished. Entire Grease Gun is unconditionally guaranteed by the manufacturer. Each Gun put up in a substantial box.

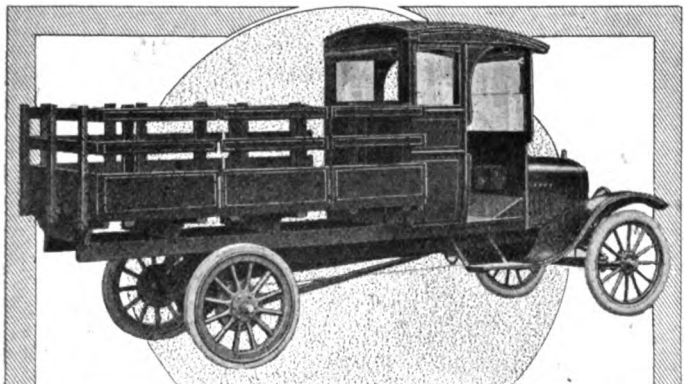
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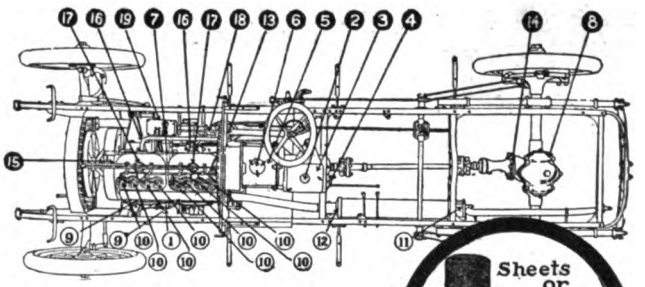
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The growing sales of ENDURA—the water-tight, oil-tight, gasoline tight sheet packing—indicate that garagemen and dealers are feeling the good effects of putting *special-purpose* packing into cars where it is *needed.* And the fact that ENDURA weighs but *half* as much as other packings that *cannot do the same work as well,* suggests the profits and benefits arising from its use. Send this coupon for booklet containing chart, and free samples of ENDURA SHEET PACKING.

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Many Jobbers stock ENDURA. Sign, check, and return this coupon for full sales proposition.

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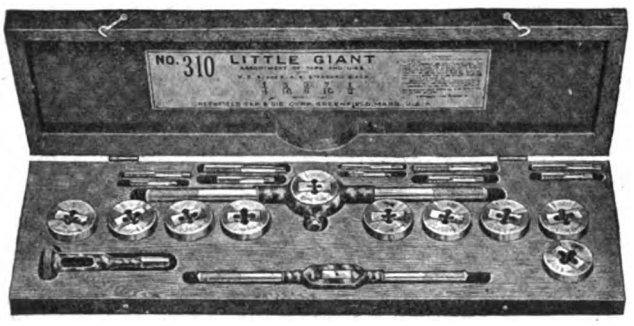
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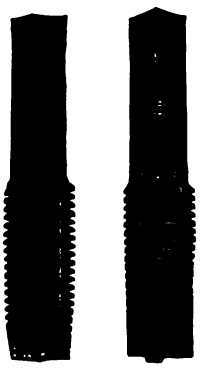
If you'll return this coupon, we'll mail the chart and samples

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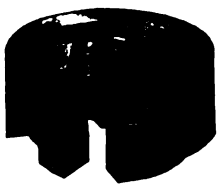


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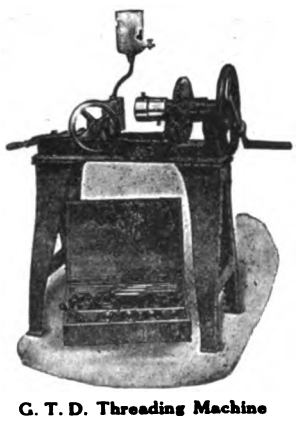
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G. T. D. Threading Machine

Whatever your requirements in the screw cutting line may be, we can meet them, as our line is the most complete in the world. Bear in mind that our service in the threading tool line is unexcelled.

Ask for a copy of our No. 37 General Catalog which contains besides the products listed below, many tables of valuable information for garage repairmen, etc.

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Taps—All kinds, for hand and machine use, in all thread standards.

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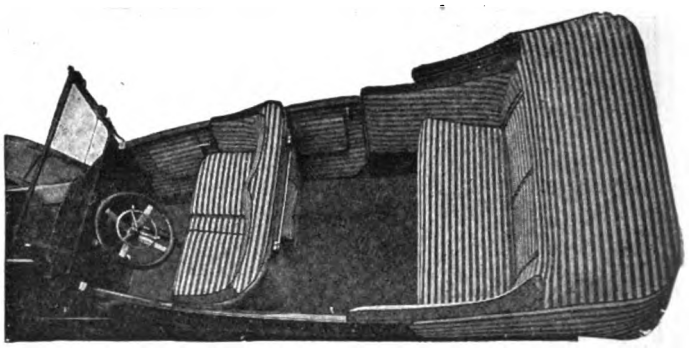


G. T. D. Burring Reamer

GTD

Greenfield Tap & Die Corp'n
Greenfield, Mass.

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Chicago, 13 South Clinton Street
London, 149 Queen Victoria Street
Canadian Factory, Wells Brothers Company of Canada, Ltd., Galt, Ont.



An Easy Riding Feature
That Will Make

GORDON Seat Covers
TAILORED TO FIT

More Popular Than Ever

The new three-piece or "Sectional Overlap Lazy-back" construction of "Gordon" Seat Covers adds ***complete riding comfort*** to the other desirable features of Seat Covers. The Overlap gives entirely free movement to the upholstery; you can sink back into its depths and enjoy solid comfort. This new "Gordon" Cover is easier to put on; the overlap takes care of any variance in the upholstery and relieves all strain on fabric and fastenings—in short it is better for the dealer to sell and is immeasurably more practical for the car owner.

Investigate this new style Cover—it means real money to every accessory dealer.



GORDON
Radiator and Engine ROBES

Every experienced motorist has a hearty welcome for the "Gordon" Robe—it insures full service from his Car all Winter. It is made in two parts—a robe for the hood and curtain for the radiator. Hood raises as easily with a "Gordon" Robe on as with it off.

Made in sizes to fit every automobile, and in two styles for Ford Cars—one-piece curtain and divided curtain.

Every automobile should have one. Get your share of the business by being prepared for it—don't let your customers wait until Jack Frost puts their Cars out of use—order a stock of "Gordons" to care for your trade before the cold days come.

Send for the new "Gordon" Catalogue for 1917-18.

The J. P. Gordon Company
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Cash In on the Demand We are Creating for

KOR-KER Tire Treatment

It's a Time-Tested Proven Success

Kor-Ker *seals punctures,* instantly and permanently. It ferrets out and *stops slow leaks.*

Kor-Ker *prevents under inflation*—you dealers know what that means to the life of a tire.

Kor-Ker is a *preservative of rubber.* Not a filler.

We *guarantee* it *will not injure,* but, on the contrary, *give them longer life.* Motorists have tried Kor-Ker out and found it's *made good* under the *most severe tests.*

We have distributors in U. S., Canada, England, France, Russia, Norway, Sweden, Holland, Spain, Portugal, India, Egypt, S. Africa, S. America, Australia, New Zealand, Java, Philippines and Trinidad.

ALCEMO MFG. CO.,
97 Bridge St., Newark, N. J.
Please mail me your book and your dealer proposition.

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Driving Nail into Tire Treated with Kor-Ker Puncture Cure. This is the strongest proof anyone can ask and will convince the most skeptical.

We are advertising KOR-KER for you in 25 leading magazines

There's a big, liberal profit in it for you. ***But first make us prove to your own satisfaction that we've got the goods.*** Then let us tell you what other dealers are doing with Kor-Ker.

ALCEMO MFG. COMPANY, 97 Bridge St., Newark, N. J.

Make Extra Profits by Oxy-Acetylene Welding

Savings made please your patrons and pay good substantial profits.

PREST-O-LITE

Dissolved Acetylene
(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high-grade welding apparatus for $75.00 (Canada $100.00). The average user will also need gas cylinders at an additional cost, and about $10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.

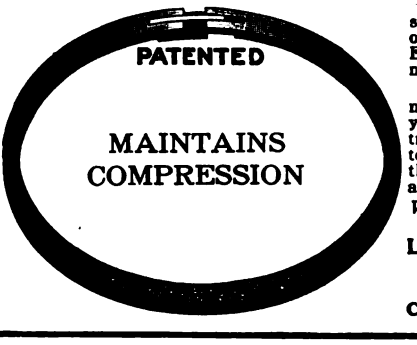
Send for details of Prest-O-Lite Service for Oxy-Acetylene Welding.

THE PREST-O-LITE CO., Inc.
The World's Largest Makers of Dissolved Acetylene
U. S. Main Office & Factory, 820 Speedway, Indianapolis
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PEERLESS PISTON RINGS

ARE THE BEST



PEERLESS RINGS are similar to the standard type of rings in every respect EXCEPT—that they will not leak.

Selling them means more money to you — improves your standing with your trade and makes you a better purchasing agent for those depending on your ability and judgment.

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FOX TYPEWRITERS

Factory Rebuilt Like New at $65.



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50% NEW PARTS AND 3 YEARS GUARANTEE

We offer a rebuilt Fox Typewriter, Model No. 24—*just like new*—for $65.00. These have standard carriages taking paper 10½ inches wide, any kind of keyboard, any kind of type, rubber covers, tabulators, back spacers, two-color ribbons, and are complete with instruction books and cleaning outfits.

Send us any amount you can spare, **from $1.00 up,** as a first payment, and pay the balance $5.00 monthly. Or, send $61.75 all cash. If $10.00 or more is sent with order we will include Free our $4.50 Solid Oak Typewriter Table. Transportation must be paid by the purchaser.

Please order direct from this offer, mentioning Automobile Dealer and Repairer for January. State price you wish to pay and enclose any amount of cash you can spare.



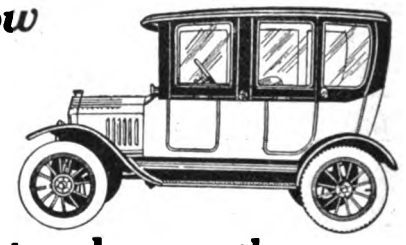
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DETROIT DETACHABLE WEATHERPROOF TOP

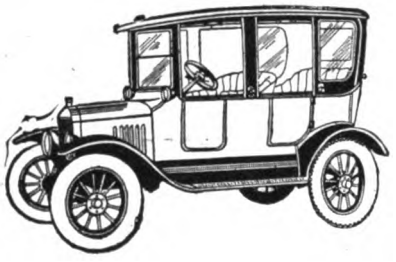
Absolutely Storm Tight from Windshield to Rear Window



ELIMINATES instantly all the Ford drivers' former hardships—no bothersome side curtains to adjust in the biting cold or blinding snowstorm. No change made in the standard body. Entire top can be attached by anyone in three hours.

It is the only patented all-weather top that does away with the objectionable features of a detachable top and affords the car owner an enclosed or open body for year-round use at a really low price.

It is absolutely rattle proof and will last as long as the car.



Just One of the Exclusive Features

of this convertible type top is the patented flexible, easy sliding doors, which disappear into the roof and increase entrance area. Not only is the full door-space available, but Detroit Weatherproof doors are three inches wider than the doors of the Ford; this gives ample entrance for the occupants even though the arms may be filled with bundles. For the other 9 big improvements, see our literature—write us to-day.

SHARRER PATENT TOP CO.

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A fine Fall and Winter Proposition for Dealers

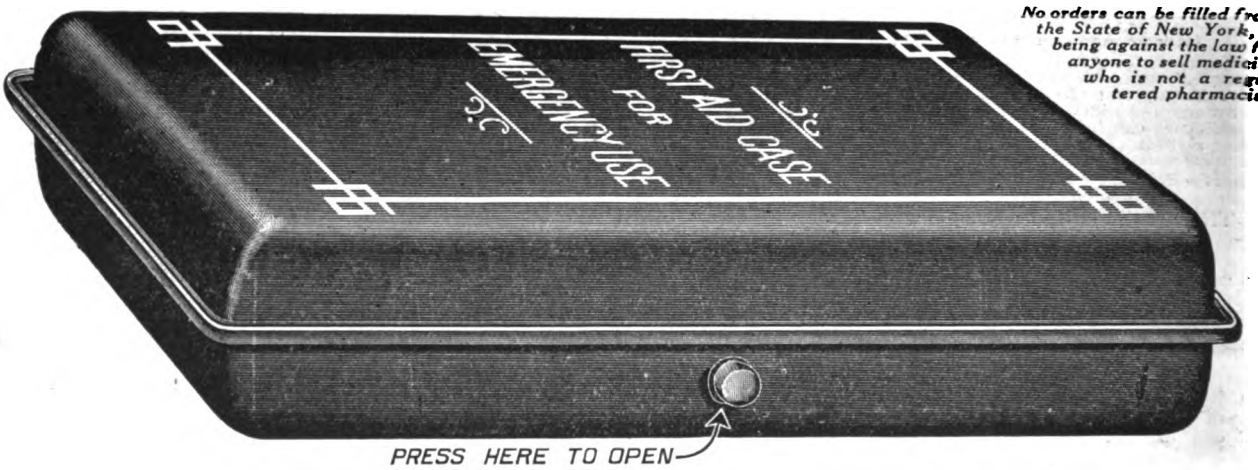
ALSO FOR CHANDLER LIGHT SIX, HUDSON SUPER SIX, CHALMERS 5 PASSENGER, BUICK D45

IT MAY BE YOUR TURN NEXT

TO MEET WITH AN ACCIDENT ON THE ROAD.

It may also be a case of life and death to have the materials at hand for prompt treatment. We have recently made arrangements for a First Aid Case for emergencies especially for the readers of the AUTOMOBILE DEALER AND REPAIRER.

No orders can be filled from the State of New York, it being against the law for anyone to sell medicine who is not a registered pharmacist.



This case is made of heavy Bessemer Steel, size 11½x5½ and 2¼ inches deep, finished in Black Baked Japan and fitted with a strong instantaneous snap. It is strong enough to resist injury to the contents through accident or dampness.

The contents have been carefully selected to supply the needs in an emergency, before the doctor comes. All gauze, bandages and cotton have been prepared in aseptic laboratories under the same rigid inspection as those supplied to the United States Army and Navy.

The contents of this case consists of:—1 "First Aid to the Injured" Instructions. 1 Yard plain Sterilized Gauze for dressing large wounds. 10 Yards 2-inch Sterilized Gauze Bandages for dressing cuts and bruises. 10 Yards 2½-inch Sterilized Guaze Bandages for dressing cuts and bruises. 1 Package Sterilized Absorbent Cotton for pads and dressings. 1 Box Carbolic Salve for burns, sores, insect bites, etc. 1 Yard 1 inch Zinc Oxide Adhesive Plaster for retaining dressings and covering small wounds. ½ Ounce Tincture of Iodine, an antiseptic for immediate use on all wounds and abrasions. ¼ Ounce Spirits of Ammonia for use in case of shock, heart failure and faintness. ½ Dozen Safety Pins.

The retail price of this outfit is $2.50. We have made an arrangement with the manufacturers of such a liberal character that we can supply this outfit with a subscription to the AUTOMOBILE DEALER AND REPAIRER for a year, for the low rate of $2.50.

In case you have already subscribed for this year, we will send you one of these outfits, postage prepaid, on receipt of $1.50, which may be remitted by check, money order, or in any convenient way.

Every subscriber to the AUTOMOBILE DEALER AND REPAIRER should have one of these outfits. It may mean the saving of your own life or the life of some friend. ***ORDER AT ONCE AND THEN YOU WON'T FORGET ABOUT IT.***

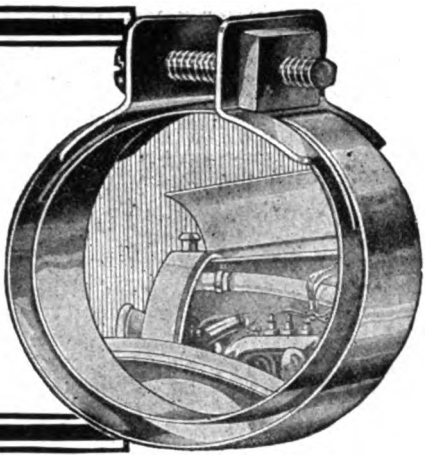
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Publishers of the AUTOMOBILE DEALER AND REPAIRER, 71-73 MURRAY STREET, NEW YORK

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COOPER Adjustable Clamp

Fits Any Size Hose Perfectly

Otis-Flagg Corp.
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THE
BENTON
"THE CASE-HARDENED PLUG"

A New York State Dealer Says:

"Benton Plugs are too good for a garageman to sell, for if he sells a set, he sells no more spark plugs to that customer for three or four years. That is true, but I believe in giving my customers satisfaction."

Price, $1.00

Write for our liberal Agency Proposition and a copy of Booklet shown



L. F. BENTON CO., Vergennes, Vermont
New York Office: 116 Nassau Street

EACH ONE SPECIALLY CAST

The one-piece tight ring with the wonderfully planned joint.

No leakage of gas or oil — more power — less expense.

Don't just try a set — get a set — put them on and feel the "pep" in your motor.

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Dealers everywhere.



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Crane TRADE MARK ENGINE-DRIVEN TIRE-PUMP

Does what *no* other pump *can* do. Because BUILT as *no* other pump *can* be built. Piston works *through* a Packing-Ring, reducing wear to the *minimum*. Beveled base of Ring shaves surplus oil off piston at every stroke. Permits ample lubrication, but prevents oil passing Ring.
Ring is endless. No gaps for air to leak out or oil to leak in. Can be instantly adjusted (by turning cylinder) to maintain air-tight, oil-proof fit, and insures 97% efficiency. This high efficiency enables the CRANE to do the work of pumps twice its size, weight and parts.
And small size, light weight, few parts and simplicity mean low production-cost. That's why the CRANE sells for $10 complete despite high grade materials and finest workmanship.

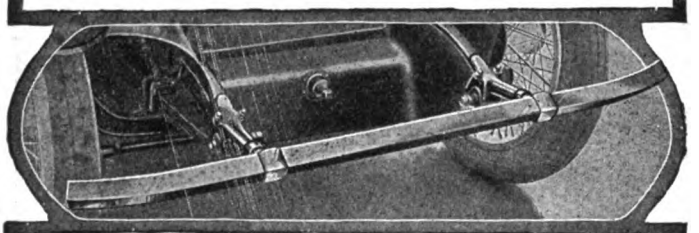
The full story of the CRANE and its patented Packing-Ring is told in an interesting little Folder—just off the press. Write for FREE copy to-day.

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Export Dept., 100 Broad St., New York. (115)

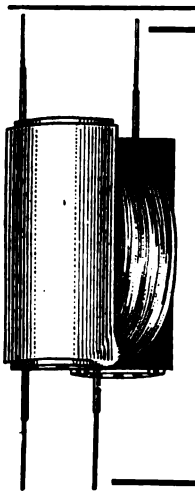
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End Thrust Bumpers

Make more money selling Gemco Bumpers for front and rear. Built on correct end-thrust principle. Diamond or channel bars—extra heavy, can't rust.

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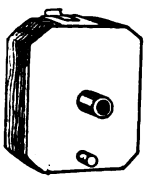


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POPULAR AUTOMOBILE ACCESSORIES



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Windings and Condensers

are fully guaranteed and equal if not superior in every detail to those of the orginal manufacture, as we make a specialty of rewinding Armatures and Coils for all makes of Magnetos.



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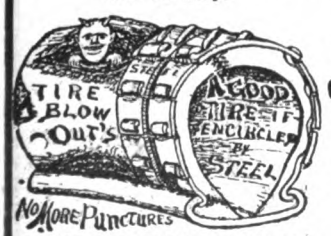
Special Attention to Dealers and Magneto Repairmen

Write to us for Details

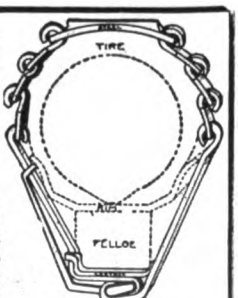
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Manufacturers and Repairers
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Hang on to your old tires. They will last as long as you live if covered with steel. **The Kimball Steel Protector** makes **Blowouts, Punctures** and **Rim Cuts** impossible. A few sections will hold any old blowout. Tires as flexible as ever.

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A Variable Dimmer Giving Any Degree of Light.

Also Prevents Flare-up.

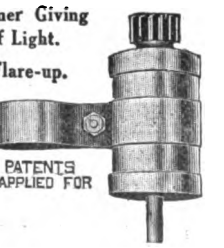


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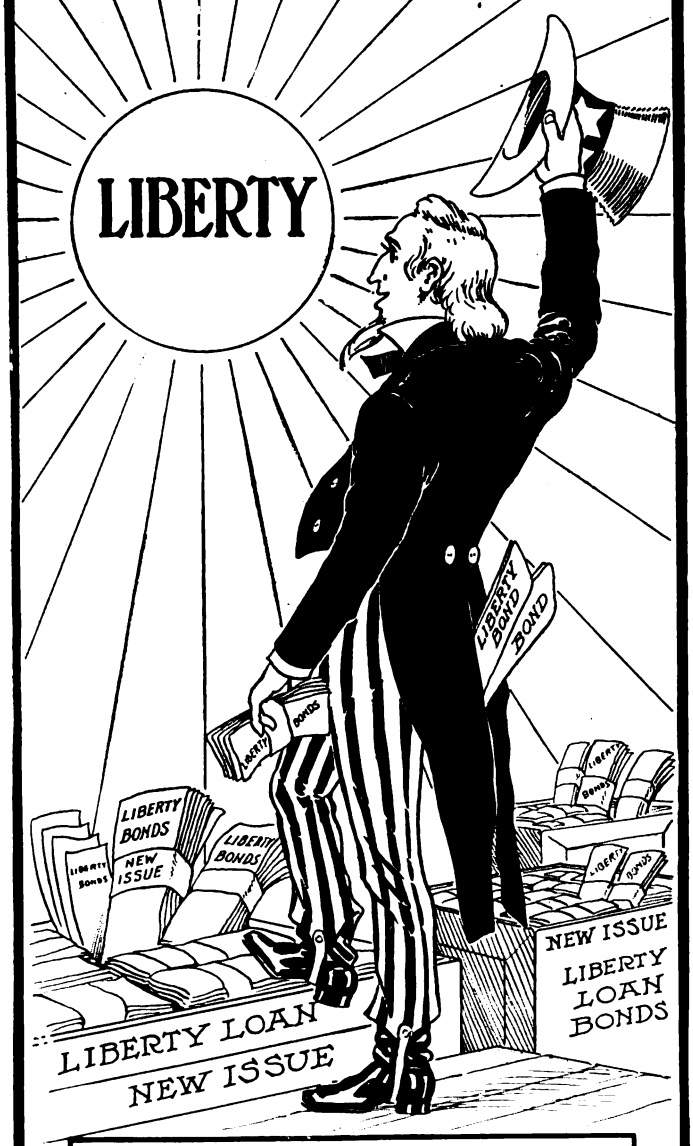
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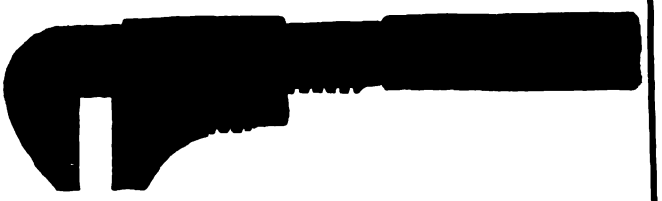
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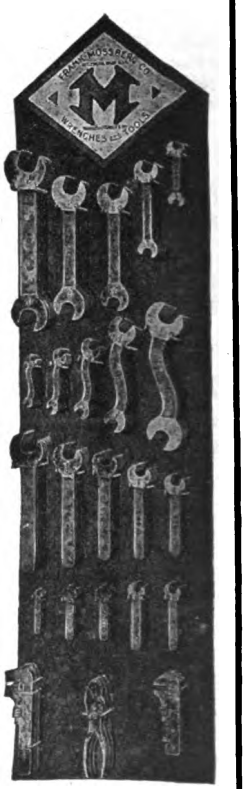
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Yield Quicker Turnovers

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The "X" board displays regular Double End, and "S" Wrenches with openings ¼ in. to 1¼ in., Single End Wrenches with openings ¼ in. to 1 in., Adjustable Sleeve Wrenches and Slip-Joint Pliers.



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"R" Board for Fords displays 27 Tools for Ford adjustments. Each Tool does a particular job well.

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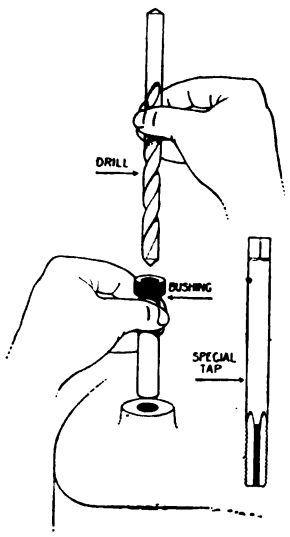
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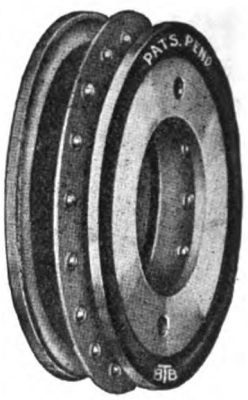
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Practically every time a Ford or Chevrolet 490 owner comes to you because of rear axle trouble the difficulty rests in the fact that his old flat thrust washers at the left (gear) side of the differential *have worn thin*, causing gears to get out of mesh and break. Because flat thrust washers have but a sliding contact they cannot help but wear thin and eventually cause trouble. If you insist upon installing them you create a dissatisfied customer. But the



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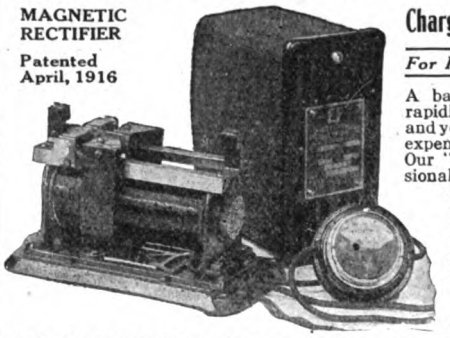
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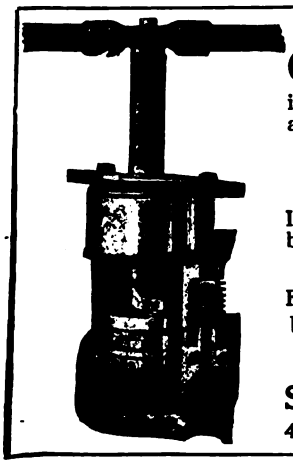
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It is simple, speedy and accurate and can be used by anyone familiar with tools.

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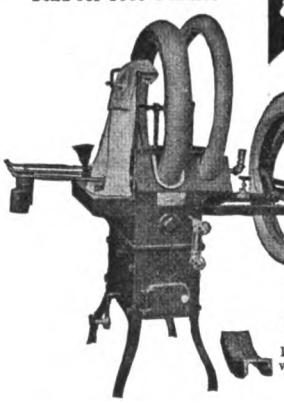
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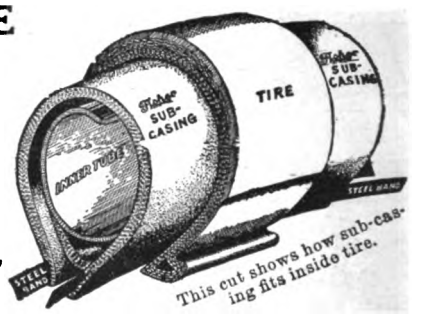
MORE MILES PER TIRE LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

RIM-GRIP SUB-CASINGS reinforce the fabric of the tire at all points from bead to bead. They make a partially worn tire stronger than it ever was. It can be worn out completely and the sub-casing used in another tire. As the cost of equipping a car with new tires is much greater than last year, it will pay you to investigate Rim-Grip Sub-Casings. *Write for particulars.*



This cut shows how sub-casing fits inside tire.

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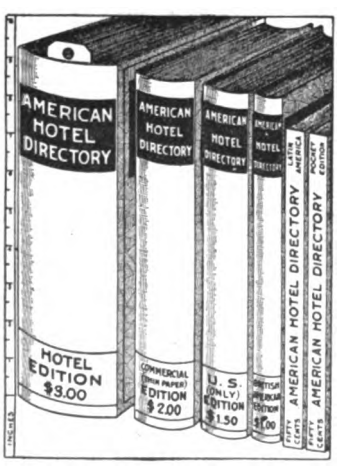
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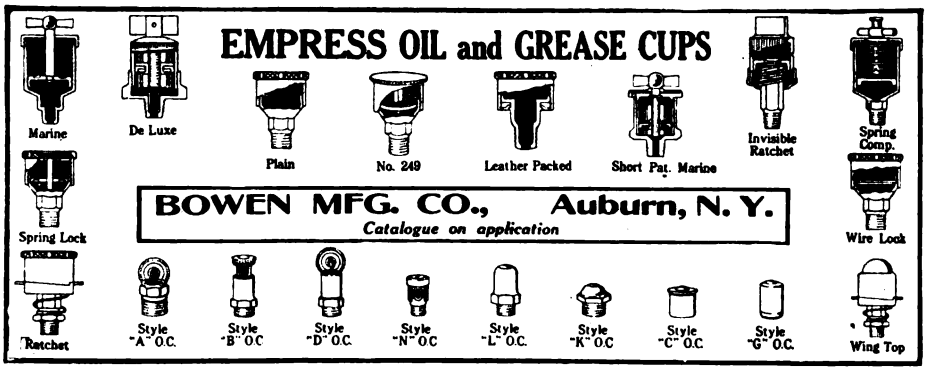
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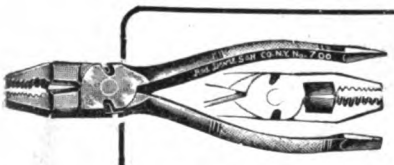


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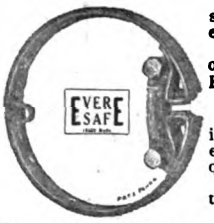
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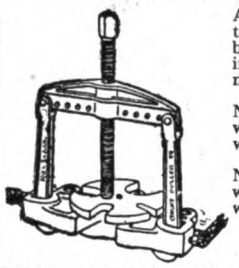
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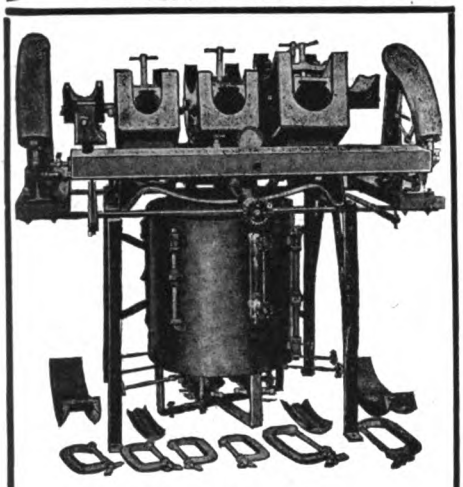
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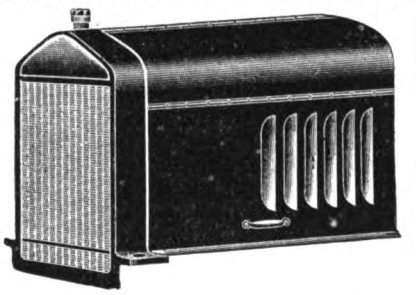
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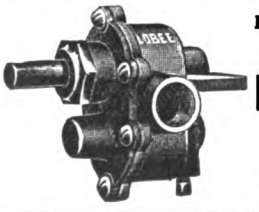
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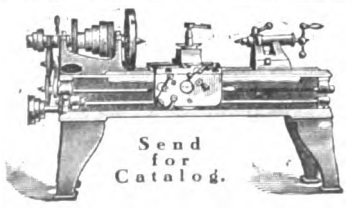
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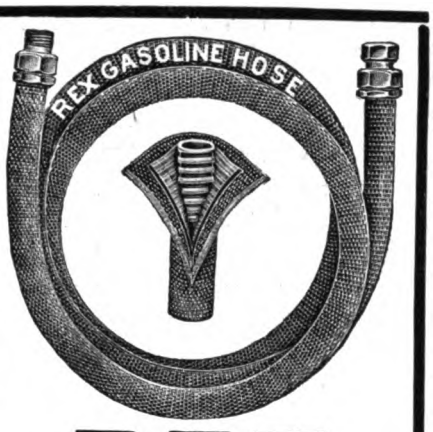
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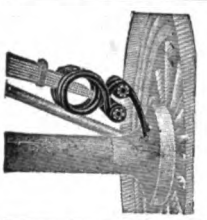
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OLD SOL NITROJECTOR No 100

THE 100% PERFECT SPOTLIGHT

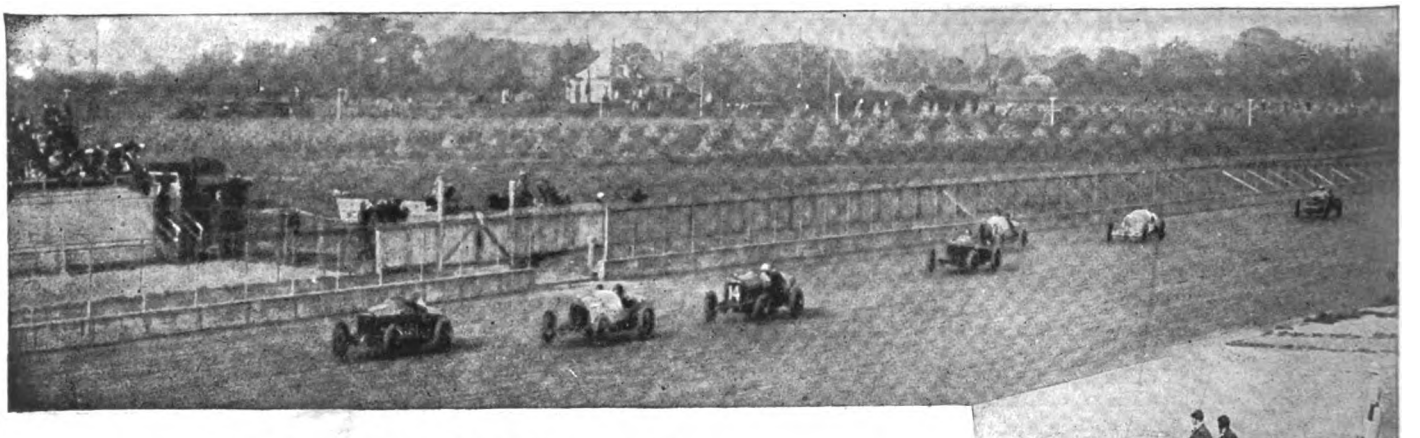
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MAKERS OF OLD SOL WINDSHIELD SPOTLIGHTS AND ELECTRIC LIGHTING DEVICES

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VICTORS

New Departure Ball Bearings carried Chevrolet's chassis to victory in the 100-mile race for the 1917 championship and Harkness Trophy at Sheepshead Bay on September 22d.

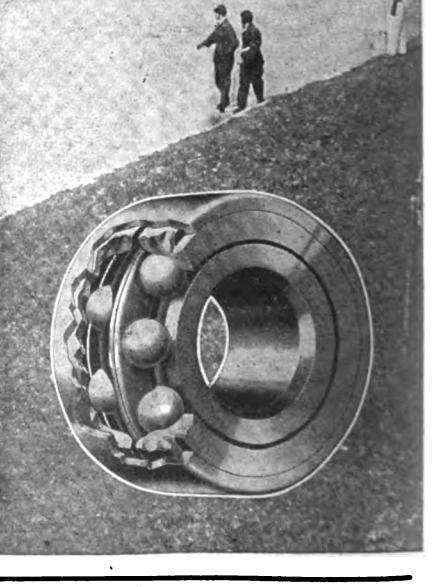
Likewise, Eddie Hearne's Duesenberg (third), and Mulford's Frontenac (fourth), were equipped throughout with New Departures.

It is a fitting tribute to New Departure quality that these ball bearings should aid in establishing both the 1917 champion and the new 100-mile record.

You should know why New Departures are chosen for the Big Jobs—where strength, stamina and service are first considerations. Send for the Brown Book.

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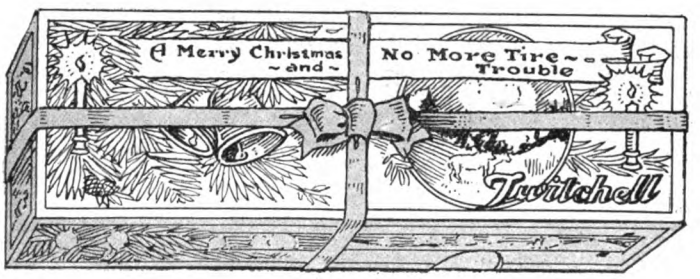


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TWITCHELL

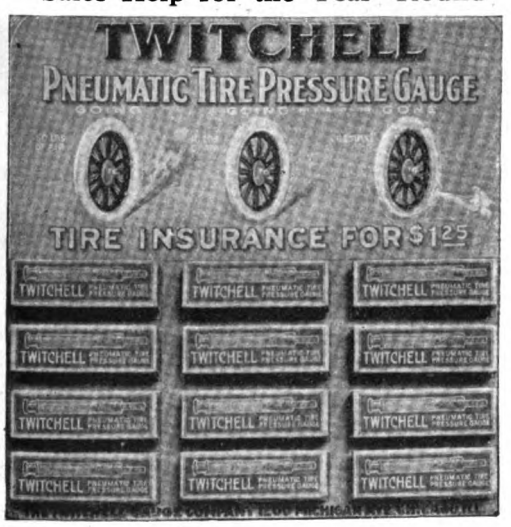
GAUGES

for Christmas



In order to facilitate the sale of TWITCHELL gauges as Christmas presents we are prepared to supply dealers with special holiday jackets (as illustrated), which can be slipped over the regular boxes used the year 'round. These jackets are gay with holly and very festive in appearance and add a great deal to the attractiveness of the package.

Sales Help for the Year 'Round



As a window display they cannot fail to arrest the attention. Write for your supply. They are furnished without cost.

SPECIAL NOTICE

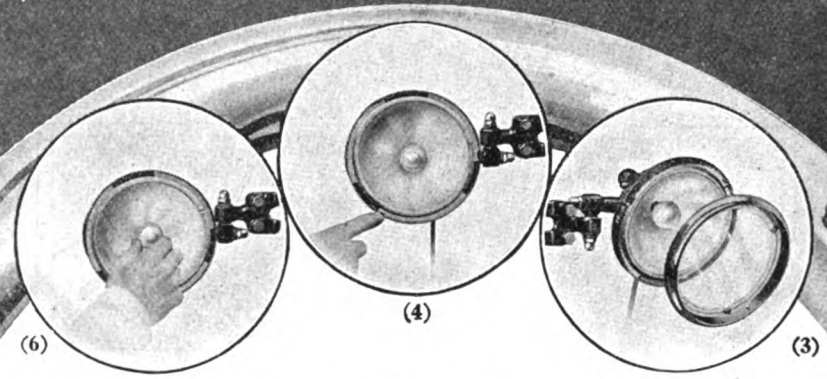
The **TWITCHELL** gauge is now packed in dozen lots for mounting on an attractive counter display easel. Dealers having used this rack for the presentation of **TWITCHELL** gauges report their sales very materially increased thereby.

THE TWITCHELL GAUGE CO.

1207 Michigan Avenue Chicago

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Here is the better spot lamp — Victor — $5.00



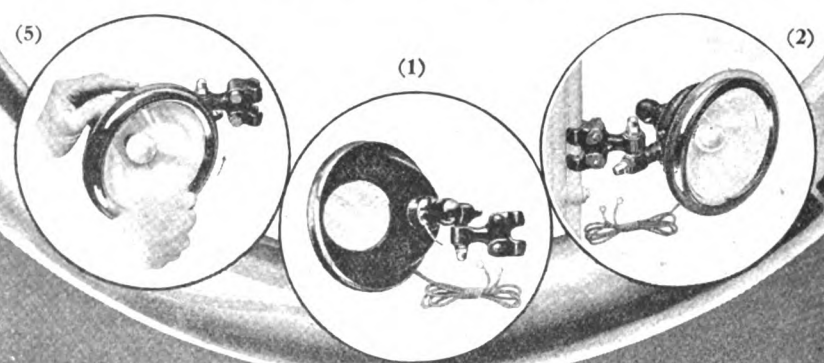
These pictures show some of the many features that make the Victor No. 50 a spot lamp of exceptional beauty, silence, and convenience.

Beauty because the 3-inch condensing mirror is inserted neatly from the inside, flush with the body (fig. 1). Every curve and line of the nickel finished door, the streamline body and the compact bracket is the expression of refined design (fig. 2).

Silence because the hingeless door is held by a tight tension latch, the glass is held firmly in the frame by clips (fig. 3). A special sealing cord between glass and reflector keeps out dust and prevents noise (fig. 4).

Convenience because the door is readily released by pressing button and turning door frame (fig. 5). The focusing device is adjustable to any sized bulb (fig. 6).

Let the Victor reduce driving dangers at once and add one more touch of refinement to your car.



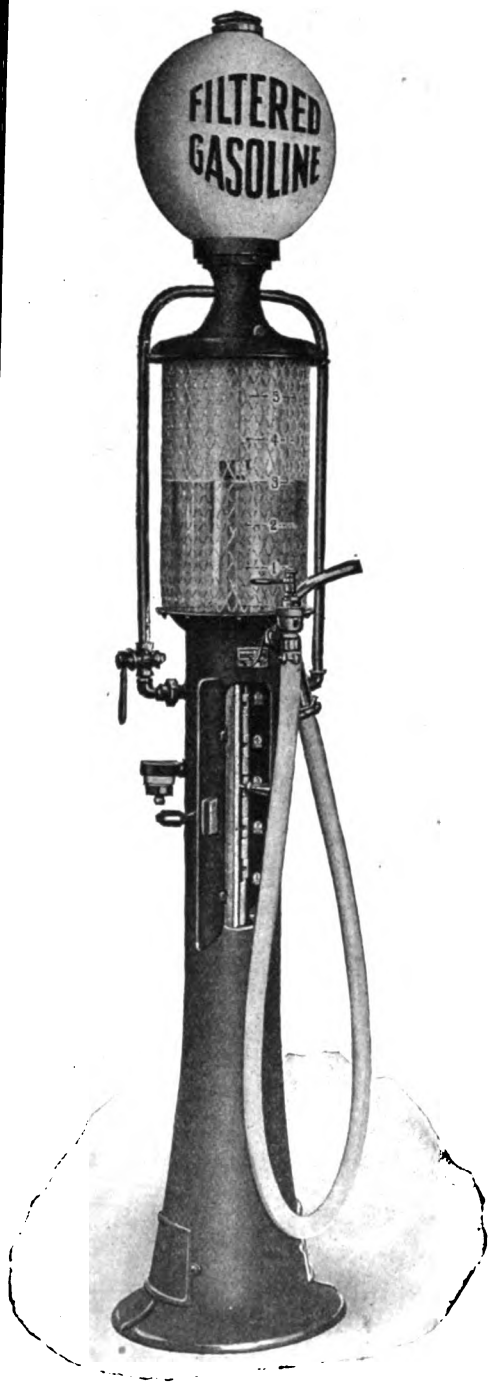


The Corcoran Victor Co.
Reading Road
Cincinnati Ohio, U.S.A



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This is a traditional trait of the American. He loves a winner. Show him one and he promptly climbs into the band wagon and goes along.

That's what garagemen and dealers in gas and oil are doing today in all parts of the country.

We have shown them a winner. They recognize it and they are riding right along to success with us.

GUARANTEE VISIBLE PUMPS

have rung the bell on all "blind" pumps. These old filling systems are going to the scrap pile. The public is responsible.

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"The Old, Old Story Oft Repeated—
Unsatisfactory lubrication—Oil would not flow at Zero—
Scored cylinders."
"It's different now—I have found an oil which 'Flows Freely at Zero'—gives perfect lubrication and leaves less carbon."
"I run her all year 'round on

SUPREME AUTO OIL

Sold everywhere you see the Sign of the Orange Disc.

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GULF REFINING COMPANY

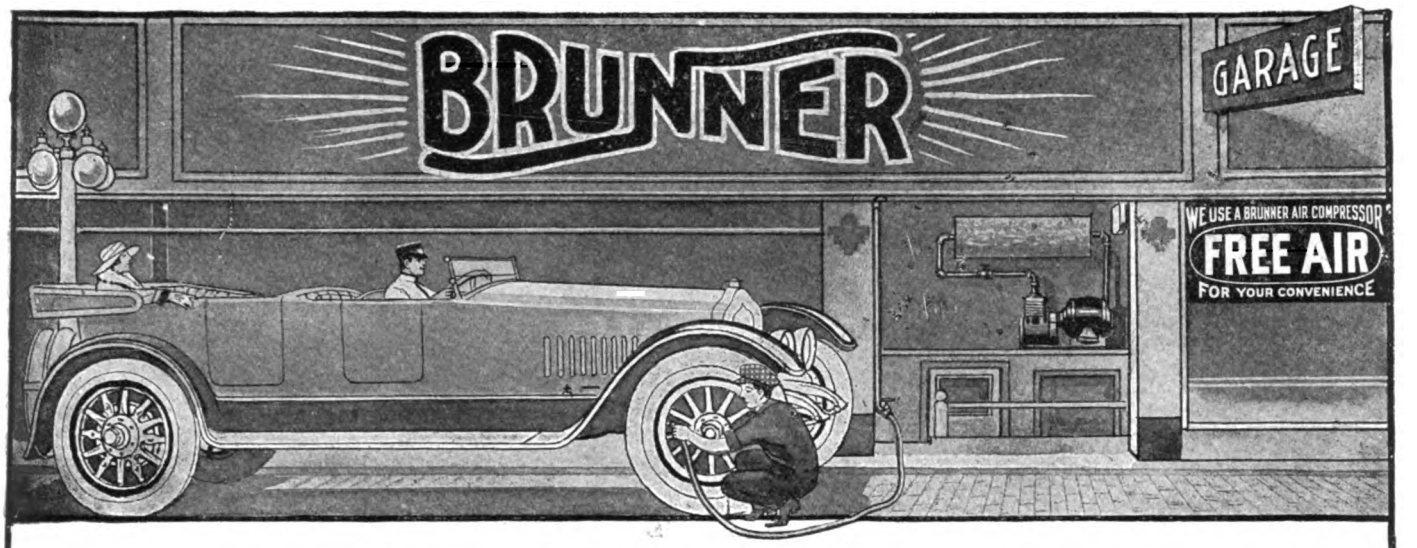
The Largest Independent Refining Company in the World

General Sales Offices: Pittsburgh, Pa.

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New York · Philadelphia Boston Atlanta Tampa New Orleans Houston

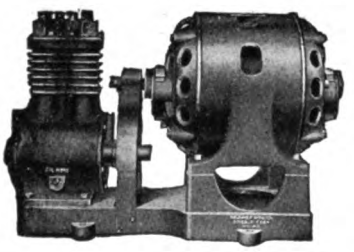
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The motorist who is Brunnerwise, with tires of the largest size,
Knows Brunner Service Satisfies—that's why they call him Brunnerwise.

Yes, the Brunnerwise Motorist knows that when he pulls up in front of a garage bearing the Brunner Sign that he is going to find an ample supply of compressed air at his disposal.

Garage efficiency starts at the end of the air hose and the good, healthy flow of air always available at the end of the Brunner Air Hose always inspires confidence and makes new friends for the Brunnerwise Garageman.



No. 42 Brunner Motor-Driven Air Compressor

INVESTIGATE THE BRUNNER AIR COMPRESSOR



No. 542 Brunner Assembled Motor-Driven Air Compressor

The Brunner Air Compressor has been making good in the garage ever since the garage business has been a business—it is built in a plant which has always been devoted to the exclusive manufacture of air compressors for the garageman's use. The Brunner Air Compressor is and always has been the leader of all garage air compressors in quality, service and volume of sales—and it is, therefore, worthy of your confidence.

We will be glad to assist you in the betterment of your compressed air service, which should be right up to the mark, if you expect to secure your share of the winter business - and we will be glad to give you any information you may desire regarding the use of compressed air in the garage.

There is a Brunner Jobber covering your territory who is thoroughly familiar with the Brunner Line and who would be glad to recommend it to you - let us send you his name and also one of our complete catalogs and Garageman's Handbook on Compressed Air.



BRUNNER MANUFACTURING COMPANY

Main Office and Plant:
UTICA, N. Y.

Cincinnati Branch:
Cincinnati, Ohio



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Winter Driving Keeps Business Thriving

Back up the big movement for winter business. More cars than ever will be run this winter. The demand for accessories and repair work will exceed that of any previous season.

Owners are deeply interested right now in questions of power and economical operation. How to meet the Government's appeal for conservation of fuel and oil. How to overcome the difficult driving conditions imposed by winter roads and winter weather.

Realize what a direct and immediate answer you have to both questions in

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

Make your customers see how they can cut down the cost of running their cars and get increased power at the same time with a set of these piston rings. Nothing to equal them for tuning-up weak, wasteful motors,—for giving such all-round dependable, efficient and durable service.

IMMEDIATE SERVICE ON ANY SIZE RING

McQuay-Norris LEAK-PROOF Piston Rings are immediately obtainable in any size or over-size—any width or diameter—for any make or model of motor. Over 300 jobbing and supply houses carry complete service stocks and can fill your order at once for all standard sizes and over-sizes. At the factory over 2000 different sizes are kept constantly in stock ready for immediate shipment.

No other piston ring manufacturer gives such complete and prompt service. It saves delay, satisfies the owner and impresses him with your live methods of doing business.

Send for this FREE book,—

"To Have and to Hold Power." It will tell you all about the Genuine McQuay-Norris LEAK-PROOF Piston Ring. Will save you and your customers a good deal of money, time and trouble. Write Dept. R.

Manufactured by McQuay-Norris Mfg. Company, St. Louis, U. S. A.

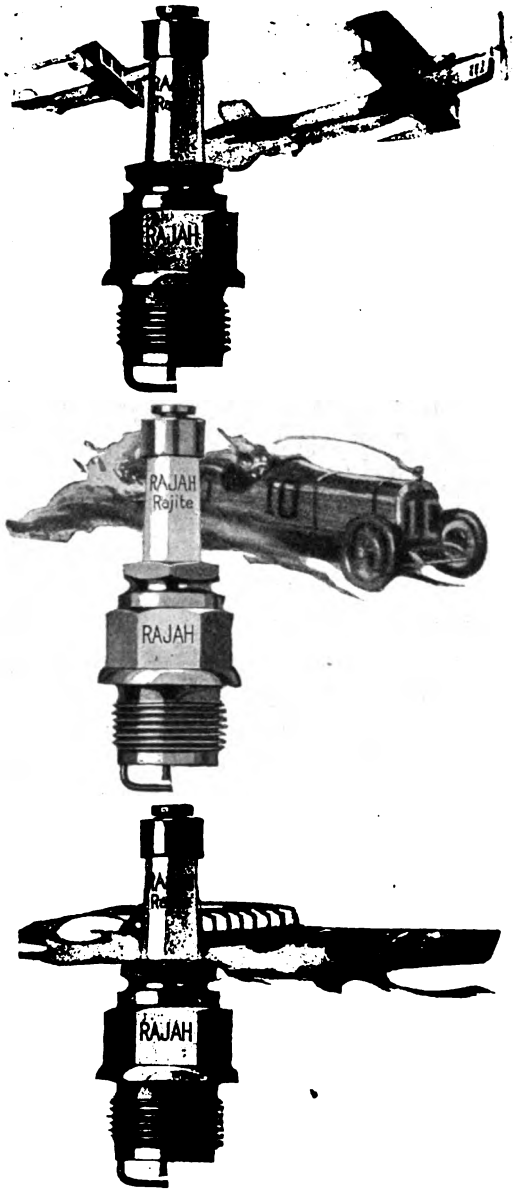


BRANCH OFFICES:

New York, Chicago, Philadelphia
Pittsburgh, San Francisco, Los Angeles
Seattle, Kansas City, St. Paul
Atlanta, Dallas

Canadian Factory: W. H. Banfield & Sons, Ltd., 372 Pape Ave., Toronto

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Supreme Afloat Ashore and in Mid-air

Rajah Spark Plugs are in their element in any element. Afloat, ashore and in mid-air, wherever the gas engine is put to the supreme test of power, speed and reliability, Rajah Spark Plugs are supreme.

These same Rajah plugs that are the choice of racing car drivers, airplane pilots and speed-boat builders and owners, are available for your trade. Can you ask a stronger endorsement or a surer proof of quality and service? Get a supply of Rajahs for the car owners in your locality.

RAJAH *SPARK PLUGS*

RAJAH TERMINALS AND ADAPTERS

are furnished so that Rajah Plugs can be used on any car not equipped with the Rajah type of Clip Terminal. Any size exchanged if desired



Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.



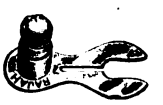
Rajah Thumb Nut Terminal
Adapter for Dodge, Ford, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.



Rajah Packard Terminal
Adapter for Packard 4 and 6 cylinder.



Rajah Stud Terminal
Adapter for Buick, Chevrolet, Oldsmobile.



Rajah Ball Terminal
Adapter for Franklin.
Special type for Willys-Knight.



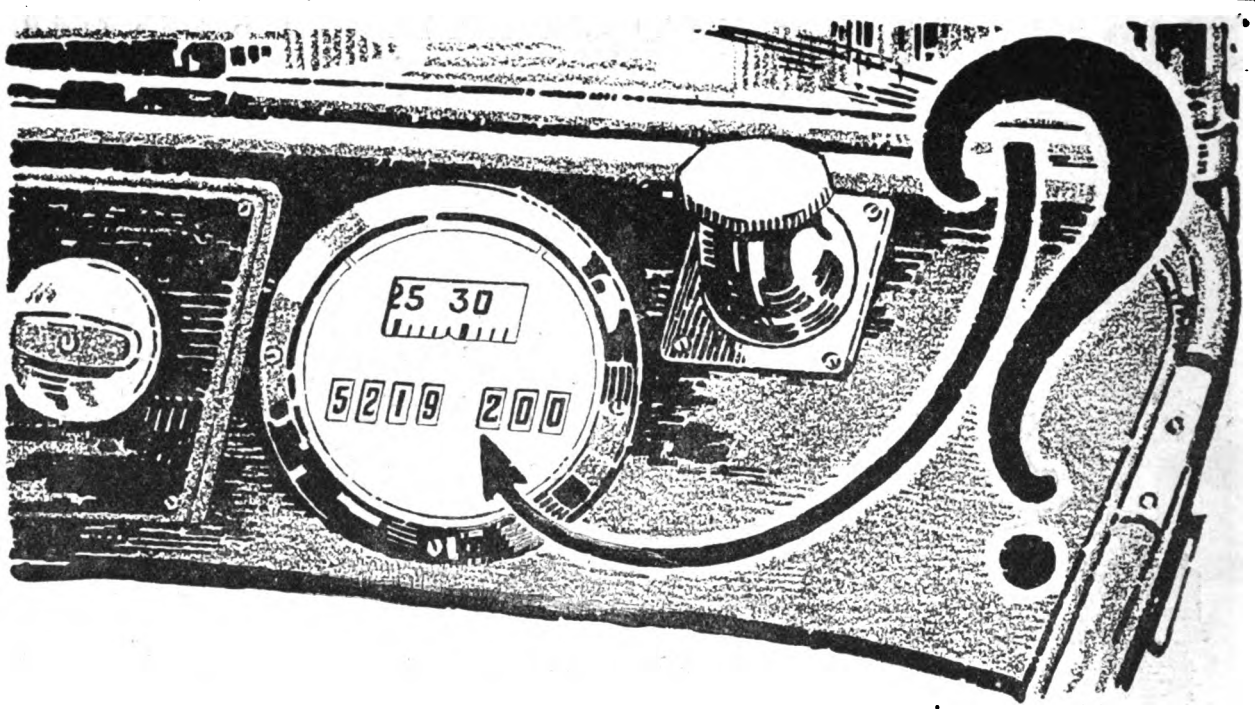
Rajah Priming Plug

Address RAJAH, *Bloomfield, N. J.*

HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland, Seattle. JOHN MILLEN & SON, Ltd., Montreal, Toronto

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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How Far?

MANY car owners keep an eye on the gasoline tank through the medium of the speedometer. So many miles, so many gallons—time to refill.

It's a good plan to follow, too, because it keeps before your mind the mileage you are obtaining per gallon of gasoline.

This mileage depends largely, not only on the gasoline you are using, but on the condition of your motor.

The condition of your motor, in turn, depends very largely on the lubricant you use. So there is a direct relation between the gasoline tank and the crank case.

To obtain high mileage, in other words low operating cost, fill the crank case with

TEXACO MOTOR OIL

There are many reasons why Texaco Motor Oil keeps the operating cost low. Due to certain basic qualities it cannot deposit a hard carbon crust. If any carbon should be deposited due to the use of too much oil it will be in the form of a soft soot easily removed with a cloth.

Texaco Motor Oil stands up well in use, retains its original lubricating qualities, because it gives a perfect seal between piston and cylinder thus preventing leakage of gasoline into the crank case.

As a result of these facts Texaco Motor Oil enables a motor to run at its highest point of efficiency, enables the gasoline to deliver all the power there is in it, and gives high mileage.

When you buy motor oil buy Texaco. The best way, the safest way to buy, is in one or five gallon cans. You can identify Texaco by its clear, clean color.

TEXACO

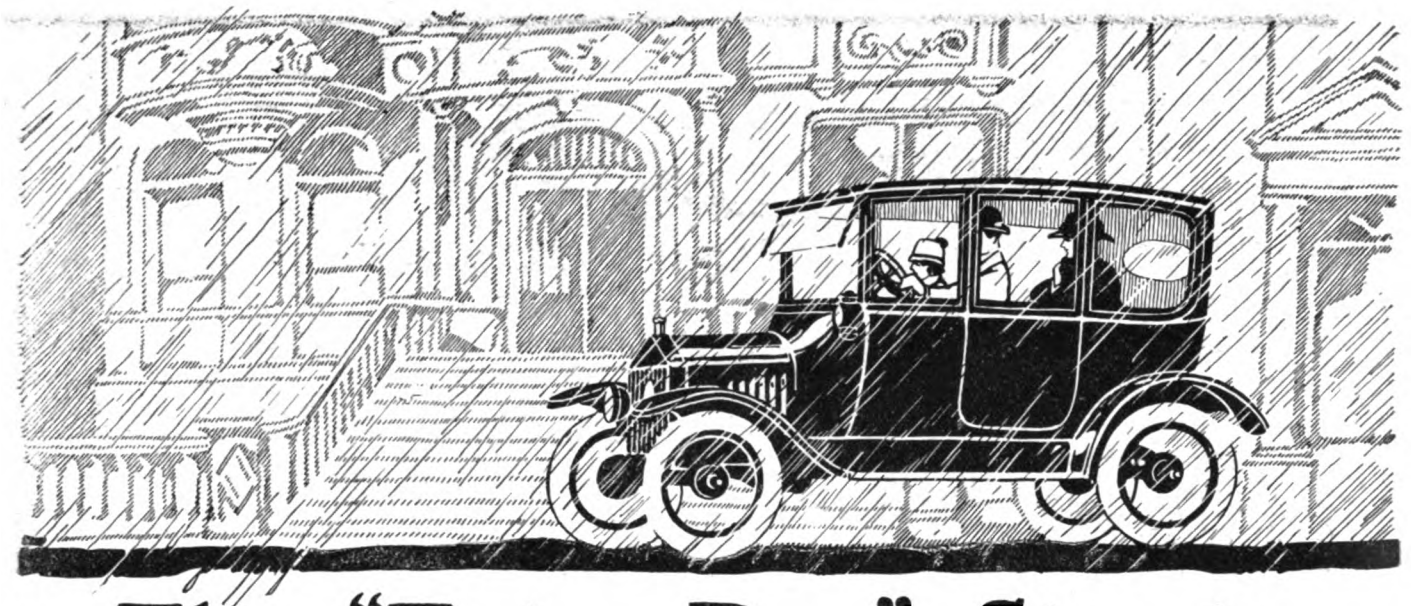
THE TEXAS COMPANY

New York Chicago Houston

DISTRIBUTING OFFICES IN MOST CITIES

TEXACO

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The "Extra-Dry" Start

GETTING soaked when getting started is absurd. Ford dealers are urging their customers to come on in out of the rain. The bracing exhilaration of the electric "extra-dry" start attains its highest development in the

A-B-C
STARTING & LIGHTING SYSTEM FOR FORD CARS

TWO UNIT SIX VOLT

This final refinement of Ford performance places Ford starting in the same class with the highest priced cars.

Dealers are cashing in heavily on its superlative advantages over its entire field, and concede that it conforms more closely to Ford engineering and construction than any other electric starting system ever developed.

Thousands of Ford owners all over the world are satisfied and enthusiastic users of the A. B. C. Responds with powerful efficiency in any weather. Simple, compact, noiseless, easiest to install, and longest lived. Weight evenly distributed by units on both sides of the engine. No drag or strain on motor when starting or generating. Its fibre, leather, and metal belt, moving in V-type pulley, gives highest possible degree of pulling contact. Guaranteed efficient and mechanically correct.

If you have not yet taken it on, fill out and mail the coupon today, and learn the terms of our generous 1917-1918 dealer proposition. Once you learn the advantages of A. B. C. starting and lighting, you will always sell the A. B. C.

A. B. C. STARTER CO., DETROIT, MICHIGAN

A. B. C. STARTER CO., Dept. H, Detroit, Mich

Gentlemen:

☐ * Please send me complete details of your terms to dealers.

☐ * Please send me A. B. C. Booklets for Ford owners.

Name ——

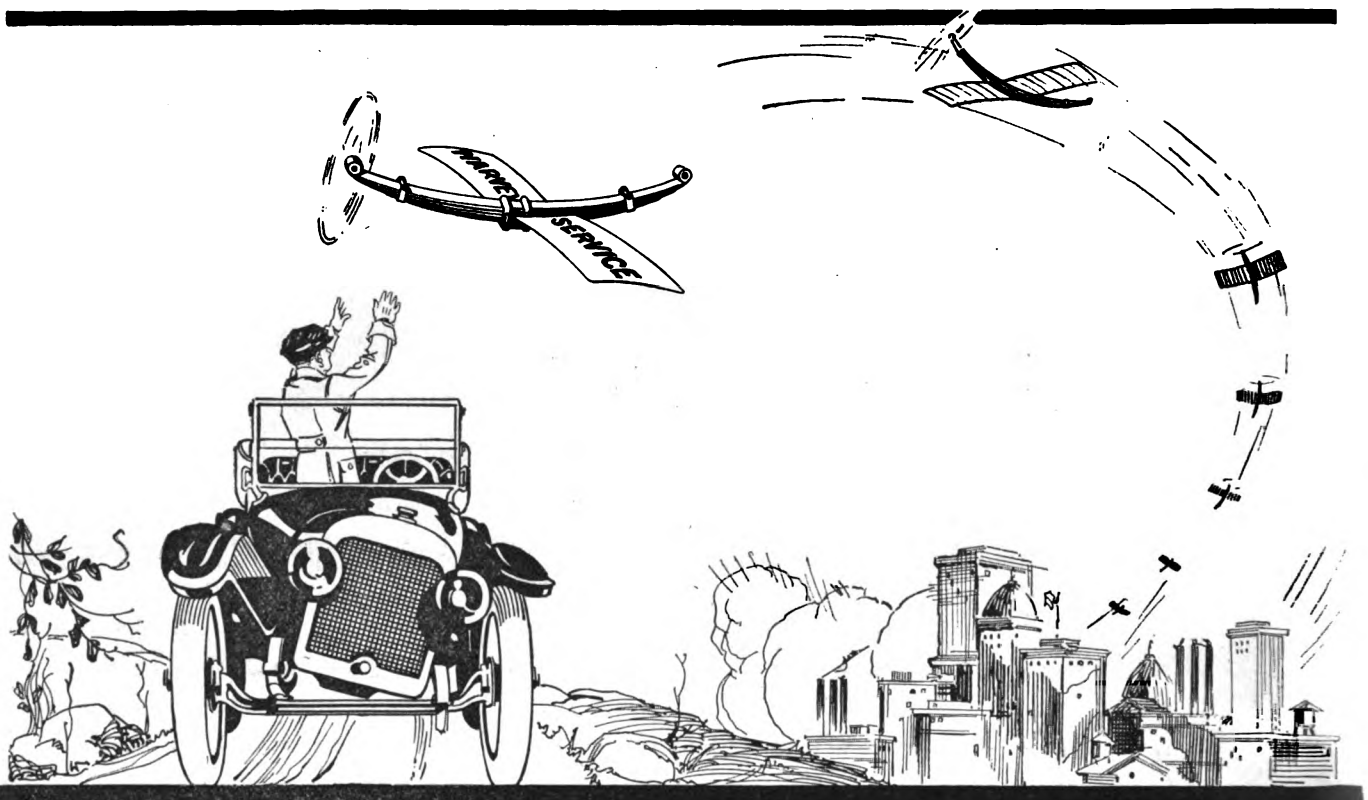
Address ——

City ——

State ——

* Please check the request you wish us to fill.

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Harvey Service to the Rescue

A BROKEN SPRING—a frenzied customer calling for help—demanding a new spring "rush"! It's an odd size; you have none in stock to match it!

And yet you realize the importance of giving this customer real service, not particularly for the profit in this one job alone, nor even for the trade of this one customer, but because service at a time like this will bring the word-o'-mouth publicity which follows naturally when a customer is pleased.

So you call Harvey to the rescue. There's a Harvey Jobber near you, you get him on long distance, in a few words tell him your needs, and then turn to your customer with the satisfied feeling of work well done, because you know already the exact spring you want and the best spring money can buy is speeding to you.



"That's service"! says the customer. And when his car is on the road again he tells his friends about it and they say with him, "That's service"!

That *is* Service, Harvey Service, and it's always ready to help you build a business that will be respected far and near. They may forget the name of the spring you used but the memory of the service you have given will never be lost.

There's A Harvey Jobber Near You

Drop us a card and we will send you his name and our Spring Book giving complete weights, styles, measurements and prices of over 900 different kinds of springs. Write today—you may need Harvey Help tomorrow.

Harvey RACINE

Harvey RACINE

Harvey Spring & Forging Company

909 17th St., Racine, Wis.

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SUNDERMAN
Vacuum Carburetor

$6

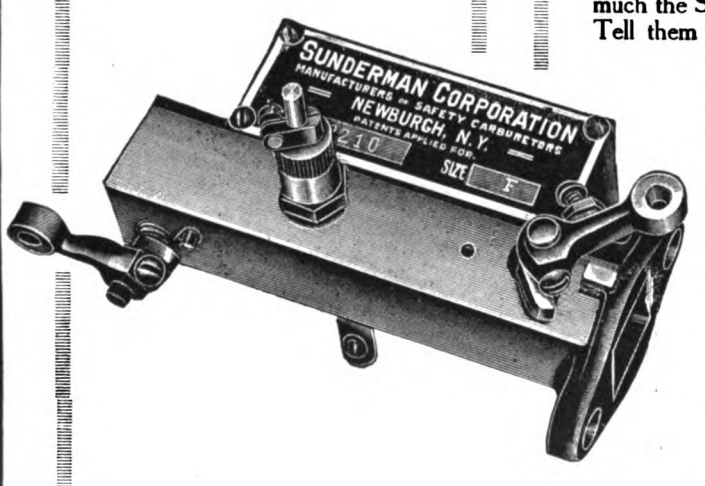
F. O. B.
Newburgh

$8 and $10 for
other than
Ford or Metz

Help Your Customers to Save

That's your duty, Mr. Dealer. Every car owner wants to save—you must show them how. The SUNDERMAN CARBURETOR will save for them without sacrificing anything.

Start NOW



This is the KEY to your Winter Business

It is also the Solution of the Industry's Problem

Every car owner in the United States must save gasoline—or stop running his car all or part of the time.

If motorists do *not* economize, you will see rations of gasoline being distributed, and restrictions being placed on the use of passenger cars the remainder of the war.

Rouse Yourselves, Dealers! You Must WORK in *Self*-Defense!

If the passenger cars stop running, SO DO YOU! They will, unless their owners save gasoline. Their owners can save gasoline if you help them.

You Can Help this Way:

1. Write us at once, sending a sample order for the Sunderman Carburetor. 2. Install it on a demonstrating car (we don't care what make or model). 3. Set down on a card, and place it in your window, the mileage you have been securing from this car. 4. Tell your customers through window and counter cards and your newspaper advertising that you are going to find out how much the Sunderman Carburetor can increase the car's mileage. Tell them when, where and how you are going to make this demonstration. 5. Print the results—you will find a gasoline saving of from 30 to 50%—with a great increase of power, speed, pick-up and flexibility. 6. Get ready for the big demand for Sunderman Carburetors that will follow—a wire to us will bring immediate delivery.

That's the way to do your bit—your duty by your country, by your industry, by your **cash register.**

Get busy at once! We'll help every way we can!

Our proposition is yours for a postal—a letter, or a WIRE!

Sunderman Corporation

13 Chambers Street, Newburgh, N. Y.

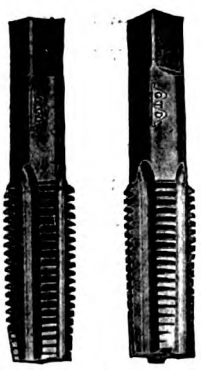
Western Office: 403 Kresge Building, Detroit

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Little Giant Screw Plate

THE COMPLETE LINE OF THREADING TOOLS

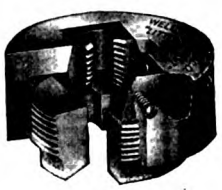


Hand Taps

Whatever your requirements in the screw cutting line may be, we can meet them, as our line is the most complete in the world. Bear in mind that our service in the threading tool line is unexcelled.

Ask for a copy of our No. 37 General Catalog which contains besides the products listed below, many tables of valuable information for garage repairmen, etc.

Below is a partial list of products shown in the catalog:



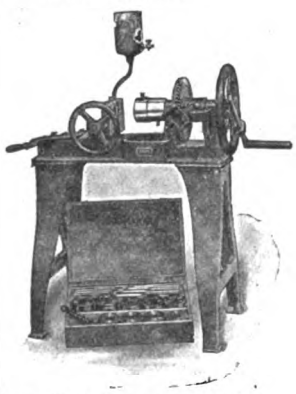
Little Giant Die

Taps—All kinds, for hand and machine use, in all thread standards.

Dies—Several styles, for hand and machine use, in all thread standards.

Screw Plates—Many styles for bolts, nuts and pipe, with Automobile (S. A. E.), or U. S. S. threads, combination assortments with both U. S. S. and S. A. E. thread taps and dies.

Reamers—Hand and machine, bit brace and straight shanks, all types.



C. T. D. Threading Machine



G. T. D. Burring Reamer

GTD

Greenfield Tap & Die Corp'n
Greenfield, Mass.

New York, 28 Warren Street
Chicago, 13 South Clinton Street
London, 149 Queen Victoria Street
Canadian Factory, Wells Brothers Company of Canada, Ltd., Galt, Ont.

WE BEAT THEM ALL



Why Patronize the Speedometer and Horn Trust?

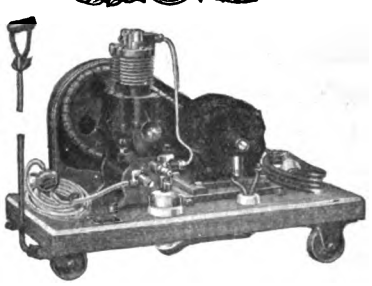
We can furnish you with Repairs and Repair Parts for all makes of Speedometers, Horns and Clocks.

Our prices are from 25% to 50% cheaper than manufacturer. We specialize in the following work: Stewart-Warner, Jones, Hoffecker, Johns-Manville, Sears-Cross, and Standard Speedometers—Klaxon, Newtone, Sparton, Long, and Stewart Horns.

Official Service Station

Van Sicklen Speedmeter — Corbin Brown Speedometer

GENERAL SPEEDOMETER REPAIR CO.
51 West 63d Street — New York City



With competition among garages and repairshops getting keener every day, SERVICE is becoming the biggest factor in *getting* and *holding* new customers.

MAYO ELECTRIC GARAGE PUMP

will put your garage or repairshop in a class by itself, in your town—attracting enough new business to shortly pay for itself. Portable—can be taken anywhere about the garage—out to the curb or into the street.

Operated by ¼ h.p. electric motor with silent chain drive. In ordering state whether for alternating or direct current. 110 or 220 voltage motor is required.

Send for prices and full details

MAYO-SKINNER MFG. COMPANY
2115 Elston Avenue — CHICAGO

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NAILING A LIE—COLD!!

We have read letters from Chalmers Distributors in which they have stated that competitors were saying to present owners of Chalmers cars and to prospective buyers, generally, that the manufacture of Chalmers cars would be discontinued.

There are thirty (30) automobile companies recognized by the general trade that manufacture and sell Touring Cars, and Roadsters at retail prices between $1,100. and $1,500. We haven't heard that all of these companies or any one of them were going to discontinue production or quit business. Why then should the Chalmers, with a better car than many others in this class of 30 manufacturers, stop production?

WE Make a prophecy, and will authorize our Distributors to back it up with $200,000. of our money; that, the Chalmers Company under the Maxwell Management, will stand ahead of 15 of these companies in production in 1918, and the Chalmers Company will stand ahead of 20 of these companies in production in 1919. This doesn't look as though we expected to discontinue making Chalmers cars.

The reason some people are trying to disturb the present Chalmers owners is to scare them about service so as to get a better "trade in" on his Chalmers.

The reason for circulating such a story generally would be to prevent the prospective purchaser from inspecting a Chalmers car, because if a prospective buyer of an automobile will look at and ride in the present Chalmers models he will be very apt to buy one. It is the best car selling at $1365 that we know of.

This is one reason why Chalmers cars will continue to be made, not only in 1918, but in 1919, 1920 and other years.

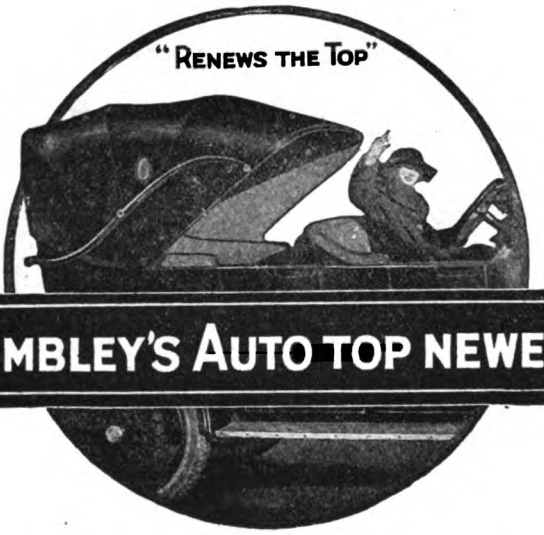
Another reason is that the Maxwell organization has told the general public that Chalmers cars would be produced in larger quantities than ever before and we have a way of making good with the public on sales and production.

Walter E. Flanders

President, Chalmers & Maxwell Motor Companies.



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PIMBLEY'S AUTO TOP NEWER

It Pays to Use, Sell and Feature

PIMBLEY'S NEWERS and ENAMEL

For ALL AUTO TOPS and BODIES

PIMBLEY'S
AUTO-TOP-NEWER

nationally advertised to millions of car owners, is a wonderful black, liquid compound for giving new life to Leather, Pantasote and Mohair. Dries quickly but doesn't harden and won't rub off. Waterproof. Fine for seats, cushions and metal parts of car such as axles—running-board, etc. Retail price 50c—$1.00—$1.50.

PIMBLEY'S
AUTO BLACK ENAMEL

known as the most beautiful, durable refinisher on the market, resists the heat and weather elements. Better than any enamel you could use, and makes the car look fresh from the factory. 45c—75c—$1.35.

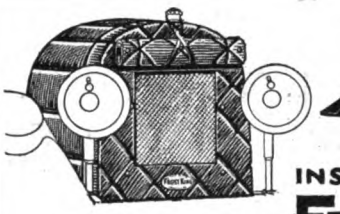
PIMBLEY'S
AUTO-NEWER

differs from waxes, oils and polishes—it's a real Renewer—restoring the original high class factory-finish in all its original beauty. 50c—$1.00.

ALL NATIONALLY ADVERTISED MONEY MAKERS

Write for a sample for your own use—
you'll want to sell them after that.

Pimbley Paint & Glass Co.
ST. JOSEPH, MISSOURI



INSIST ON THE GENUINE

FROST KING

Asbestos Insulated Radiator Cover

This high-grade radiator and engine cover will save enough *more* gasoline to many times offset the cost of its superior construction.

It has an extra thick layer of long fibred heavy Kersey, having great insulating properties. Next comes Asbestos, which absolutely keeps out cold and is the most remarkable heat retaining material known. Good quality waterproof Imitation Leather forms the outside covering.

For double wear, better appearance and better protection get the Frost King. Prices $2.75, $3.25, $5.00 up. Order early.

Dealers, order your Frost Kings now from your jobber. If he can't supply you, write us for samples and net prices.

Manufactured exclusively by

The Cincinnati Auto Specialty Company

Dept. R117, Cincinnati, Ohio, U.S.A.

ASBESTOS FROSTKING INSULATED

REFLEX SPARK PLUGS

Cold weather driving makes stern demands upon spark plugs—the temperature extremes call for a plug that has *stamina*. And the only way stamina is secured is by being *built in*. Chromite porcelain—the strongest heat-resisting insulator known—is used in every Reflex Plug.

Equip your engine with Reflex Spark Plugs and let their *actual performance* convince you that Reflex Plugs *do* "keep the car on the go!"

As a dealer, are you getting the Reflex business that you ought to have? The man who once uses Reflex Plugs becomes a steady, enthusiastic user. Let us send you a free test plug and details of our proposition.

THE REFLEX IGNITION CO.
1711 Payne Ave.
CLEVELAND
OHIO





"KEEP THE CAR ON THE GO"

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"WHITNEY" KEYS

FOR THE
WOODRUFF SYSTEM

For the benefit of dealers, garages, and repair men, we are prepared to furnish our keys put up in two assortments. Every garage and repair man should keep these on hand. They may be purchased from the leading jobbers or ordered direct from the factory.



Regular Assortment

One hundred keys of the sizes most likely to be required for repair work.

Ford Assortment

One set of keys for the Ford car. These keys are of the special material and special treatment specified by the Ford Motor Company.



THE WHITNEY MFG. CO.

HARTFORD, CONN.

Chains Keys Hand Milling Machines

Stop that waste!



Uncle Sam is calling for gasoline economy—you can do *your* bit by getting after the car owners you know and urging them to install Inland *gas-tight* piston rings. Our plan will show you how to GET THEM—it will boost your business in dull winter months. Don't wait—write us to-day. The Spiral cut makes Inlands absolutely gas-tight; strongest and most durable because equal width and thickness all around; and low-priced because one-piece.

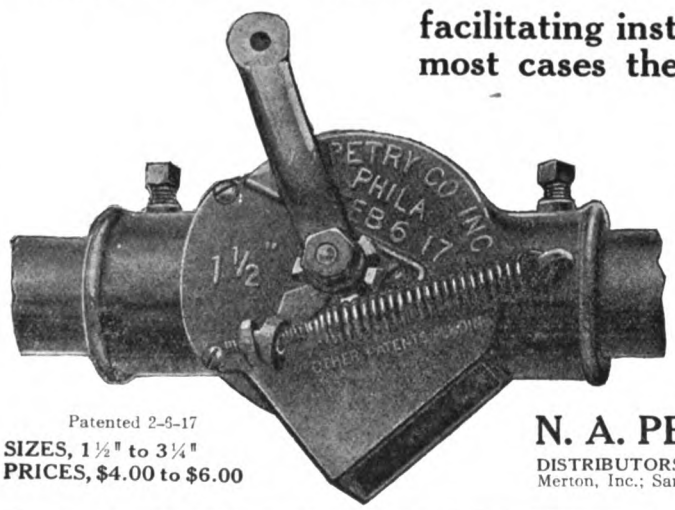
INLAND MACHINE WORKS
802 Mound St. St. Louis, Mo.

INLAND
1 PIECE PISTON RING



Seven Points of Adjustment

facilitating installation and eliminating in most cases the use of pulleys



Patented 2-6-17
SIZES, 1½" to 3¼"
PRICES, $4.00 to $6.00

Every motorist is quick to appreciate this exclusive, patented feature of the Petry.
Yet it's only **one** of the many constructional advantages of a cut-out scientifically correct in every detail.
The Petry Cut-Out is the first device of its kind to give permanent satisfaction. It expels the exhaust gases through a full-size megaphone-shaped vent, which greatly augments sound and facilitates tuning up of motor. Has adjustable lever, positive cut-off non-fluttering valve, and is absolutely noise-proof when closed. Spring is away from the heat. Makes a gas-tight joint of permanent rigidity without strain on exhaust pipe. Easy to install and easy to operate. A size perfectly suited to every car.

N. A. PETRY COMPANY, Inc. 1313 Race Street PHILADELPHIA

DISTRIBUTORS: Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Hughson & Merton, Inc.; San Francisco, Cal., Los Angeles, Cal., Portland, Ore., Seattle, Wash.

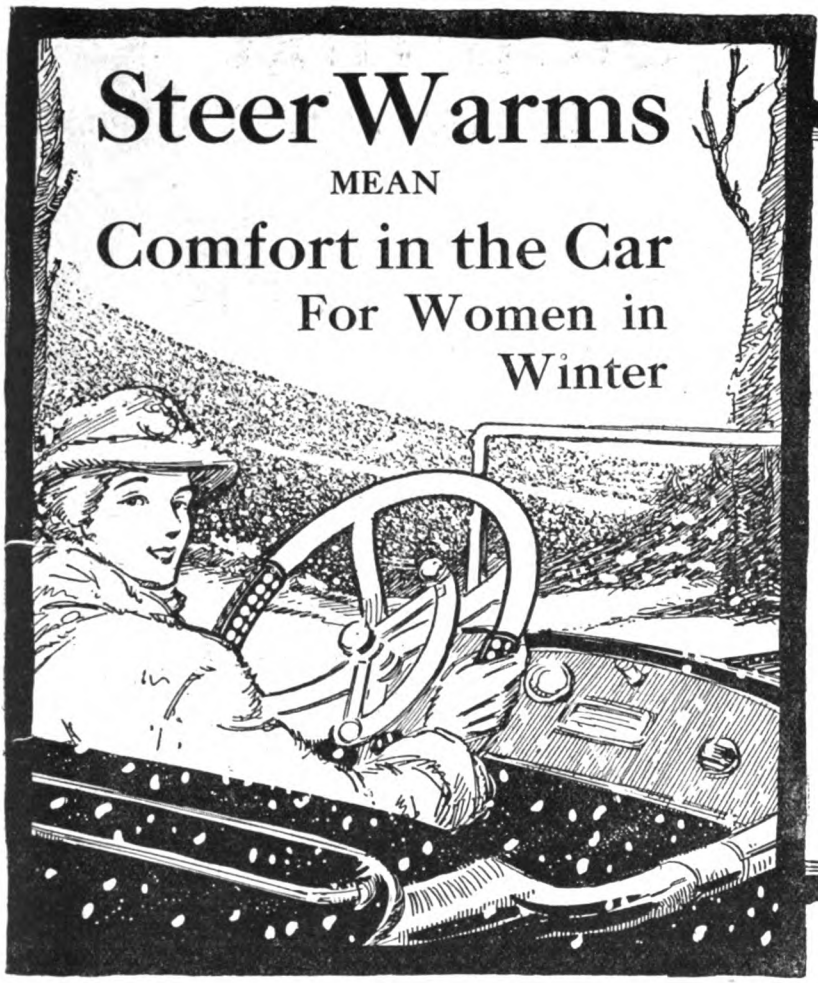
PETRY CUT OUT

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Steer Warms

MEAN

Comfort in the Car For Women in Winter



LIVE DEALERS

are finding Steer Warms great business bringers. Sell on sight to live motorists all over the cold-weather country. Make people—especially women—use their cars all winter. Help the sale of accessories and supplies. Because

Steer Warms

KEEP THE HANDS WARM IN COLD WEATHER

and warm hands mean the warmth all over that gives comfort and wards off "bad colds;" also limber fingers that give firmer grip and make driving safer.

GUARANTEED: Steer Warms are guaranteed against burn-out for five years; and guaranteed every other way; money refunded if they fail in anything we claim for them.

THE ONLY hand-warmers in which the heating element is protected, insuring uniform and unbroken heat. Don't experiment with infringements—get the genuine Steer Warms.

— PRICES —

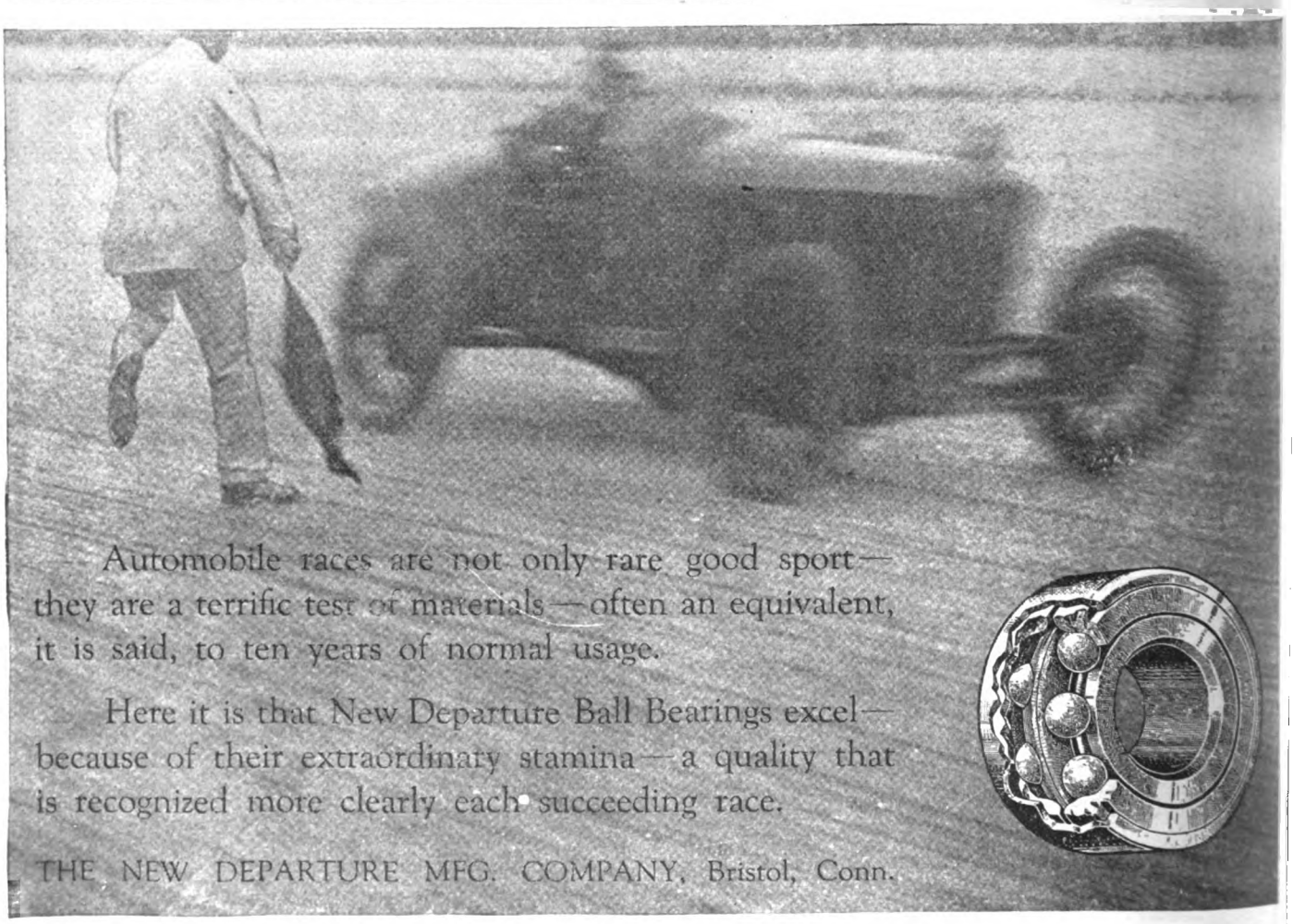
For all gasoline cars, $7.50 a pair (in Canada, $11)
Special For Ford Cars, $5 a pair (in Canada, $7.25)

GOOD PROFIT TO DEALERS

Liberal discounts from retail prices give dealers good profits in handling Steer Warms and national advertising and dealers aids which we furnish make Steer Warms "big sellers." It will pay YOU to handle them.

Write for full information.

INTERSTATE ELECTRIC CO.
845 PERDIDO STREET NEW ORLEANS



Automobile races are not only rare good sport—they are a terrific test of materials—often an equivalent, it is said, to ten years of normal usage.

Here it is that New Departure Ball Bearings excel—because of their extraordinary stamina—a quality that is recognized more clearly each succeeding race.

THE NEW DEPARTURE MFG. COMPANY, Bristol, Conn.

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The Right Way

to build up your accessory business is to sell your customers supplies that give the best service—tires, "gas," oils or lubricants

DIXON'S GRAPHITE Automobile LUBRICANTS

are the ones that give 100% service and are ever dependable. They will help you build a better business.

Write to us for Dixon's Dealer's Deal No. 184-G

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE CO.

D X N TRADE MARK ESTABLISHED 1827 D X N TRADE MARK

Guaranteed for 10,000 Miles



EVERY Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser.

"Absolutely Puncture Proof"

Brictson Tires are puncture proof, and proof against blowouts, skidding, rut wear, rim cuts, and can't be damaged by oil or gasoline. Wonderful resiliency, easy riding and economy commend them to every car owner.

The Big One-fourth Retread Feature

Should the tread surface wear out after 10,000 miles of service you can get a new retread for one-fourth the original cost of the tire, instead of buying a new tire and you keep the remaining three-fourths in your pocket. With ordinary service the Brictson Tire should run enough beyond the 10,000 miles to require one or two extra retreads. The more retreads you use the cheaper your service.

FREE TRIAL OFFER

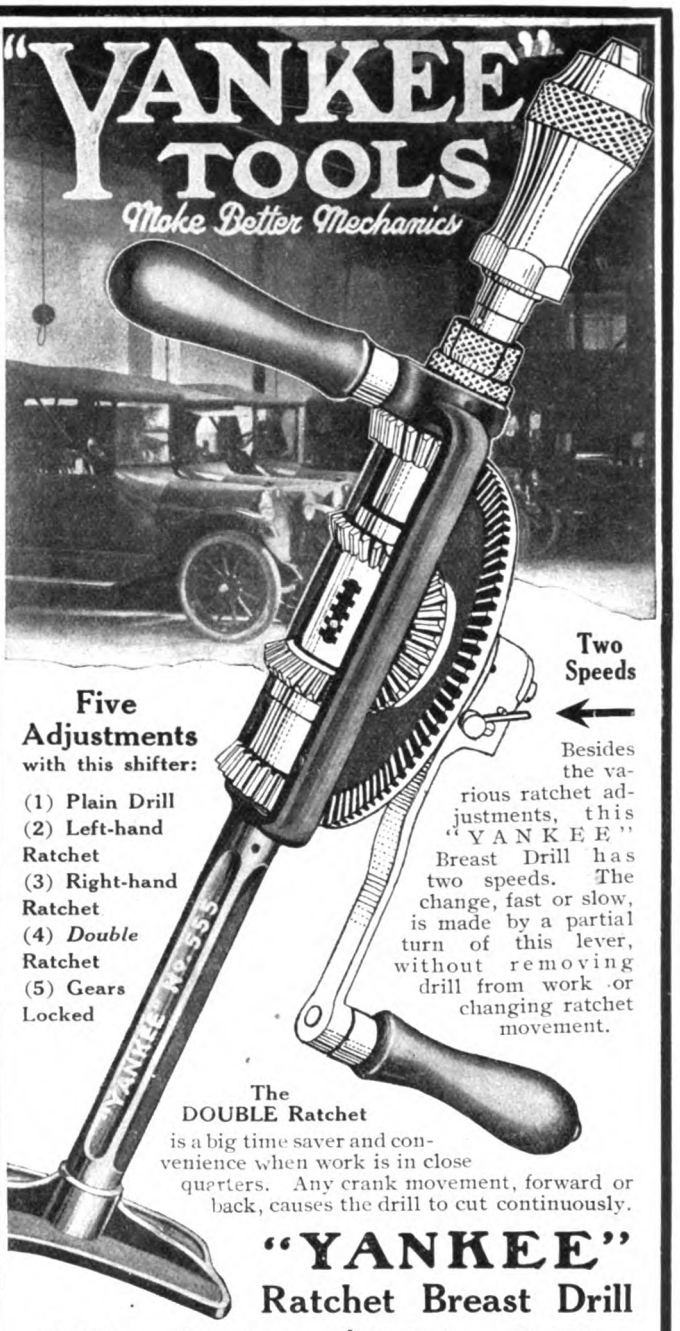
To convince you the Brictson Tire will give satisfaction TRY THEM ON YOUR CAR AT OUR EXPENSE. Write today for this Free Trial Offer, a copy of our guarantee and full information about Brictson Tires.

The Brictson Mfg. Co.
1117 Brictson Bldg.
Brookings, South Dakota

Brictson Pneumatic Tires

"YANKEE" TOOLS

Make Better Mechanics



Five Adjustments with this shifter:

(1) Plain Drill
(2) Left-hand Ratchet
(3) Right-hand Ratchet
(4) *Double* Ratchet
(5) Gears Locked

Two Speeds

Besides the various ratchet adjustments, this "YANKEE" Breast Drill has two speeds. The change, fast or slow, is made by a partial turn of this lever, without removing drill from work or changing ratchet movement.

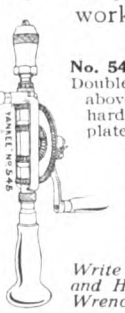
The DOUBLE Ratchet

is a big time saver and convenience when work is in close quarters. Any crank movement, forward or back, causes the drill to cut continuously.

"YANKEE" Ratchet Breast Drill

No. 555—Two-jaw chuck **Price, $7.70** No. 1555—Three-jaw chuck

appeals to garage men and up-to-date shop workers not only because of the time and labor it saves, as compared with any other tool for like purposes, but because it works with splendid efficiency in ways and places where no other drilling tool can be worked at all.



"YANKEE" Hand Drills

No. 545 and No. 1545—two- and three-jaw chucks. Double speed; and same ratchet movements as above, but made lighter and with polished hardwood handle instead of shank and breast plate. . . . . **Price, $6.80**

"YANKEE" Plain Breast Drills

No. 455 and No. 1455—two- and three-jaw. Double speed, but *without* ratchet movements. . . . . **Price, $5.00**



Your Dealer Can Supply You

Write us for "'Yankee' Tool Book" of Breast and Hand Drills, Bench and Chain Drills, Tap Wrenches, Screw-drivers and other garage tools

North Bros. Mfg. Co., Philadelphia

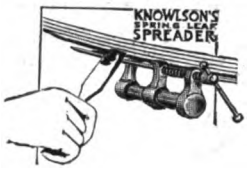
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KNOWLSON'S

100% EASIER RIDING

BOTH GUARANTEED.

Either or both delivered upon receipt of price.

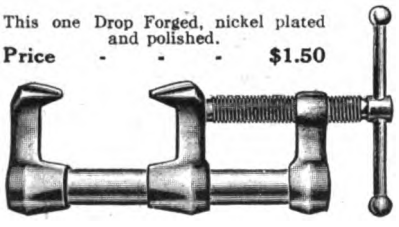


Spring Spreaders

SQUEAKING STOPPED

Your money back if you want it.

This one Drop Forged, nickel plated and polished.
Price - - - $1.50



Fit any Spring. Easily operated. Strong and durable.

Don't ruin your Springs by neglecting them.

There is but one effective way to take care of them.

GET A KNOWLSON SPREADER.

At your Dealer's or sent direct.

This one Drop Forged; Yoke, gun metal finish. Screw and handle nickel.
Price - - - - $1.00



SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., ANN ARBOR, MICH.

One jolt of a rusty, squeaky spring may cost you ten times the price of a sure preventive.

For Motor Truck Upholstery

DU PONT FABRIKOID
REG U S. PAT. OFF.

TRUCK SPECIAL

Satisfactorily meets the scarcity-of-leather situation. Costs less than even the poorest split leather but wears better.

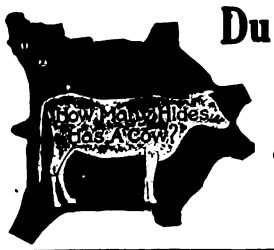
Comes in 60-yard rolls 50 inches wide. Cuts in multiples without waste.

You should use it to save money.

You should use it to save leather.

It is waterproof, washable and its fine leather appearance and "feel" leave nothing to be desired.

Write for Truck Special Booklet, Samples and Prices



Du Pont Fabrikoid Co.,

Wilmington, Del.

Works at Newburgh, N. Y., and Fairfield, Conn.

Canadian Office and Factory, Toronto

World's Largest Makers of Leather Substitutes

Akron-Williams

TIRE REPAIR EQUIPMENT

Akron-Williams outfits include every approved time and labor-saving device for modern tire and tube repairing. No equipment is too large, no tools are too small.

Experts employed by the largest tire companies have helped design Akron-Williams equipment and over

60 Leading Tire Companies

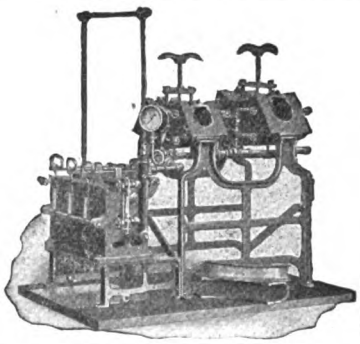
use these outfits, and recommend and sell them to their Dealers all over the World.

Send for new Catalog.

THE WILLIAMS FOUNDRY & MACHINE CO.

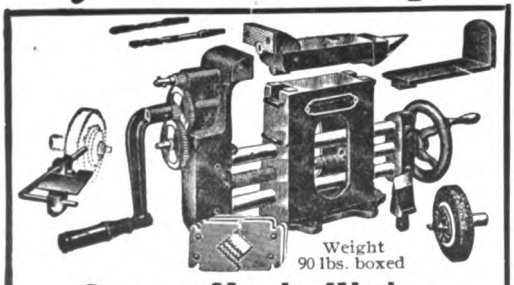
GLENDALE STREET AKRON, OHIO

Exclusive distributors for California:
THE WATERHOUSE & LESTER CO., San Francisco





Try at Our Expense this wonderful Repair Outfit



Weight 90 lbs. boxed

Stewart Handy Worker "SIX-IN-ONE" Price Complete $14

Handiest combination of tools you ever saw. Just the thing for the garage, public or private. Wonderful value for the money. If you were to buy separately all of the tools you get with this outfit, and get tools of the same high quality, strength and durability, THEY WOULD COST YOU AT LEAST $25 to $30.

A COMPLETE, COMPACT WORK-SHOP

A strong, practical anvil; powerful vise up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ in. pipe; A Corundum grinding wheel ⅝ inche. by 1 inch; a two-speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing handle grip. It operates grinding wheel, buffing wheel, and many other similar tools.

With the STEWART HANDY WORKER you can do car repairing, blacksmith work, home repairing, make plumbing repairs, keep knives and other tools sharp and in good working condition.

OUR SPECIAL TRIAL OFFER

Send for one of these great combination outfits today. Order with this understanding: If you aren't thoroughly satisfied in every way, you can ship it back and we will return every cent you paid out. THOUSANDS HAVE BEEN SENT OUT ON THIS BASIS AND NOT ONE HAS BEEN RETURNED.

Send only $2 with your order, and pay the balance when it arrives. BOOKLET GLADLY MAILED ON REQUEST. But the best way to appreciate this wonderful outfit is to order it, on our special trial offer.

CHICAGO FLEXIBLE SHAFT CO., Dept. M, 12th ST. & CENTRAL AVE., **CHICAGO, ILL.**

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Thos. Cusack Company



START YOUR MOTOR INSTANTLY IN COLD WEATHER!

FOR SALE BY ALL DEALERS and GARAGES

Imperial Primer

MADE SOLELY BY THE IMPERIAL BRASS MFG. CO. CHICAGO

THIS is IMPERIAL PRIMER year in every sense of the word. Motorists everywhere, with thoughts focused on problems of winter motoring, are being advised to invest in an Imperial Primer.

Start Your Motor Instantly in Cold Weather

That pointed suggestion is the keynote of our big national advertising campaign. It is featured on painted boards like the one shown here, and in full-page advertisements to appear in the Saturday Evening Post, issues of November 3rd and December 1st.

Every live dealer should plan to "cash in" on the demand for the Imperial Primer. The selling season is now at its best. ***Write to-day for full information.***

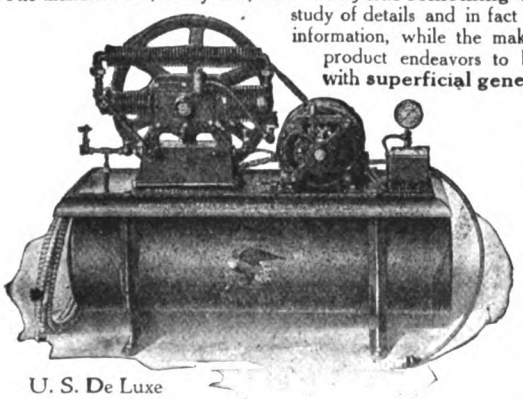
IMPERIAL BRASS MANUFACTURING CO., 520 S. Racine Ave., Chicago, Ill.

TWO-STAGE AIR U.S. AIR COMPRESSORS

DEMAND TO KNOW *WHAT IS ON THE INSIDE*

The **very least** you should expect in an air compressor is a machine that will deliver a strong volume of air and satisfy your patrons, bringing them back time after time. Beyond this point you have a right to know **how the machine is built on the inside, how it operates and whether that principle is conducive to long life, how much attention will be required to keep it in perfect running order, etc., etc.**

The manufacturer, in any line, **that really has something welcomes** minute study of details and in fact **volunteers** such information, while the maker of an ordinary product endeavors to becloud the **issue with superficial generalities.**

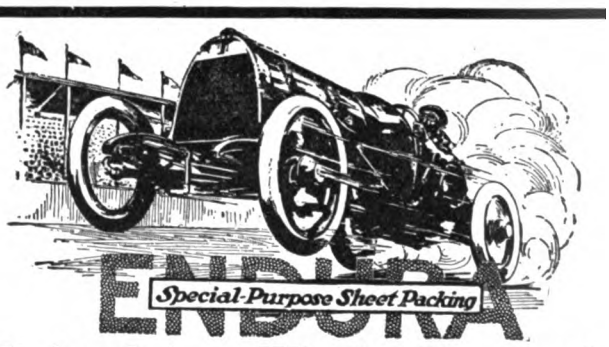


U. S. De Luxe

United States **Two Stage** Air Compressors embody refinements and improvements in every detail. They are a product that is sold on **reason why** argument and the improved features prove their unquestionable superiority in every case. Write for literature describing the U. S. **two stage** and **single stage** compressors.

THE UNITED STATES AIR COMPRESSOR CO., 6542 Carnegie Ave., Cleveland

TWO-STAGE AIR U.S. AIR COMPRESSORS



Tight Joints Win in Races of Endurance—

But racing service is abnormal. It proves the quality of any material, if there's quality in it.

Garage men, dealers and jobbers have found proof of ENDURA quality in the steadily increasing sales of Endura Sheet Packing.

Here's the packing that sells, because you can guarantee that it's oil-tight, gasoline-tight, hot-and-cold-water tight. It is made especially for such connections, so all its resistance to wear is centered against the substances that kill other packings.

Have you enough ENDURA stocked to satisfy every-day demands? Full particulars regarding discounts and representation, as well as usable ENDURA samples, free on request.



ENDURA Mfg. Co., 6305 Eastwick Ave., Philadelphia

SIGN — CLIP — MAIL

Name.....

Street.....

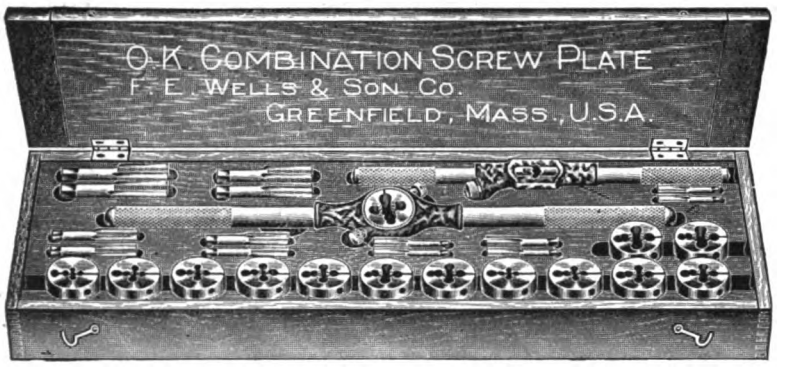
City.....

State.....

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O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

$1/4^{20}$, $5/16^{18}$, $3/8^{16}$, $7/16^{14}$, $1/2^{13}$, $5/8^{11}$, $3/4^{10}$,
U. S. Standard

$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $7/16^{20}$, $1/2^{20}$, $5/8^{18}$, $3/4^{16}$,
S. A. E. Standard

LIST PRICE — $20.00

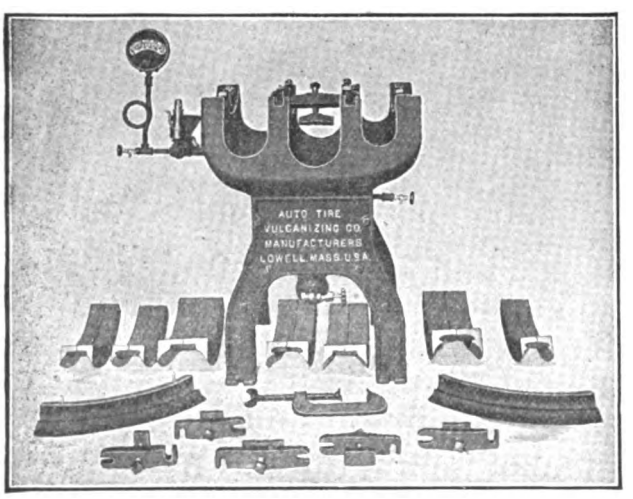
This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

F. E. Wells & Son Company Division

Greenfield Tap and Die Corporation
Greenfield, Massachusetts

GTD



Exceptionally Large Profits can be made by Repair and Garage Men with

No. 8 Lowell Adjustable Sectional Vulcanizer

It's different, superior, economical in operation, in fact beyond comparison.

Complete and thorough work can be accomplished with this vulcanizer at all times.

DON'T LOSE A MINUTE—WRITE TODAY!

Auto-Tire Vulcanizing Company,
140 Powell Street - - - Lowell, Mass.

DETROIT DETACHABLE WEATHERPROOF TOP



Absolutely Storm Tight from Windshield to Rear Window

Eliminates, instantly, all the Ford drivers' former hardships. It is the only all-weather top that does away with the objectionable features of a detachable top and affords the car owner an enclosed or open body for year-round use at a really low price.

It is Absolutely Rattle Proof and Will Last as Long as the Car

Detroit easy sliding flexible doors, which disappear into the roof, are three inches wider than the doors of the Ford; this gives ample entrance for the occupants even though the arms may be filled with bundles. For the other 9 big improvements, see our literature.

SHARRER PATENT TOP CO.

239 West 56th St. Tel., Circle 1636 New York City

A Fine Fall and Winter Proposition for Dealers

Also for Chandler Light Six, Hudson Super Six, Chalmers 5-passenger, Buick D-6-45

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Divided Curtain style supplied for all cars.



One-piece Curtain style supplied for Fords unless divided curtain is specified.

Gordon "Jack Frost" Radiator and Engine Robes

The Best for the All Winter Test.

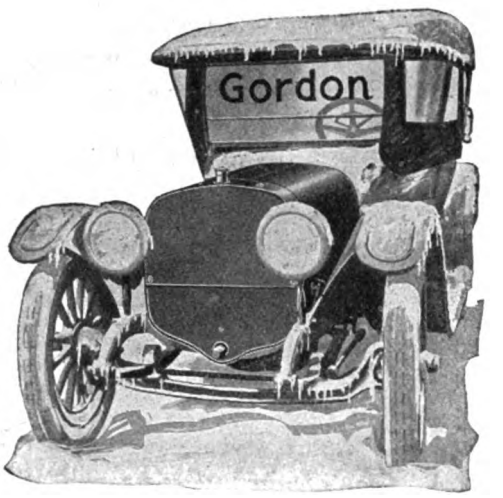
The Service You Give and the Satisfaction Your Customers Get from the Accessories You Sell Measure Your Success.

The Gordon "Jack Frost" line includes Robes for every American Automobile and it is the line that gives COMPLETE SATISFACTION to the car owner in fit, appearance, wear, and convenience, and to the dealer in profits. The "Gordon" name is known to motorists with whom quality counts—you need not coin "just-as-good-as" arguments when you feature the "Gordon" line. Your sales are quick and easy and GORDON service will keep you smiling and your customers coming back.

Three-Day Shipments

We offer you three-day shipment on Robes for cars that it does not pay to carry in stock. For the popular makes of cars, keep a stock on hand. You can't lose. Good Robes are a necessity for Winter driving. Car owners appreciate thoughtful service and if you can supply the demand from stock you will get many an extra sale aside from building up your reputation for service.

Order from your Jobber or direct from us, today....



The J. P. Gordon Company

306 No. Fourth St., Columbus, Ohio

Send for Catalog.

Our New Catalog No. 110, giving prices on "Gordon" Seat Covers, "Jack Frost" Radiator and Engine Robes, Tire Covers, and other fabric accessories. Shows samples of 24 attractive Seat Cover Materials.

DO YOU HEAR

the UTILITY KID signaling you to go ahead and get



UTILITY VARNISH RENOVATOR

THIS is a NECESSITY, not a luxury. Because if you are particular about the appearance of your automobile in WINTER, you'll NEED "Utility." It's no joke to clean your car in cold weather the "Old Way." You require a multitude of tools—sponge, hose, boots, etc., and you have a cold, unpleasant job. Why not

Avoid that old-time dirty mess—
You can clean your car in evening dress

with cheese-cloth and a can of "Utility Varnish Renovator."

Remove the water spots from your car.
Cover up the blemishes caused by flying ice and sleet.
Dissolve and remove mud absolutely, without scratching the varnish.
PRESERVE the fine finish of your car at a minimum of time, labor and expense.

DEALERS: Why not be prepared to give your customer that which he will need? Our special offer sent on request.

LIST PRICES

4 Ounce Bottles	$0.25
12 Ounce Bottles	.50
Quart Cans	1.00
Gallon Cans	3.00

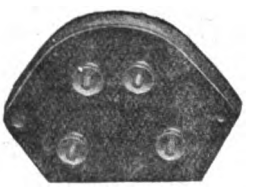
POUGHKEEPSIE UTILITIES CORP.
46 Winnikee Avenue Poughkeepsie, N. Y.

MAGNETO PARTS



FOR ALL MAKES OF

MAGNETOS AND COILS



SPARK COIL PARTS TUNGSTEN CONTACTS
STARTER AND GENERATOR BRUSHES

ALL PARTS ARE GUARANTEED AGAINST DEFECTIVE MATERIAL

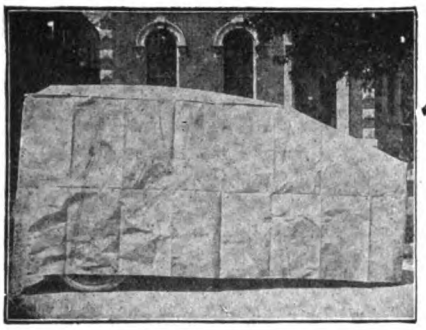
Write for our Catalogue and special agency proposition.





GUARANTEED MAGNETO PARTS CO.
1765 BROADWAY NEW YORK CITY

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Kennedy Auto Storage Covers

"Wrap Up" Your Cars When Not in Use

When you store your car for a season, don't let its polish be dimmed by dust, and its metal tarnished before it gets out of the garage. Cover it at once with a KENNEDY AUTO STORAGE COVER, and it will remain as clean and bright as washing makes it, until the cover is removed, next day or next season.

Protects the limousine all summer, or touring cars through the entire winter season. No cost but first cost. Never wear out if care is taken in handling. Insist that your garageman use them.

Popular for Use *and* Sale in Every Garage

Garagemen—Charge extra for storing with KENNEDY AUTO STORAGE COVERS. Service your patrons are glad to pay for. Many will demand it.

Made of strong, heavy paper, reinforced to prevent tearing. Protects a car against dirt, dust and moisture. Prevents polished portions from tarnishing and keeps finish from checking in cold weather, and also prolongs the life of the tires by excluding the light. Furnished for 5 and 7 passenger gasoline cars, electrics, and Ford cars. Good profits in retail sales and service use. KENNEDY COVERS can be sold at a season when trade on other accessories is usually light.

Write For Free Illustrated Literature

The Kennedy Car Liner & Bag Co., Shelbyville, Indiana

WITHERBEE STORAGE BATTERIES

For

STARTING — LIGHTING — IGNITION



WITHERBEE BATTERIES are of correct size, shape, voltage and capacity for every make and model of car, and for starting and lighting systems of any manufacture in general use.

MODERN—carefully constructed batteries—they possess high starting ability; the plates are specially processed to prevent buckling, and the jars are made of the finest rubber; the wood cases of acid-proofed hard wood.

Recognized standards since 1903.

Complete information, prices and illustrated catalog mailed promptly upon request.

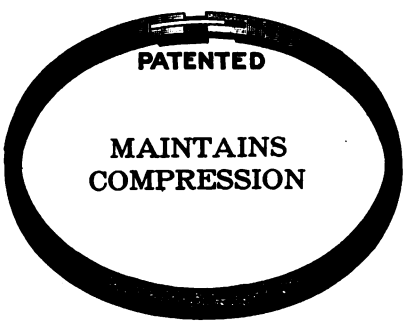
WITHERBEE STORAGE BATTERY CO., Inc.

1904 Broadway; Factory, 643-9 West 43rd St.

NEW YORK

PEERLESS PISTON RINGS

ARE THE BEST



PEERLESS RINGS are similar to the standard type of rings in every respect EXCEPT—that they will not leak.

Selling them means more money to you — improves your standing with your trade and makes you a better purchasing agent for those depending on your ability and judgment.

Write today for prices and descriptive matter.

LARSON & HILKER,
Distributors,
19 S. La Salle Street,
CHICAGO, U. S. A.

WALDEN WORCESTER WRENCHES

SPECIALISTS IN MOTOR CAR WRENCHES

GUARANTEED SERVICE TOOLS

JOBBERS—DEALERS EVERYWHERE, ASK THEM

SEND FOR CATALOG No. 100.

WALDEN-WORCESTER, INC., WORCESTER, MASS.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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TO make the old car look almost new again, all you need is a brush and some

"F-S" "Evernew" Auto-Body Enamel

It works easy and dries quickly. Doesn't show brush marks, but gives a hard, durable surface that is smooth, bright and attractive. Eight standard colors—special shades to order.

Write for color card

FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 North Fourth Street Philadelphia

"Evernew" Auto-Top Dressing revives and waterproofs old tops, yet leaves them pliable.

Pyramid Brushes

For Starting Motors and Lighting Generators

Have you ever thought of the great number of cars which are equipped with starting motors and lighting generators? There are hundreds of thousands! Every one of those starting and lighting sets will sooner or later require new brushes.

Let us show you how to get your share of the profits in this brush renewal business!

Send for our brush specification sheet in which the proper brush for every car equipped with starting and lighting brushes is shown in a simple manner.

National Carbon Co., Inc.

CLEVELAND, OHIO



Have you received your copy?

It is a *Book of Knowledge* that enables you to become an electrical expert in your automobile work. No more guessing at what you need. It is a complete illustrated catalog of contacts, starter and generator brushes. *Free* to every repair man. This is a line that will build up a splendid business. Ask about our Cash Register of contact parts proposition. Write today.

PAUL G. NIEHOFF & CO., Inc.

Metallurgical Laboratories Clark St., at Kinzie, CHICAGO, ILL.

THE NEW

ADAMSON

MODEL "E"

5-MINUTE VULCANIZER

This light and handy outfit mends tube punctures ANYWHERE in five minutes. Makes repairing a pleasure.

Uses common gasoline, the most convenient and dependable fuel—always available.

Just as easy to use and sure in its results as the larger "Adamson" Vulcanizers—built on the same proven principles.

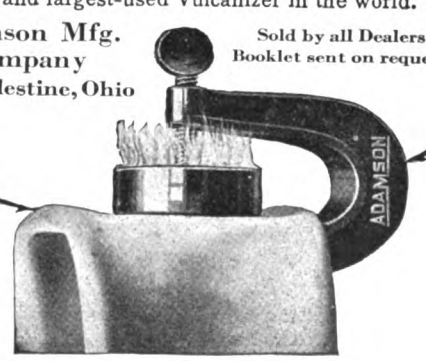
Price complete with box of a dozen "Adamson" 5-Minute Repair Gum Patches—

$1.00; Extra Box of 12 Patches, 25c

For general tube and tire repairing the "Adamson" line is complete with various models at from $1.50 to $12.00. Be sure to buy an "Adamson"—the most practical and largest-used Vulcanizer in the world.

Adamson Mfg. Company
East Palestine, Ohio

Sold by all Dealers
Booklet sent on request



GENUINE

Armstrong Stocks and Dies



FOR THREADING PIPE OR RODS

HINGED PIPE VISES PIPE CUTTERS

Manufactured by

THE ARMSTRONG MFG. CO.,

335 Knowlton St., Bridgeport, Conn.

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"NORMA"
BALL BEARINGS
(Patented)

Silent, smooth, dependable service demands ample power at all times available and a lighting system at all times dependable. Dissatisfaction with many a good car and truck can be traced to defective performance on the part of ignition and lighting apparatus.

The service capacity of a magneto or lighting generator depends upon the service capacity of its parts. The highest grade magnetos and generators are safeguarded against bearing troubles by the use of "NORMA" Ball Bearings—the speed bearings of proved serviceability.

Be Sure—See that Your Electrical Accessories are "NORMA" Equipped

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

Ball, Roller, Thrust and Combination Bearings.



20th Century's No. 6



Self-Vulcanizing Patch

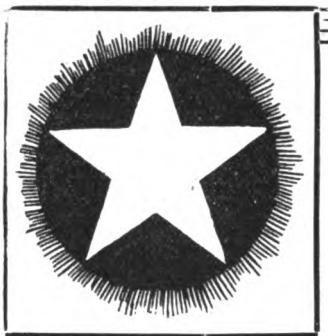
Note carefully from above illustration the construction of this Patch—how the Semi-Cured Rubber is vulcanized on to the Fabric, which gives an absolute GUARANTEE against leakage, while the RED RAW Rubber Guarantees a perfect Job of Vulcanizing on to the Tube.

GUARANTEED SATISFACTION or Money REFUNDED

Made in 3 sizes
- 2¼x16— 36 Square Inches ..... $ .50
- 4 x15— 60 Square Inches ..... $ .75
- 6 x18—108 Square Inches $1.50

If you want a Patch, call for "20th CENTURY"
We make all kinds of Patches, all Sizes and Prices.
If your JOBBER or Dealer has not got them, write to us direct.

20th CENTURY TIRE PROTECTOR CO.
MIDLOTHIAN, TEXAS.



Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish.

Waterproof and weatherproof.

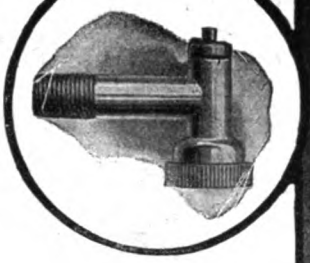
Dealers Can Make Money As It Is a Big Seller.

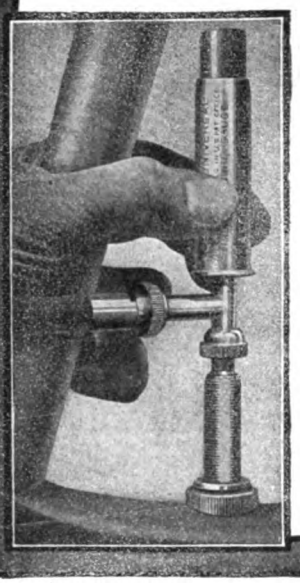
R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri



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You Can't Tell How Much Bengal Tiger there is in a White Rabbit Until You Put Him on a Meat Diet.





.... and you can't tell how many miles your tires *can* give you until you put them on a REGULATED, MEASURED, air diet.

Just so many pounds pressure, no more and no less.

If you pumped up your tires every time they fell below the pressure specified by the tire-maker they would last for the maximum distance.

Don't say pumping is too much trouble. With a

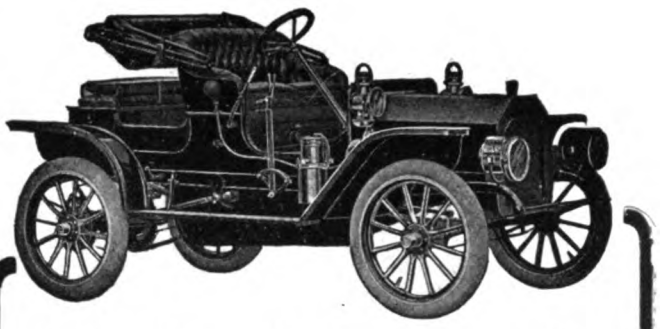
SCHRADER UNIVERSAL PUMP CONNECTION

it is no trouble at all.

Ask your dealer to show you how it works

Price, Thirty-five Cents

A. SCHRADER'S SON, Inc.
783-803 Atlantic Ave.
BROOKLYN, N. Y.



A Free Book for Auto Repair Men

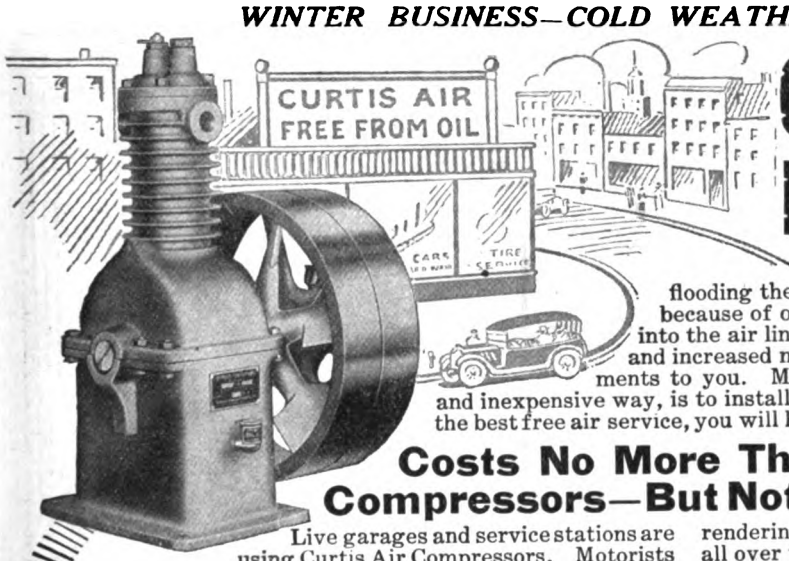
The **Auto Repairers' Guide & Price Maker** is issued in the interest of automobile repairers, dealers and garage men—**it's free to the trade** and sent to them only.

Think of it, **512 pages of bargains**—about 3000 illustrations—a complete auto repairers' guide and price maker—quotes **lowest wholesale prices on** first quality automobile supplies, auto repairers' tools, tool kits, spark plugs, horns, lamps, pumps, springs, forgings, brass fittings, batteries, coils, switches, auto tops, Ford Specialties, and in fact **everything used on an auto.**

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1119-1123 W. 11th St., Cleveland, Ohio

WINTER BUSINESS—COLD WEATHER MADE PROFITABLE.



CURTIS AIR FREE FROM OIL

The Curtis Compressor is the only one designed to prevent flooding the cylinder with more oil than it needs for lubrication. This, because of our controlled-splash oiling system. No excess oil is forced into the air line. **Oil ruins tires**—air free from oil means fewer blowouts and increased mileage all around for your customers, with less tire adjustments to you. Make your place the most popular one in town. An easy and inexpensive way, is to install a Curtis Compressor. The customer assumes if you have the best free air service, you will have the best service in all departments.

Costs No More Than Ordinary Compressors—But Note The Difference

Live garages and service stations are using Curtis Air Compressors. Motorists expect free air service. Why not give them the best and win over new customers by supplying, not only reliable air service, but **Curtis Air—Free From Oil.** A poor air system which shoots oil into the tires, or which is unreliable, drives customers away. Thousands of Curtis Outfits are rendering daily, effective, efficient service all over the country. Your Curtis Compressor can further pay for itself by supplying air for air hoists, painting, cleaning, vulcanizing, blowing dust and drillings from tools, and many other things. Curtis Compressors are backed by manufacturers who have been specialists in this line for twenty-five years.



10 Combinations of Compressor and Tank Sizes—Any Current

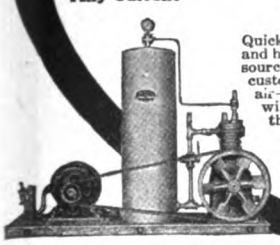
Five Sizes—Tight Pulley Only, or Tight and Loose Pulley

11 Combinations of Compressor and Tank Sizes—Any Current

Makes New Customers—Holds Old Ones

Quickly pays for itself in bringing in new trade and holding the old trade, for it not only is the source of a dependable supply of air when your customers want it, but it also supplies clean, cool air—free from oil. Motorists realize that oil will quickly destroy their inner tubes, and, therefore, look for a station that supplies Curtis Air—Free From Oil.

Curtis Compressors are built to meet the requirements of your business in sizes, arrangements and prices. Send coupon at once for full information and attractive prices. It will pay you to investigate our proposition. *Write us today, or ask your jobber for prices—but insist on a Curtis.*



Curtis Pneumatic Machinery Co.
1530 Kienlen Avenue St. Louis, Mo.
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Curtis Pneumatic Machinery Co.
1530 Kienlen Ave. St. Louis, Mo,

Gentlemen: Please send me full details regarding Curtis Garage Air Compressor—your proposition and low prices.

Name.....

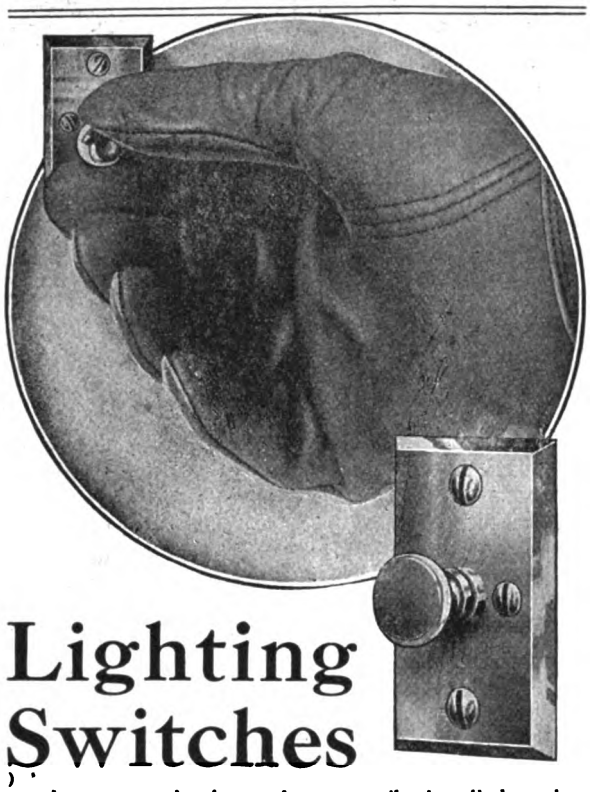
Address.....

Jobber's Name.....

Address.....

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Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS

The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

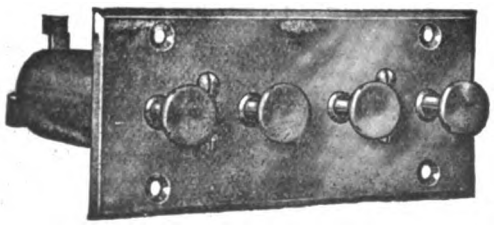
HEAD, SIDE AND TAIL LIGHTS

Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP

Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.

Leave Your Tube in the Vulcanizer
AND WAIT ON YOUR CUSTOMERS
Why Not?

AMERICAN AKRON

Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

IF YOUR VULCANIZER IS YOUR BOSS, DECLARE YOUR INDEPENDENCE TODAY

Write for Prices

The American Rubber & Tire Co.
AKRON, - - - - OHIO

BUNTING BRONZE
CORED BARS

Bunting Bearing Metal is overwhelmingly favored—because we have steadfastly adhered to an ideal which subordinates everything to the prime question of quality.

Beyond the shadow of a doubt, we can suit you to a "T"—for our Cored Bars are made of the world's best—yes—very best phosphor bronze. Over 300 of the largest manufacturers of machinery, engines and motors have adopted it for use in their products and they are more than satisfied.

If you, too, wish to use Bunting Bronze, the wise practical expedient way would be to write us a letter today—why not—it's for your own good.

Write for Pamphlet "X"

STOCK SIZES

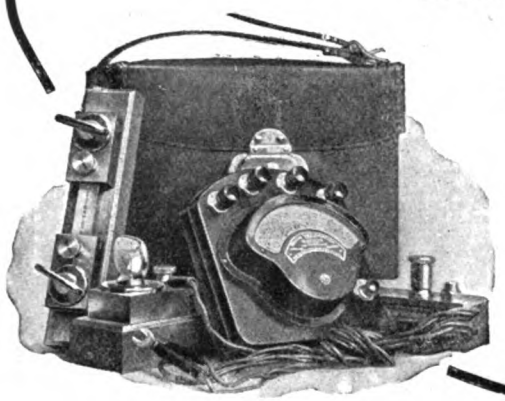
PIECE No.	Outside Diameter	Inside Diameter	Length	Approximate Weight
A	1	⅛	12	2
B	1¼	⅛	12	3½
C	1½	¾	12	5
D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15¼
K	3½	2½	12	17
L	4	3	12	21
M	4¼	3¼	12	20



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The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.

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23 Branch Offices in the Larger Cities

What does Oro GOOD as GOLD mean?



Some say it comes from the Greek "Oro" (Ōro) which means period of time. Some say it is a Spanish word and means gold.

When you see it on the AU-TO air compressor—on steering wheels, bumpers, bumper brakes, connecting rods, cut-outs, tire carriers, valve lifters, and valve grinders—it has both meanings. It stands for

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"Oro" tells you the article is good as "gold" and will last for a long "period of time." "Oro" enduring accessories are sold by all jobbers.

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SAFETY FIRST

PRACTICAL



POSITIVE

ASSURES YOUR SAFETY

HOLDFORD BRAKES are high-grade external contracting brakes for Ford cars which can be easily and quickly installed to act from the hand lever as emergency brakes, or from the foot pedal as service brakes. Designed in accordance with the best engineering practice; the band and brace are of steel, the toggle crank and bracket are dropped forgings and the lining J-M non-burn. Do not drag when released, no readjustment for wear is necessary and oiling is easy.

HOLDFORD BRAKES save wear and tear and will be attached by the wise owner on his pleasure car, delivery car or truck. They will positively stop a Ford with locked wheels on *any grade, at any speed, with any load.* Not necessary to remove old brakes.

When Ordering State Whether for Hand or Foot.

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IF YOU WANT THE DEPENDABLE KIND OF

DIFFERENTIAL AND TRANSMISSION GEARS AND SPROCKETS



That can be relied upon to be accurately machined, and of the highest grade material, to fit all makes of cars,

Write for prices and terms to

William Ganschow Co.
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SMOOTH-ON

TRADE MARK REG. U.S. PAT. OFF.

MOTOR REPAIR PACKAGE

For permanently repairing cracks or leaks in

Water Jackets, Engines, Tanks, Pipes, Boilers, Screw Thread Joints

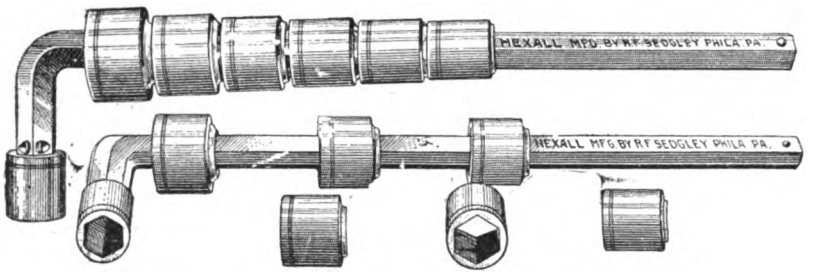
Smooth-On Iron Cements expand and contract with the iron to which they are applied and are not affected by heat, water, gasoline or oil.

For Sale by Supply Houses and Garages
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There's no getting away from it—this is the master tool—no frills or high-flown adjectives can make it any stronger—the fact that each month breaks the preceding month's record for sales should make you think.

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Complete Cure—One Heat — Extra Ply—5,000 Miles

NEW 1918 MODEL "4 CAVITY" EN BLOC

Insulated Air-Cooled Flanges Prevent Marking Tires

Complete---Gas Burner

$150.00



One of 53 Kinds and Styles From 75c up

We teach Tire Repairing FREE OF CHARGE at factory or by mail.

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Give More Miles at Less Cost

"COG" & "Wrapped" Treads contain 25% more Fabric and Rubber than Standard.

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Can you say that of **your** motor? Can you step on the accelerator any time, anywhere and know that every ounce of power your engine has is at your command?

If you are using Pressure Proof Piston Rings, yes, if you aren't the chances are even that the carbon devil is going to interfere.

"**New Facts About Piston Rings**" will tell you why. It's free to you.

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For Fords

The best in finish, fit, material, and the lowest in price. Radius Rod, twenty-five cents; Steering Rod, fifteen cents. At all jobbers and dealers.

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Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

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KOR-KER Tire Treatment

ALCEMO MFG. CO.
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Please mail me your book and your dealer proposition.

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It's a Time Tested Proven Success

Kor-Ker seals punctures instantly, and permanently. It ferrets out and stops slow leaks. Kor-Ker prevents under inflation—you dealers know what that means to the life of a tire. Kor-Ker is a preservative of rubber. We guarantee it will not injure tires, but on the contrary give them longer life. Motorists have tried Kor-Ker out and find it's made good under the most severe tests.

We have distributors in U. S., Canada, England, France, Russia, Norway, Sweden, Holland, Spain, Portugal, India, Egypt, S. Africa, S. America, Australia, New Zealand, Java, Philippines and Trindidad.

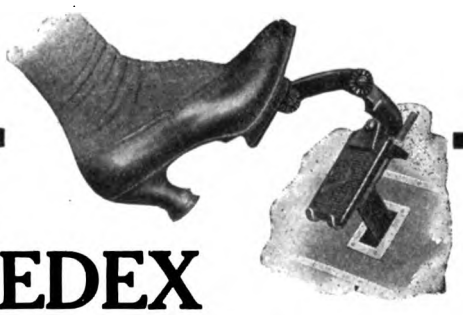
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Driving Nail into Tire Treated with Kor-Ker Tire Treatment. This is the strongest proof anyone can ask and will convince the most skeptical.

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The Adjustable Pedal Extension

eliminates the driver's clumsy cushion and gives the correct leverage to insure greater control, safety, comfort and convenience.

PEDEX clamps on backs of pedals leaving them free for use when desired.

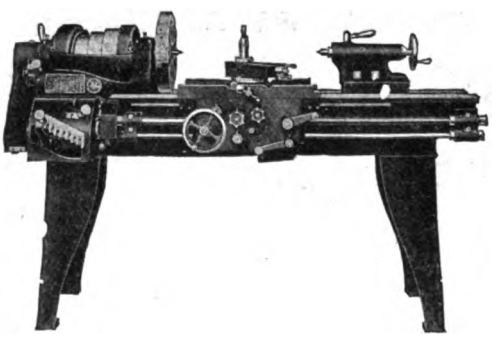
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14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

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HIGH TENSION

SIMMS MAGNETOS

are made of the highest quality materials, correctly assembled and the exclusive patented mechanical and electrical features are productive of a very efficient magneto.

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Parry Bodies

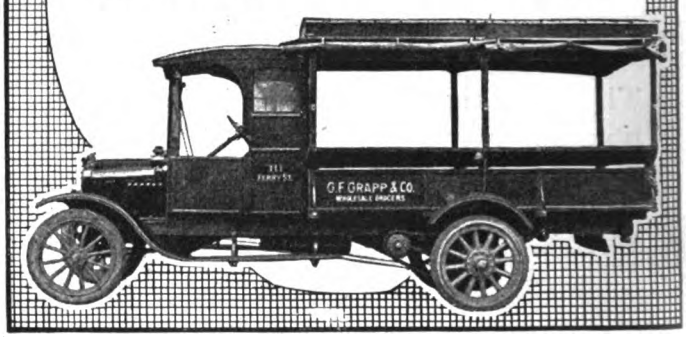
For Extension Chasses of Any Make

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Dealers have found the Parry Line a profitable one. And this for several reasons. The *complete* line is one; prompt shipment is another. And still another is the recognized combination of high quality and low prices.

There are yet a number of valuable territories open for a Parry dealer. Correspondence solicited from live wires. The Parry line is an excellent *side-line* to any sales agency or garage.

PARRY MANUFACTURING CO.
INDIANAPOLIS **U. S. A.**



Mr. Dealer, Why Not Handle the Most Popular Grease and Oil Gun on the Market?

——HERE IS——

THE "GEM" COMBINATION GREASE AND OIL GUN

Price, $1.50



"GEM" Grease and Oil Gun

Length of Barrel, 7 in.; Diameter of Barrel, 1¼ in.; Capacity, 8 oz.; Weight of Gun, 18 oz.

We call attention to the improved features of this Gun, such as the quick change adjusting nut, which enables an immediate change from grease to oil, and vice versa. Also, the hydraulic cork plunger, which will last forever. The spout has a removable Oil Nipple. The barrel and end caps are made of extra heavy steel, heavily brass plated. The handle, stem and spout parts are made of brass, highly polished. Entire Grease Gun is unconditionally guaranteed by the manufacturer. Each Gun put up in a substantial box.

We Absolutely Guarantee the "Gem" to Give Entire Satisfaction

Build Up a Reputation for Yourself by Handling the Best

Manufactured By

E. EDELMANN & CO.
353 E. Ohio Street **Chicago, Ill.**

Automobile Manufacturers KNOW

The finest car built would be ruined if run three blocks without lubrication.

Lubrication staves off the scrap heap—how long depends on the quality of the lubricant. The finest lubricant obtainable is the most economical you can use. That means



TRADE MARK REGISTERED IN

NON-FLUID OIL

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Use K-No. 000 grade for bearings; K-No. 00 Special for gears.
Packed only in orange-colored cans
At all dealers

N. Y. and N. J. Lubricant Company
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Crane TRADE MARK

ENGINE-DRIVEN TIRE-PUMP

Does what *no* other pump *can do*. Because BUILT as *no* other pump *can* be built. Piston works *through* a Packing-Ring, reducing wear to the *minimum*. Beveled base of Ring shaves surplus oil off piston at every stroke. Permits ample lubrication, but prevents oil passing Ring. Ring is endless. No gaps for air to leak out or oil to leak in. Can be instantly adjusted (by turning cylinder) to maintain air-tight, oil-proof fit, and insures 97% efficiency. This high efficiency enables the CRANE to do the work of pumps twice its size, weight and parts. And small size, light weight, few parts and simplicity mean low production-cost. That's why the CRANE sells for $10 complete despite high grade materials and finest workmanship.



The full story of the CRANE and its patented Packing-Ring is told in an interesting little Folder—just off the press. Write for FREE copy to-day.

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100 PURCHASE STREET BOSTON, MASS.
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We can SAVE you MONEY

BUTLER MFG. COMPANY

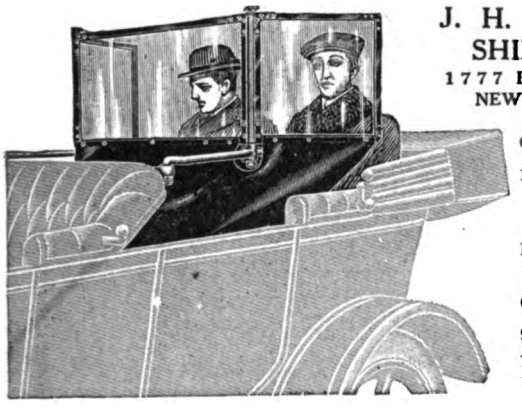
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CYLINDER REGRINDING
PISTONS, RINGS and PINS

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Patented Feb. 27, 1912—Sept. 4, 1917. Reg. U. S. Pat. Office.



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NEW YORK CITY

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Dafoe Eustice, Detroit, Mich.

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Columbia Tire & Top Co., 922 Commonwealth Ave., Boston, Mass.

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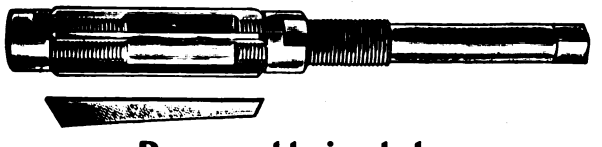
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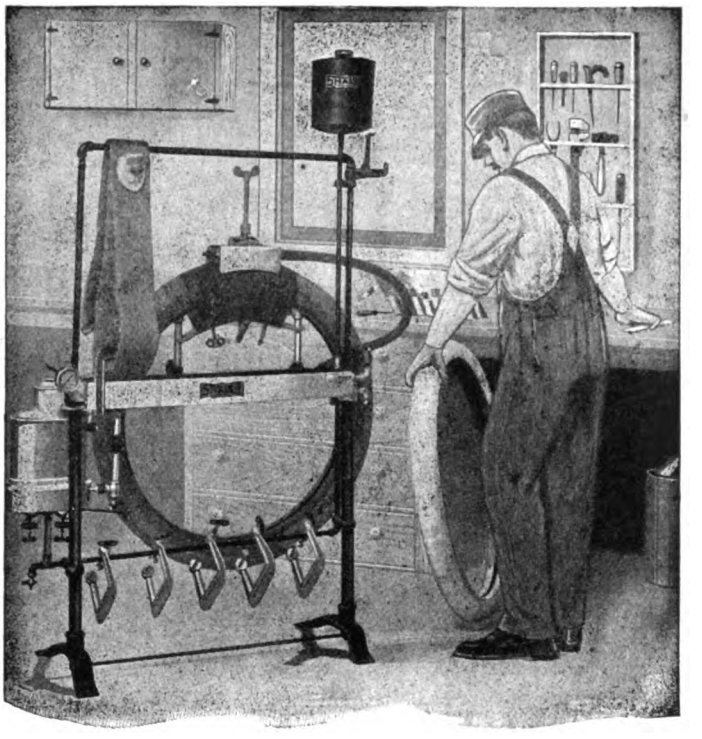


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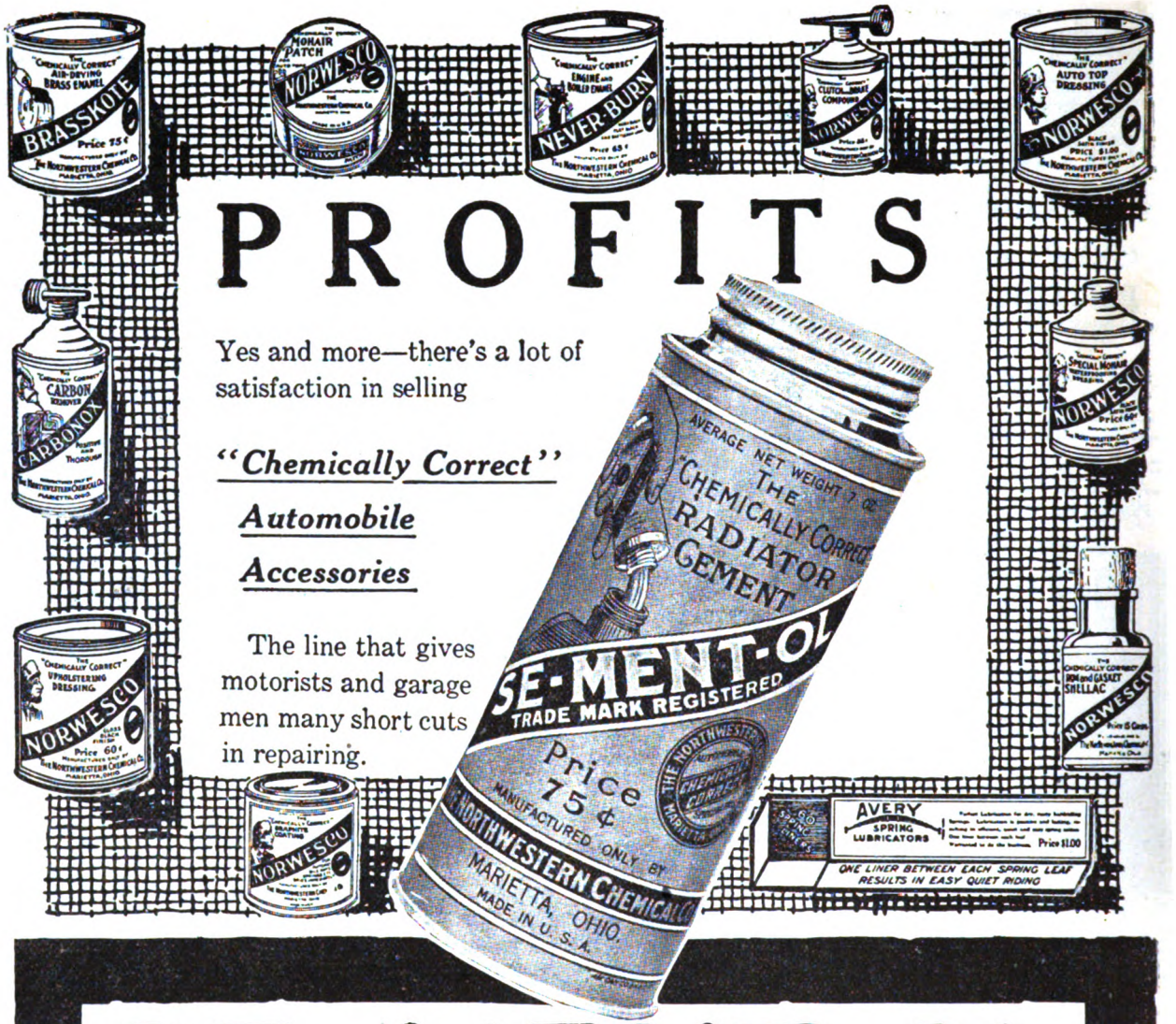
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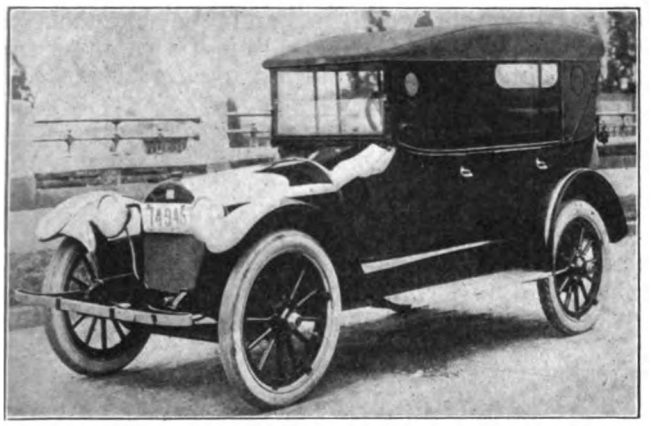
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KEEPING OUT THE WEATHER.

Wide Variety of Winter Enclosures Offered Owner of the Used Motor Car.

With the automobile being utilized during the entire year the manufacturer is providing comforts and conveniences obtainable with other forms of modern transportation. During the past year or two the efforts of designers have been toward the



The "A-W" Convertible Glass Enclosed Top Attached to a Buick Car.

development of the enclosed body, one of the most interesting possibilities of body designing, and the owner of the used car is now offered a variety of winter enclosures. These embrace what is termed the detachable or demountable body, a design replacing the summer top, and the convertible. The first named differs from the detachable in that it provides the owner of moderate means with design that can be changed from the open touring to the enclosed type in a few minutes.

Both the detachable and convertible types are made for practically all standard makes of passenger cars, these including the roadster and touring types. Some manufacturers specialize on a number of makes, while others concentrate on one, the Ford car, for example. Owners of this machine contemplating the purchase of a winter enclosure are offered a variety of designs.

"A-W" Convertible Top.

The "A-W" convertible tops, made by the Adams-Williams Mfg. Corp., 351 West 52nd street, New York City, have been greatly improved since their introduction some three years ago. This design, which is standardized for the Ford touring and roadster cars, differs from the conventional convertible types in that use is made of heavy glass panels to protect the occupants of the machine from the cold, etc. These panels or glass are enclosed in steel frames having two small flat lugs which are inserted and locked in the door sills. When thus installed, which takes but a few seconds, the glass panels become practically a part of the door.

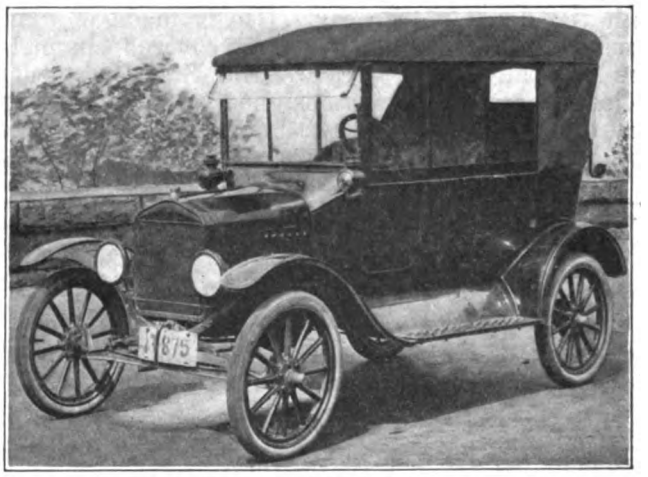
There are four of these door panels and these, with the other two or middle panels, are stored in a neat container and carried in the car when not in service. One of the features of the construction is that one or more panels can be used as desired. This arrangement affords a partially or wholly glass enclosed car, and with all panels removed the design becomes an open touring type. The door panels are hung at a slight angle so that when they are closed a perfectly tight joint is obtained. The construction is extremely flexible, and the maker states that the doors with panels may be slammed without danger of breaking the glass.

A Steel Construction.

The "A-W" top is, with the exception of the mohair covering, constructed of steel. It is a patented design, a one-man top, having a sliding joint which permits of its folding compactly and easily. When the top is raised it conforms to the lines of the body; that is, there is no overhang. The width is 42 inches against 55 for the Ford top. This adds to the attractiveness of the design, which is shown in an accompanying illustration with the top up and glass panels in place.

Rain Vision Windshield.

The present Ford windshield is converted by special brackets, etc., into a clear vision, rain vision type. The manufacturer of the "A-W" top states that the design can be converted from the open touring into a fully glass enclosed car in less than three minutes. The weight is said to add but 30



Illustrating the Protection Afforded by "A-W" Ford Top

pounds to that of the car, and the top is rattle and noise-proof. No alterations are made to the body. The company lays great stress upon the excellent ventilation provided. The "A-W" tops are also made for the Buick, Cadillac, Dodge, Hudson, Oldsmobile, Scripps-Booth, etc.

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Anchor Line Complete.

The Anchor Top & Body Co., 541 South street, Cincinnati, O., is offering a complete line of the Anchor glass enclosed tops. These are made in



Side View of Anchor Glass Enclosed Top Installed on Overland Country Club Model.

both the sedan and coupe latest styles, as well as for standard makes of cars, such as the Overland model 85-B four and six, the Country Club model 90, Buick models D-34, D-35, D-44, D-45 and E-45. Tops are made for the Oakland models 32, 34 and 50. The tops fit on the regular body irons, have no overhang and are stated not to rattle or squeak. The windows are of bevel glass, of the drop and ventilating type, and the doors open as one. The interiors are attractively lined with light whipcord cloth and each is equipped with dome electric light. The finish outside is high grade in every respect. The Anchor tops are shipped completely set up, and it is claimed that they can be readily installed on any car for which they are designed. The prices vary from $62.50 to $165, according to the car and model.

Standard Enclosures.

The Standard Auto Top Co., Philadelphia, Pa., manufactures both the demountable and what is termed the Standard enclosure. The last named, and which is illustrated herewith, is used in conjunction with the regular top, the doors opening with the doors of the car. Use is made of glass panels, these being set in velvet covered channels. The company also produces the Standard sedan enclosure, a construction designed to fit on the regular touring body when the standard top has been displaced. This is a demountable type, and is stated

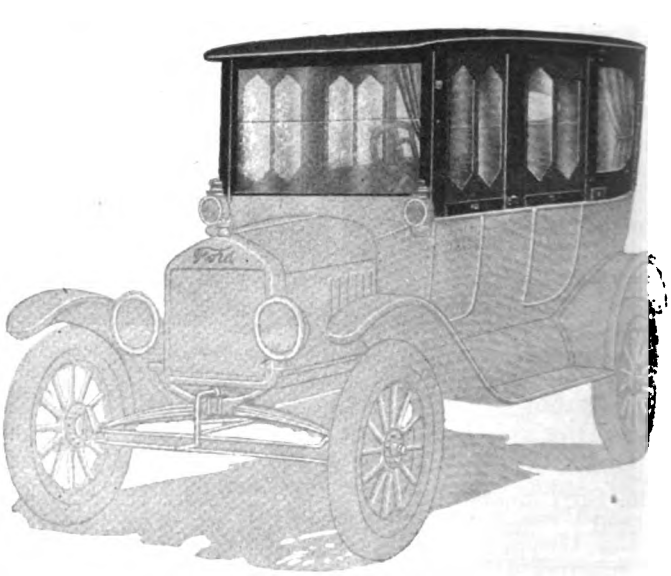


The Standard, a Design for Attachment to Regular Top and Body.

to fit the regular body very closely. This top or body comes equipped with a Troy three-way windshield, a design having an extra or projecting shield, which affords a clear vision at all times. These tops are richly upholstered, and the same material is utilized to cover the upholstery of the car. The equipment includes dome lights, pillar lamps, flower vases and grab handles. The company also produces a design for the Ford car.

Fouts & Hunter Cozy Tops.

The Fouts & Hunter Co., Terre Haute, Ind., specializes on a design for the Ford car for both the touring and roadster types. That illustrated is the touring design. The Cozy top, so termed because of the comfort it provides, fits over the regular body, and makes use of flexible as well as glass windows for keeping out the cold and weather. The side panels are of glass, while the door curtains are of a transparent flexible material mounted on a roller and travel in metal grooves two inches deep. This permits of rolling the curtain up out of the way when desired. Metal strips at the bottom make for weatherproof qualities, and the handhold is located on the inside. The automatic curtains can be raised or lowered as desired by the driver, and



The Cozy Top Having Flexible Curtains Mounted on Automatic Rollers.

this applies to both the side, front and rear members. The maker claims exceptional width or shoulder room of these curtains, which are practically doors. The roadster comes in five pieces, the touring in seven, and the maker claims both are easily attached.

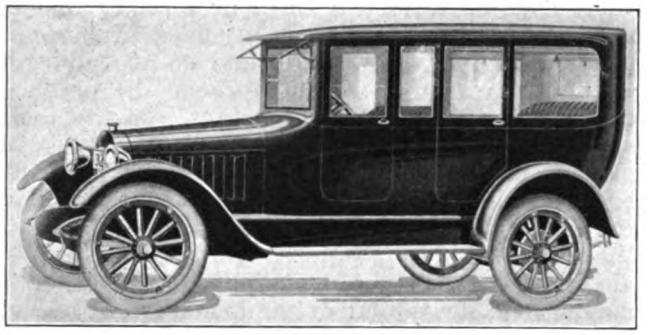
De Luxe Limousine Tops.

The Limousine Top Co., Kalamazoo, Mich., offers a wide variety of limousine tops, supplying standard designs for the Franklin, Premier, Haynes, Chalmers, Liberty and Roamer cars. The top is a combination summer and winter construction. The top doors are attached permanently to the automobile doors and are hinged to the side panels. The regular door lock is not employed when used as a winter body, however, retaining plates being utilized instead. The side panels are attached to the top irons of the car, and the windshield, which is built into the job, includes an auxiliary rain vision shield. The windshield is attached to the irons regularly supporting the shield of the car. The glass in the windows is divided so that the upper half

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may be lowered as desired and for ventilation. The side panels and door frames may be removed, making the top practical for summer driving. The entire construction can be displaced if the owner desires to utilize the regular top.

The glass employed in the windows of the De Luxe limousine tops is so set in channel rubber that

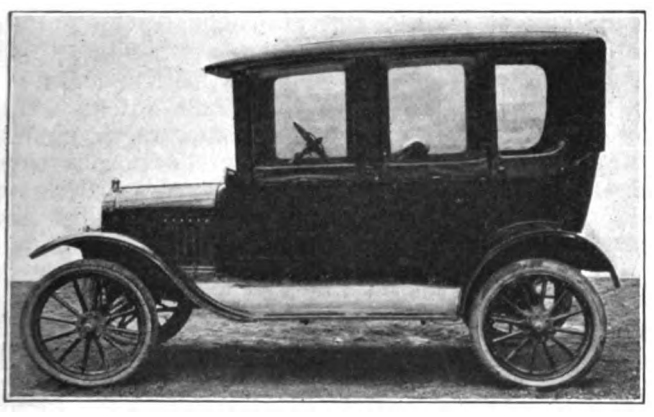


The De Luxe Limousine Top Mounted on Chalmers.

it makes for a watertight and noiseless construction, the maker claims. The windows, that is, the top members, slide in felted channels.

Detroit Detachable Tops.

The Sharrer Patent Top Co., 239 West 56th street, New York City, is distributor for New York, New Jersey and Connecticut for the Detroit detachable weatherproof top made by the Detroit Weatherproof Body Co., Detroit, Mich. It is a highly developed special design for the Ford car. It provides the all-year body and can be attached without any changes or alterations to the Ford body. The maker lays great stress upon the stormproof features and the guarantee against rattle or squeaks. One of the several features of the design is the use of the patented, flexible sliding doors. These disappear into the roof when not in service. Another feature is the width afforded for the entrance and exit of passengers, the doors being three inches wider than the Ford door. Excellent shoulder room is thus provided. The Sharrer Patent Top Co. supplies a de-



The Detroit Detachable Weatherproof Top.—Wide, Flexible Sliding Doors Disappear in the Roof.

sign for the Chandler light six, Hudson Super Six, Chalmers five-passenger car and the Buick D-45.

One of the features of the Detroit detachable weatherproof top is that it can be attached by anyone in three hours. The tops are constructed of high-grade material throughout, and the workmanship and finish are first-class in every respect. Another advantage claimed of the design is that it affords the car owner an enclosed or open body for all-year service at a reasonable price.

Tires Scarce and High.

The only automobile in Germany running on pneumatic tires is Kaiser Wilhelm's. Other officials use cars that bump along to the front on tires filled with rags, compressed cork and paper, according to Victor Van der Linde, special technical representative of the B. F. Goodrich Rubber Co., Akron, O., who just returned from Europe after a long study of tire conditions abroad. In some countries tires are not to had at all, except at fabulous price.

"German scientists have tried to improvise for the scarcity of rubber by compounding what they call synthetic rubber," said Mr. Van der Linde, "but in this they have been unsuccessful. There is not an ounce of crude rubber in it at all and therefore it is devoid of fiber. Then again it has cost about fifteen times more a pound than the vegetable.

"The situation of both Germany and Austria, as concerns tires, is truly deplorable. Countries bounding the central empires, with the exception of those that are at war with them, are in just as bad plight. Most casings are stuffed with compressed champagne corks, paper, rags and sausages made of ground cork. In Sweden a tire costs $550 and one has to have a permit."

Car Stealing Statistics.

Columbus, O., holds the record as being the most successful in recovering stolen motor vehicles. Cleveland, O., is second, and Buffalo, N. Y., third. According to statistics gathered by the Cleveland Automobile Club, Detroit, Mich., is next to the lowest in the percentage of stolen cars recovered between January 1 and September 1 of the present year. The figures follow:

	Cars stolen.	Cars recovered.	Percent. recovered.
Columbus	294	264	89
Cleveland	1,375	1,214	88
Buffalo	493	432	87
Toledo	443	385	86
Detroit	3,052	2,333	76
Chicago	2,515	1,718	68

Causes of Skidding.

Whenever you follow or see a car one of the rear wheels of which slides and the other rolls when the brakes are applied, you may be sure that the driver of that machine is in danger of skidding some day and is inviting an accident. Both brakes should grip alike. If they do not, adjust them. When one wheel locks and the other revolves it affords the differential or equalizing gear a chance to become active. The use of tire chains will not correct brake troubles.

Builds Roads for Motor Cars.

Foochow, China, conspicuous for its absence of roads, is to construct a seven-mile macadam road to replace the footpaths utilized for transporting goods from the river to the city. Motor vehicles are to be employed both for passengers and freight.

It is the custom among the rich to decorate their cabriolets with flowers. For some of the cars we see limping around Flatbush century plants would be exceedingly appropriate.

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LIGHTING DYNAMOS.

Defining the Common Causes of Sparking, the Function of Tertiary and Magnetic Pressure.

BY SYDNEY F. WALKER, M. E.

(No. 5)

In the early days of electric lighting dynamos for ordinary work, the variation in the current furnished by the dynamo caused a considerable amount of sparking at the brushes, unless they were moved forward and backward as the current taken from the machine increased or decreased. Modern dynamos are constructed with the magnetic pressure of the magnetic field very much more powerful than that produced by the armature current and so the tendency to increased sparking with varying currents is not serious; the sparkless dynamo at all loads has long been an accomplished fact.

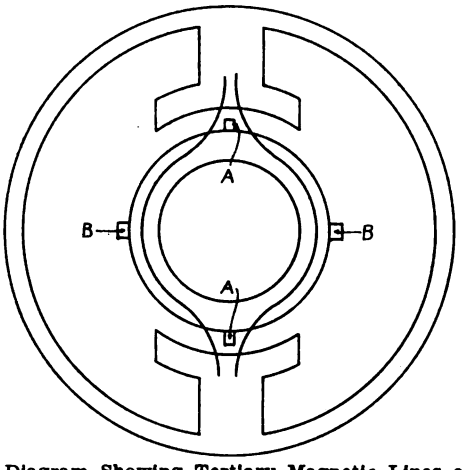


Fig. 24—Diagram Showing Tertiary Magnetic Lines of Force in Leitner System Due to Presence of Auxiliary Brushes.

With the small dynamos used for electric lighting of motor cars, the variation in the current taken from the machine would have produced an awkward amount of sparking, if it had existed, but the fact that the machine is furnishing approximately the same current at all times enables the brushes to be set in one position, where the sparking is inappreciable. This means again that the current furnished should be that which the battery will take on the flat part of the charging curve, 2.2 volts per cell; if there is much variation in the current furnished by the dynamo, either on account of the battery varying in its requirements or from any other cause, the sparking may easily be serious. The writer has seen cases where this has occurred.

Troubles Due to Sparking.

Sparking at the brushes leads to troubles of various kinds. The heat liberated by the spark tends to warm the machine up, to increase the resistance of its coils and to reduce the current it furnishes. The sparking is due, as mentioned above, to the distortion of the resultant magnetic pressure. When the current furnished is that for which the brushes are set, if the machine is properly designed there should be practically no sparking, and the brushes should run with very little attention, only such as they can receive when overhauling everything before starting in the morning. If the current is reduced considerably owing to the back pressure of the accumulator increasing considerably, the magnetic pressure due to the armature currents will be reduced, the resultant magnetic field will be changed, and with it the proper points of sparkless collection for the brushes; and hence sparking will follow.

Magnetic Pressure.

In the machines referred to in this portion of the article, in which auxiliary brushes are employed, what may be termed a third or tertiary magnetic pressure is set up, which is intended to reduce the primary magnetic pressure, and so to compensate for the increased speed and to keep the product of the two factors F and N constant. In the Leitner system, in which two auxiliary brushes were employed, both placed 90 degrees from both main brushes, the field magnet current that had flowed round one of the coils, that which was connected to the positive brush, entered the armature by its auxiliary brush, and the current for the other field magnet coil flowed out of the armature at its auxiliary brush which was diametrically opposite the first one. The currents flowing in and out of the armature through the two auxiliary brushes created their own magnetic pressure, which was directly opposed to that of the field magnets.

Tertiary Magnetic Pressure.

This is shown diagrammatically in Fig. 24. The tertiary magnetic pressure being directly proportional to the current flowing in the field magnet coils tended to reduce the number of lines of force operating to produce the electric pressure at the brushes in exactly the same proportion, so that the increased speed was directly compensated for. In the later Leitner system in which one brush is employed the results are claimed to be practically the same, but the inventor has added a number of accessories, including a bucking coil, which comes into operation when the pressure reaches a certain figure, and another apparatus throws a resistance into the field magnet circuit if the pressure is raised to the extreme figure 2.75 volts per cell.

In the Lucas system, the one in which a few turns of thick wire are employed, carrying a comparatively large current, the action is very much the same, but certain other results are produced, due to the special arrangement of the connections. As men-

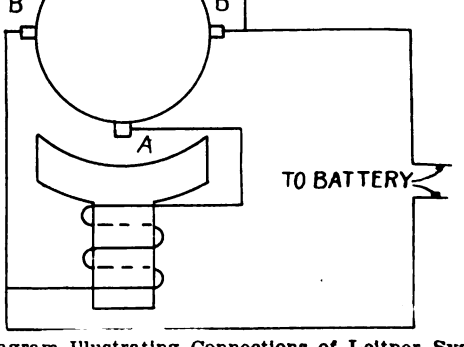


Fig. 25—Diagram Illustrating Connections of Leitner System Utilizing Auxiliary Brushes The Shunt Field Coils Receive The Current from the Auxiliary Brushes.

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tioned above, a few turns of thick wire are connected between the auxiliary brush and the negative brush, the turns of wire being coiled round the field magnets in the same manner as the bucking coil, but it is not a bucking coil. It only connects the auxiliary brush with the negative brush, and it does not carry the current flowing to the batteries or the lamps; it only carries the current which can flow from the auxiliary brush to the negative brush by virtue of the difference of pressure existing between them, this difference of pressure being due to the position of the auxiliary brush on the commutator.

Under ordinary working, when the machine was furnishing say 12 volts, the difference of pressure between the auxiliary brush and the negative brush would be 6 volts, and the current flowing through the thick wire coil connected between them would be due to that pressure, and inversely to the resistance of the connecting wire.

Operation of Coil.

Fig. 25 shows the arrangement of the coils in the Lucas system. But the presence of the auxiliary brush, connected by a wire of low resistance to the negative brush, alters the conditions of the magnetic field considerably. The inventor claims that while the speed is low a considerable current flows through the auxiliary coil, which acts in unison with the ordinary shunt field coils, and therefore tends to get up the pressure quickly even at the low speed. He claims that as the speed rises, and as the pressure between the positive and negative brushes rises, the difference of pressure between the auxiliary brush and the negative brush gradually decreases, and when the pressure would rise above that which is required for charging the accumulator the direction of the pressure between the negative brush and the auxiliary brush is reversed.

Current now flows round the auxiliary coil in the reverse direction to that of the shunt field coil, the current tending to produce a magnetic pressure opposed to that of the field magnet, and therefore to reduce the number of lines of force in the same proportion as the speed is increased. The auxiliary coil is claimed to act virtually as a bucking coil after a certain critical speed is passed. The action produced by the auxiliary coil and the auxiliary brush in this arrangement is very complicated. The low resistance of the auxiliary coil would tend to bring the auxiliary brush near to the pressure of the negative brush, and the current flowing through the auxiliary brush would create its own magnetic pressure just as in the Leitner system.

Disadvantages of Method.

The inventor claims to have worked out the system by a long series of very careful experiments, and to have produced the results mentioned above. The writer will therefore leave it at that, but it appears to him that the same objection applies to the auxiliary brush method as to the bucking coil method, it commences to operate immediately the dynamo commences to furnish a pressure, and therefore the field magnet coils must furnish a higher magnetic pressure than would otherwise be necessary in order to compensate for this. In the Lucas system the object appears to be to keep the dynamo small, and to assist the pressure in the early periods of low speed.

With regard to the Mather and Platt system, which was shown diagrammatically in Fig. 8, the same principles apply, but completely new ground is broken. As indicated by the diagram, the field magnet cores, as mentioned above, have very small sectional area, while the pole pieces are very large, and embrace the armature very closely. The field magnet coils receive their current directly from the battery, as shown in the diagram; the usual main brushes are connected together by the short length of wire shown, and current for charging the battery is taken from the auxiliary brushes. The action is as follows: The shunt field coils create a very weak magnetic pressure across the air spaces between the pole pieces and the armature core, and in the armature itself, but it is sufficient to cause the flow of a comparatively large current through the armature coils and through the short length of wire connecting the usual main brushes. But the powerful current flowing in the armature coils creates a powerful secondary magnetic pressure in the manner already described, and the armature coils themselves, moving in the magnetic field created by this secondary magnetic pressure create an electric pressure between the two auxiliary brushes.

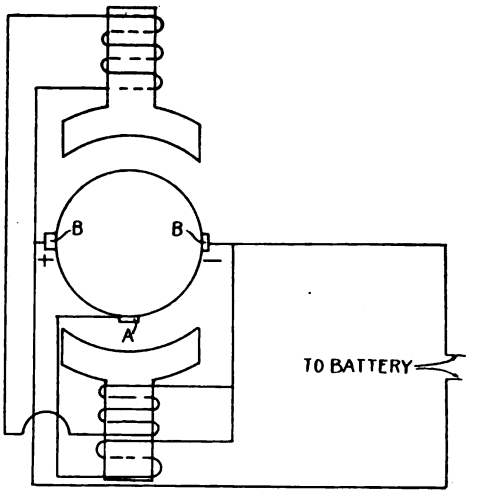


Fig. 26—Diagram Showing Arrangement of Lucas System. One Auxiliary Brush Is Employed and Is Connected to Negative Brush of Dynamo by a Short Thick Wire.

Has Peculiar Feature.

There is a peculiar feature about the magnetic pressures created in the Mather and Platt dynamo. The primary pressure, created by the shunt field coils, causes the lines of force it produces to take the usual path, across the air spaces, through the field magnet cores and back by the mass of the containing cylinder. The secondary pressure operates almost entirely around each pole piece, the air space enclosed between it and the armature core, and that portion of the armature core lying between the ends of the pole pieces. There are two secondary magnetic pressures operating in the two pole pieces, which are specially designed to accommodate them, and it is the lines of force due to these secondary magnetic pressures that give rise to the secondary electric pressure, and to the secondary electric currents flowing from the auxiliary brushes to the accumulator. The secondary magnetic pressures and the primary magnetic pressure act at right angles to each other, and are therefore quite independent of each other. No increase of the secondary magnetic pressure affects the primary magnetic pressure directly, but it does affect it through the secondary

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electric current delivered by the auxiliary brushes, and flowing through them. The current flowing through the auxiliary brushes creates a tertiary magnetic pressure, which is at right angles to the secondary pressure, and therefore directly opposes

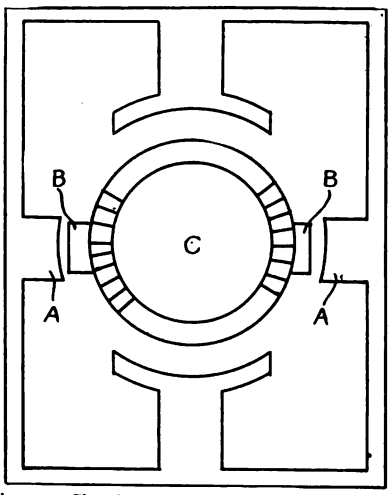


Fig. 27—Diagram Showing Section of Brolt Dynamo. Auxiliary Poles Are Employed to Keep Pressure Constant.

the primary magnetic pressure, with the result that the machine is beautifully self-regulating.

Variable Resistance.

In the train lighting apparatus there is what the makers call an output adjuster which is practically a variable resistance inserted in the circuit of the shunt field coils. By varying this resistance the current in the shunt field coils is varied at will, but once it is set, the working of the machine is automatic. Different current strengths in the shunt field coils correspond to different pressures at the auxiliary brushes, that is to say, at the terminals of the battery. The working of the apparatus, the creation of the tertiary magnetic pressure in exact proportion to the current the armature is trying to deliver, keeps the pressure at the secondary brushes constant. Any attempted increase of pressure at the secondary brushes, by causing an attempted increase in the battery charging current, automatically increases the tertiary magnetic pressure and reduces the secondary pressure to the normal. It is like the case so often met with in mechanical engineering in connection with the government of steam engines, for instance, where an increase or decrease does not arise, because a small increase or a small decrease creates the condition necessary to prevent the increase or decrease.

Auxiliary Pole Pieces.

This method is a development of the one just described, and is intended to avoid the necessity of auxiliary coils, etc. In place of auxiliary coils and auxiliary brushes, there are two auxiliary pole pieces, usually much smaller than the main pole pieces, and placed at right angles to them. Fig. 27 is a sectional diagram showing the arrangement of the pole pieces in a machine in use in the United Kingdom. It will be remembered that the flow of current through the armature coils creates a secondary magnetic pressure, the lines of force due to it modifying those due to the main electro magnet. In the apparatus under consideration, secondary poles are placed, as shown in the diagram.

Distribution Altered.

The writer believes that the system has only been employed so far with two-pole machines, and so there are four poles spaced equally around the armature. Two of them, the main pole pieces, are of the usual crescent shape, the other two being in the form of very blunt wedges. In the manufacture of this dynamo the auxiliary poles are usually cast as part of the containing case, which is generally rectangular, not cylindrical, and they appear more as symmetrical lumps in the casting. The presence of the auxiliary poles alters the distribution of the lines of force produced by the currents flowing in the armature.

A Derived Magnetic Circuit.

As will be seen from the diagram, the brushes are placed exactly opposite the auxiliary poles, and so there is what electrical engineers call a derived magnetic circuit, formed by the armature coil, the armature core, the air spaces between the armature and the auxiliary poles and the auxiliary piles themselves. But this is not the whole of the arrangement. In addition to providing the auxiliary poles, the brushes are made to embrace two or three segments of the commutator, as shown in Fig 27, and this again alters the working of the system. In order to understand how this follows, it will be necessary to explain the action which takes place when the segments of the commutator pass under the brushes.

The brushes, it will be remembered, perform the double office of receiving the currents from the armature coils and of reversing the direction in which the current is flowing in each coil as it passes under the brush. It will be remembered that currents are flowing in opposite directions in the two halves of the armature, that they enter the armature from the outer circuit at the negative brush and divide between its two halves, flowing through each side till they meet again at the positive brush, where they pass out to the outer circuit. The two coils on opposite sides of the positive brush have currents flowing in them in opposite directions, though the two currents unite at the positive brush and in the outer circuit.

Short Circuits Coil.

When two adjacent segments are under the brush, the coil which is connected to them is short cir-

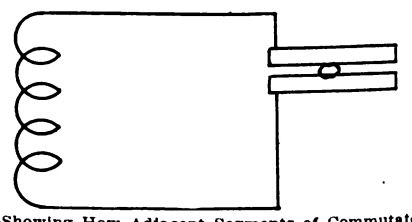


Fig. 28—Showing How Adjacent Segments of Commutator May Be Connected and the Coil Permanently Short-Circuited by Small Piece of Copper When Turning Up in Lathe.

cuited, as was shown in Fig. 17. It will be remembered that the ends of each coil are connected to adjacent segments, so that when these two segments are connected together the coil is bridged. One of the most frequent troubles with continuous current dynamos arises when two adjacent commutator segments are connected together, say by a minute piece

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of copper, such as might be carried over by the tool in turning the commutator up, as shown in Fig. 28. If the spaces between the commutator segments are not very carefully cleaned out after the commutator is turned up and before the armature is put into service, a minute connection of this kind, if allowed to remain, will result in the coil connected to these two segments burning out the first time the machine runs.

Reduces Magnetic Pressure.

In the motor lighting dynamo under consideration, the short circuiting of the armature coils by the brush is made use of to assist in reducing the magnetic pressure furnished by the main electromagnets when the speed rises above the normal. As mentioned above, the brushes are made to embrace two or three segments of the commutator, as shown in the figure, and this means that two or more coils on the armature are short circuited, as the segments to which they are connected pass under the brushes, in place of the one coil that is usual.

This means, again, that while the two or more segments are under the brushes a very powerful current is circulating through the two or three coils, and it is creating a powerful magnetic pressure, the lines of force passing principally in the derived magnetic circuit described above, lying between the auxiliary pole pieces and the armature core. This magnetic pressure is acting at right angles to the ordinary magnetic pressure produced by the currents flowing in the armature coils, and is therefore opposite to the main magnetic pressure produced by the main field magnet, and so tends to reduce that pressure. The auxiliary poles, with the arrangement of the brushes, create a tertiary magnetic pressure which tends to reduce the primary magnetic pressure, and so to compensate for the increase of speed.

Pressure Is Constant.

The operation of the machine is as follows: When it is running at normal speed the resultant magnetic pressure, the balance of the primary, secondary and tertiary pressures is sufficient for the dynamo to give the electrical pressure at the brushes that will charge the battery at say 2.2 volts per cell. When the motor car runs faster than the usual speed, the main magnetic pressure tries to increase, but the tertiary magnetic pressure immediately reduces the resultant pressure to the normal figure, so that the charging elctrical pressure remains constant. When the back electrical pressure of the accumulator rises, with the motor running at normal speed, the action is very much the same as described with the shunt wound machine; the electrical pressure at the brushes rises automatically owing to the smaller current flowing through the armature, and the tertiary magnetic pressure should check any increase beyond that required by the battery.

Reduces Efficiency.

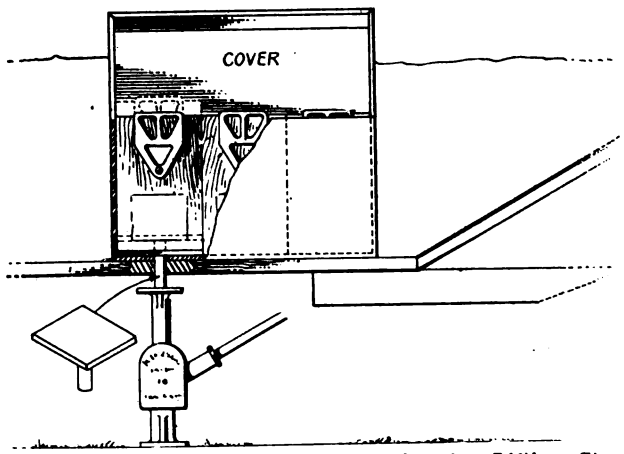
The writer's objection to this method is the same as that urged for the others; it is acting all the time, not only when the pressure would tend to rise owing to a rise of speed. The tertiary magnetic pressure is created at all speeds, and is constantly reducing the primary magnetic pressure at all speeds, so that the primary magnetic pressure has to be greater than it otherwise would need to be by the amount of the tertiary magnetic pressure at normal speed. This means again that the ampere turns, the magneto motive force of the shunt field magnet coils have to be greater than they otherwise would be, and this leads to a lowered efficiency. As pointed out in a previous part of this article, the magneto motive force of the shunt coils of any dynamo depends directly upon the gauge of the wire, so that a larger gauge wire would have to be employed taking a larger current, and more of the current generated by the armature than would be necessary without the arrangement described.

When the Funnel Is Absent.

When it is necessary to renew the supply of distilled water in the cells of the storage battery and a funnel is not handy, the trick can be turned much in the same manner as one pours sauce from a bottle having a glass and cork stopper. Take a small rod of glass or wood (do not use metal) and insert it in the cell opening. Then pour the water slowly and carefully on the rod. The fluid will follow the rod into the cell.

Removing Storage Batteries.

It is not always easy to remove a storage battery from the running board type of box, particularly when the battery is not equipped with convenient handles. A device for making easy the work is shown in the accompanying illustration and is practically self explanatory. It consists of a strip of wood with a round part at right angles. This is placed in the battery box, which is cut as shown. To remove the battery, use a jack and raise the battery until it can be grasped.



Illustrating an Easily Constructed Device for Lifting Storage Battery from Box on Running Board.

May Form New Association.

A movement is on foot to form a new association to control racing on certain speedways throughout the country. The name chosen for the new association is the National Grand Circuit of American Speedways. It is stated that twenty-nine drivers have been secured by the promoters for the 1918 season. The larger tracks, such as Providence, Indianapolis, Chicago and Cincinnati have agreed to stick by the Contest Board of the American Automobile Association, which controls racing in this country. The effort to form an independent racing association recalls the rivalry between the L. A. W. and the N. C. A. when bicycle racing was in vogue.

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TRANSMISSION TROUBLES.

Why Gears Deteriorate and the Cause—Need of Inspection and Adjustment.

BY J. W. BAGLEY.

Many users of motor cars have little knowledge of the working parts of the transmission. Because they cannot see the gears in operation the parts are often subjected to severe service and abuse. Damage caused by changing speeds will, if let run,

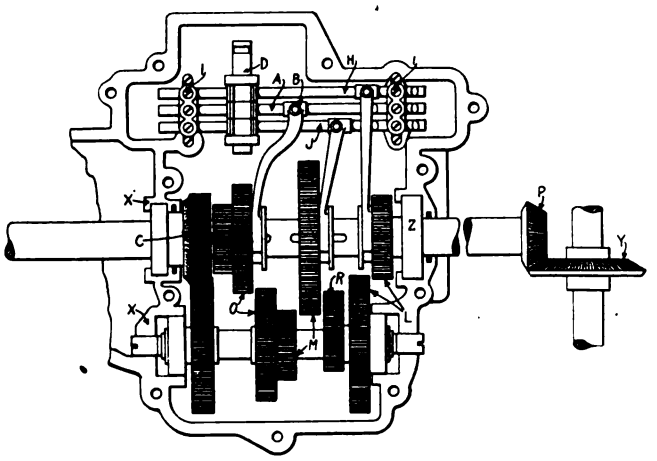


Fig. 1—A Four-Speed Gearset or Transmission.

often result in costly repairs. These troubles could be avoided if the gearset was understood.

There are times when a little lubrication at the proper time would save the car owner expense. If not familiar with the construction and operation of the gearset he should go to the garage man or repair man when minor troubles occur. Lack of lubrication causes the gear teeth to start chipping and cutting. The minute particles of steel work into the bearings and ruin them. When the glasslike surfaces of the gears are broken it is but a matter of a very short time before the gear is ruined. Lack of lubrication will also play havoc with the shifting yokes, for it allows them to wear rapidly, and when a little play occurs the gears have a tendency to crawl out of mesh, damaging the corners of the teeth to such an extent that they will not drive.

Fig. 1 illustrates a four-speed sliding gear set as used on some of the best cars. The three-speed gear set shown at Fig. 1 is very similar, except that it does not have the higher speed of the four-speed, which is obtained by bringing the extra set into use on good roads. In the drawing, D is the shifting lever. When the lever D is moved into the notch on slide bar A bringing gears L into mesh, we will have the gears in position for the lowest speed obtainable. As soon as the car is started the lever may be shifted, bringing gears M into mesh, obtaining the second or intermediate gears. This operation disconnects gears L when the lever is changed to position M. When we change the lever D, bringing gears O into mesh, we have the third speed, or what would be known as high, with a three-speed gear set. But in the four-speed gearset we have still another gear. The clutch for high speed, or direct, as it is sometimes called, is obtained by connecting the gear at C with the gear O. All other gears are in neutral except the idler V gear on the reverse gear, as shown at R. When we shift into the bar J bringing the three gears into mesh, including the idler gear, we reverse the direction of the driving pinion P and the car is moved backward.

End play of the shafts carrying the gears should be reduced to a minimum, for end play will allow the gears to slip past each other. When only a portion of each drive, and on a hard pull, the teeth are liable to be torn from the gear. Slide bar H in this instance has to do with the high or direct drive, and many times while driving along the road the gears will jump out of mesh without any apparent cause. This may be due to different causes, but the most common is the little spring locking device shown at Fig. 2. This has a ball held down by a spring which is forced into the notch in the slide bar as the shift is made. If for any reason this ball does not drop into the notch the pressure on the gear will cause it to work back and get out of mesh.

Then again this same trouble can be brought about by the yoke B being worn at the gear O, and to such an extent that the yoke will not push the gear into position. The ball will not have a chance to seat in the notch in slide bar H, in which case it will jump out of high, for the pressure has a tendency to force it back rather than into mesh. There are, of course, other things which might cause the gears to get out of mesh, but these are the most common. Many times the thrust washers Z wear so thin that they allow the shaft to play back and forth and sufficiently to disengage the gears, or allow them to only mesh on the extreme outer edges. The bearings X may wear to such an extent that the gears will separate, allowing the pressure to come on the extreme outer ends of the teeth. In this instance the gears will "howl," become noisy, and it is but a matter of a very short time before the ends of the teeth will be chipped off. When this occurs they will pass each other with a scraping sound and fail to drive properly.

There is another sound that comes from the gear box, a sort of a pound or knock. This is usually due to a corner of a tooth being broken off, picked up and meshed into the gears. When this takes

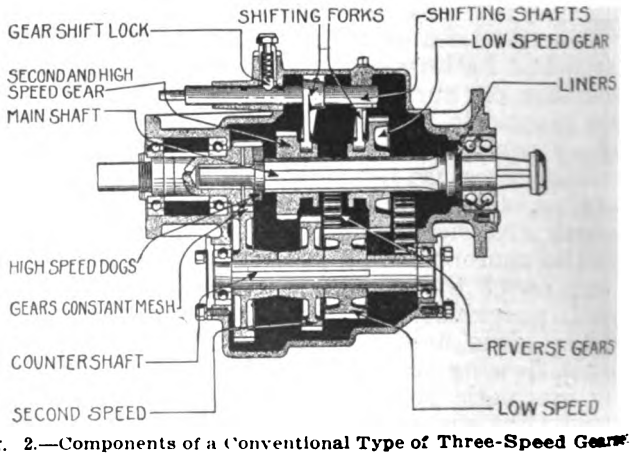


Fig. 2.—Components of a Conventional Type of Three-Speed Gearset.

place every revolution of the gear brings the next gear over the broken piece. This should not be allowed to remain in the gearbox, for it brings about an undue strain on the bearings and shafts, and is liable to result in a badly sprung shaft. I have known of instances where the gearbox has been split, broken apart, by metal particles.

The gears of the rear axle are subject to this trouble. For instance, if a piece of metal lodges

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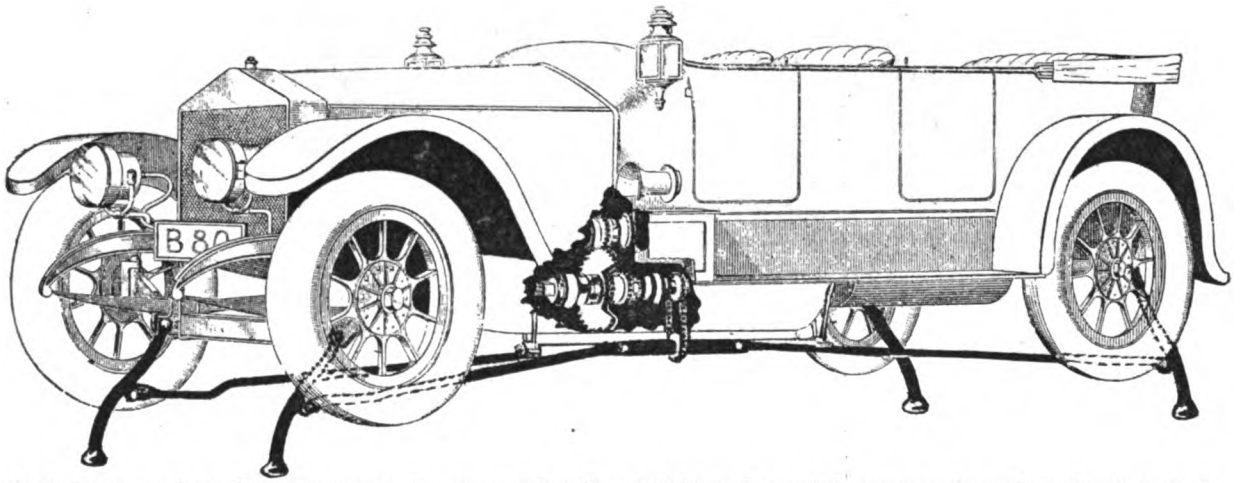
in the gear Y, every time the pinion P passes over it a thump or a pound will be heard, a noise somewhat like the sound made by a car running on the pavement with a deflated tire. When this condition exists there is danger of springing the gear Y. It will be noisy at each revolution of the wheel. The noise is not very noticeable at a very low speed, but as the car is speeded up to 25 or 30 miles per hour the sound increases until it is very easy to hear.

The grease in the gear box should be taken out occasionally and the case washed with kerosene to remove all the particles of metal. The gears of the back axle should be cleaned also. It is not a good plan to use a heavy grease in the gear box unless it is leaky, for a light oil will lubricate much better and there is not so much danger of the particles of metal being picked up by the revolving gears.

Care should be taken in changing the gears that they do not scrape, for the scraping removes particles of metal from the teeth, which will work into the bearings. When the gears scrape in changing it is evident that the clutch stop is at fault or that the clutch does not release sufficiently to stop spinning.

The gearbox should be at all times secured fast to the frame of the car. If the case works loose the bolts holding it to the frame will soon wear and drop out, which may result in a broken shaft or a broken gearbox.

When placing the gears in the reverse position and letting in the clutch a "howling" takes place, sounding as if something was tearing loose. Many times this is due to the fact that the idler gear is loose on the stud or the bearing is so worn that the gear does not mesh properly with the sliding gear. When the idler gear is loose it should be repaired at once or it will be torn out entirely.



A Novel Jack Operated by the Power of the Engine and Capable of Raising Car and Passengers from Ground. Jack is Controlled by Lever at Driver's Seat.

Jack Lifts Car and Passengers.

A novel jack in that the car and passengers can be raised free of the ground by the energy of the engine, has been brought out in England. The Rapid mechanical self-lifting jack, as it is termed, is permanently attached to the car, and it is said that with it the largest vehicle can be raised eight inches from the ground in a few seconds.

Two different types are being manufactured, one an engine-driven device and the other a mechanical. With the first named the mechanism raising the car is controlled by a lever at the driver's seat. The hand-operated model is operated by means of a winch handle being inserted into a recess under the running board. The last named type is said to be easy to install.

The weight of the car is supported by four ball-ended hinged legs, which are normally horizontal and practically concealed from view. These legs or levers have coupling rods linked with threaded sleeves which are actuated by chain as shown in the accompanying sketch. The chain pinion operating the sleeves is actuated by the energy of the engine through the use of the engine clutch shaft. This shaft has a sleeve mounted on roller bearings and carries a small spur pinion which meshes with a larger wheel on an intermediate shaft. The sleeve also embodies a pawl clutch, by means of which the clutch shaft can be locked solid with the sleeve carrying the small pinion.

The lifting mechanism is automatically disconnected when the car is raised the desired or maximum height from the ground. This is obtained by a limit lift rod connected to forks operating dog clutches. In lowering the car the power is taken through the small and large pinions, as when lifting. Two hand-operated jacks are made. One is the design mentioned and the other consists of a type with which each wheel can be raised separately or the entire car raised. When the machine is jacked up it can be moved forward, backward, sideways or turned around in its length by means of the ball runners. It is stated that there is sufficient room under the car for inspection, etc., when jacked up. The jacks are made in six different capacities, and while prices have not been definitely fixed on account of the war, these are said to vary from $100 to $200.

Renovating Worn Bushings.

When the bushings of the steering spindle, etc., become badly worn and new ones cannot be obtained because the car is no longer being made, a repair can be effected by the following method: Remove the bushing and split it lengthwise. Cut and roll shim stock or steel and sufficiently thick to compensate for the wear of the bushing. Place this stock in back of the bushing and drive the latter in place. Ream to fit.

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HOW FUEL IS WASTED.

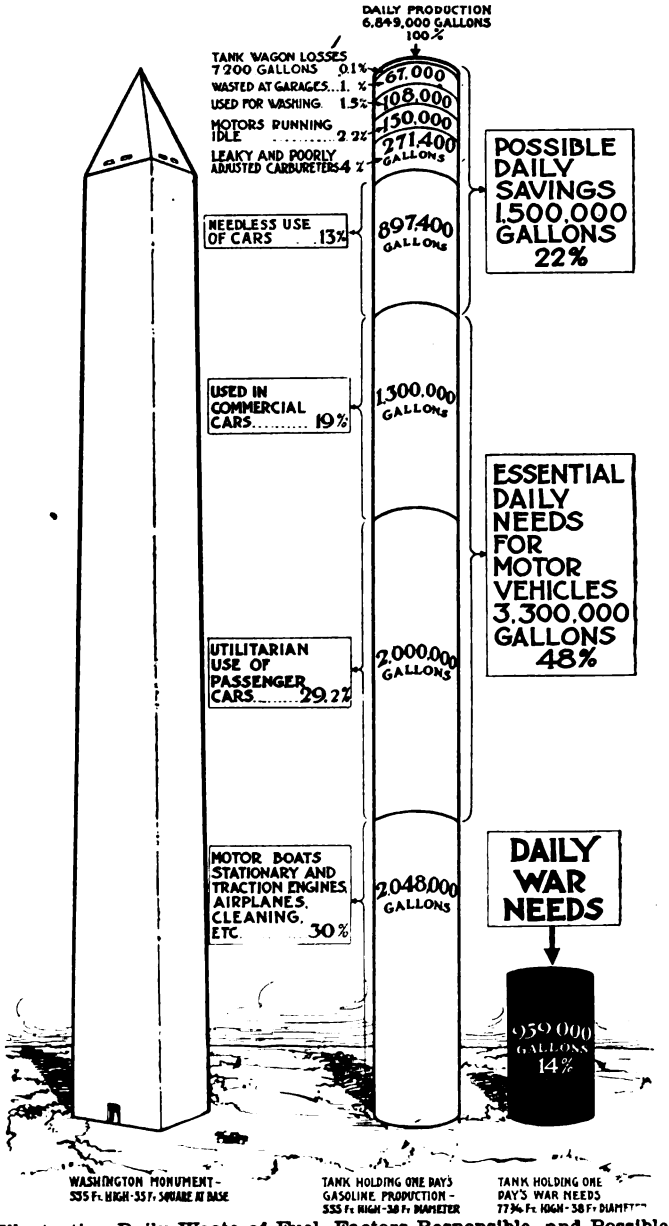
Leaking Carburetors, Rich Mixtures, Etc., Cause Daily Losses of 1,500,000 Gallons.

According to figures compiled by the National Automobile Chamber of Commerce we are wasting millions of gallons of gasoline yearly, statistics

ESTIMATED DAILY FUEL WASTE.

	Gallons.
Tank Wagon Losses	7,200
Leaky Carburetors	30,400
Poorly-Adjusted Carburetors	240,000
Engines Running Idle	150,000
Waste In Garages	67,000
POSSIBLE DAILY SAVING	494,600
By Using Kerosene In Garages	108,000
Needless Use of Cars	897,400
TOTAL POSSIBLE DAILY SAVING	1,500,000
TOTAL POSSIBLE YEARLY SAVING	561,000,000
ESTIMATED GOVERNMENT REQUIREMENTS	350,000,000

showing that nearly 500,000 gallons of fuel are wasted daily through avoidable losses. A million gallons can be saved by substituting kerosene for gasoline in repair work, by avoiding needless use of automobiles, etc. This represents a total of



Illustrating Daily Waste of Fuel, Factors Responsible, and Possible Daily and Yearly Saving.

1,500,000 gallons daily, a saving that could be effected by co-operation with the government. The total possible yearly saving is estimated at 561,000,000 or 150,000,000 more gallons than required by the government to operate its vast fleet of motor trucks and airplanes now in the process of construction.

How Waste Occurs.

It is estimated that the tank wagons in transporting fuel to the garages, etc., are responsible for a daily loss of 7,200 gallons, or one per cent. Figuring and conservatively, that leaking or flooding carburetors average about one-seventeenth of a pint of fuel daily to the car, the daily loss is 30,400 gallons. The use of too rich a mixture, or an improperly adjusted carburetor, represents a daily loss of one-half a pint per engine, or a total loss of 240,000 gallons. Thus the loss through leakage and using too much fuel in proportion to the air, is four per cent. of the total. Running the engine idle is the cause of another avoidable waste of fuel. It is reckoned that one-quarter of a pint per car is wasted daily or 150,000 gallons. The waste in garages of fuel utilized for cleaning is figured at 10 pints per day, and it is estimated that there are 63,000 dealers and garages. The waste is 67,000 gallons daily.

Possible Daily Saving.

The elimination of these losses would, it is said, save 494,600 gallons daily. By using kerosene for cleaning in garages, etc., a still further saving, 108,000 gallons, would be effected. What is, perhaps, responsible for the greatest waste is the needless use of cars. This represents a waste of 897,000 gallons of fuel daily.

These figures are based on the operation of 4,212,000 motor vehicles in this country, of which number about 400,000 are trucks. Of the 6,849,000 gallons of fuel produced daily, approximately 4,800,000 gallons are used by automobiles and the balance by marine and stationary engines, etc.

The accompanying illustration shows graphically how waste of fuel may be avoided and the factors responsible for the losses. It shows that it is possible to save 22 per cent. by economical use of automobiles, etc.; that 48 per cent. is needed for the daily needs of motor cars, and that the daily war requirements is 14 per cent. The reserve crude oil supply on July 1, 1917, was 164,580,000 barrels.

Dollar Gasoline in London.

The price of gasoline is increasing steadily in England. The latest raise is 16 cents, to which is added 12 cents per gallon, which must be paid by the holder of a license before he claims his right to purchase fuel. The final cost to the motorist is $1.12. And there are motorists in this country who complain about the high cost of fuel.

Be Careful When in New York.

Motorists visiting New York with cars will do well to exercise caution in leaving their machines unattended in the city streets. The police are conducting a campaign against such owners and 97 were fined recently in one day.

After listening to an automobile salesman's chatter for an hour you don't know whether you are a client or a patient.

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STORAGE BATTERY PRACTICE.

Factors Contributing to Efficiency and Demand for Longer Service.

Wm. H. Conant, a member of the Society of Automotive Engineers, read a paper on storage batteries before that body recently. In his discussion he brought up the point of high and low rates of discharge and their effect upon the plates. His paper in part was as follows:

RESULTS OF TESTS OF BATTERY AT VARIOUS TEMPERATURES.

Discharge, Rate, Amp.	Test No. I. Specific Gravity Init.	Final	Temp. Deg. F. Init.	Final	Time, Min.
100	1.280	1.240	70	75	23.50
200	1.303	1.271	70	75	4.50
300	1.290	1.271	70	76	2.50
400	1.287	1.268	70	75	1.25
500	1.280	1.260	70	78	1.25
Discharge, Rate, Amp.	**Test No. II. Specific Gravity Init.**	**Final**	**Temp. Deg. F. Init.**	**Final**	**Time, Min.**
100	1.287	1.253	32	46	20.00
200	1.284	1.265	32	44	4.30
300	1.307	1.275	33	41	1.30
400	1.293	1.265	32	40	1.25
500	1.300	1.270	32	48	0.90
Discharge, Rate, Amp.	**Test No. III. Specific Gravity Init.**	**Final**	**Temp. Deg. F. Init.**	**Final**	**Time, Min.**
100	.....	.....	....	...	.....
200	1.305	1.265	20	55	6.8
500	1.300	1.258	3	46	1.6

High vs. Low Rates.

High rates of discharge for short periods do not absorb so much of the life of the battery as long discharges at low rates, because the coating of lead sulphate over the surface of the active material in the former case is not so dense. This coating, therefore, a, is more easily converted back into its original state with less chemical disturbance of the surface and loosening of particles to fall in the form of sediment; and, b, produces less heat from the effect of the curent passing through the lead sulphate, which is a poor conductor as compared with the lead peroxide and spongy lead. Automotive service, in fact, is not as trying on storage batteries as may be believed, and with some little latitude allowed in the matter of price limitations, much better life results can be produced.

The operating demand on a starting battery today is affected by, a, fuel grade; b, cranking speed; c, engine design and manufacture.

Effect of Temperature.

Under the first heading nothing need be sa[id] because the situation is so generally recognized, but when this is taken in conjunction with the higher cranking speed needed to start the same engine on poorer fuel, it is evident that more is required of the battery than formerly. If, now, under the third heading it be considered that for reasons of both design and manufacturing economy, engines today are much stiffer than formerly as well as with greater weight to be turned by the starting motor, it must be clear that more battery capacity is essential, if only enough has been used hitherto.

These considerations are sufficient in themselves, but we must also consider the maximum battery capacity available under cold weather conditions, as regards effect on fuel, lubrication and on the battery itself.

The action of low temperatures on gasoline and oil has been covered thoroughly in other papers presented before this society, and even that on batteries is fairly well recognized, but the combination of all three in conjunction with the greater demands now being placed on batteries—as previously described—probably has not appealed to engineers of automobile makers as much as it has to those connected with starting and lighting equipment manufacturers.

Battery Temperatures.

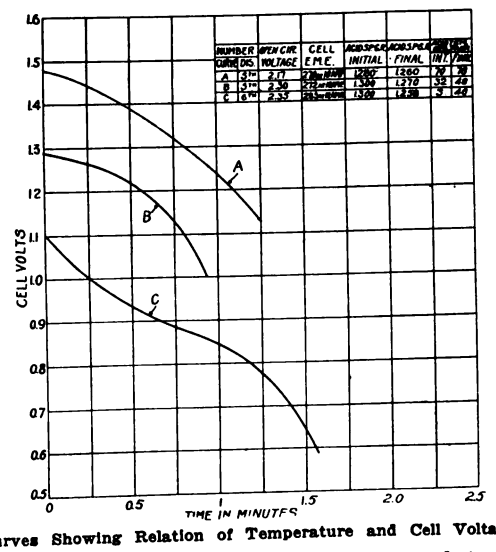
An accompanying chart shows clearly the effect of temperature on voltage and effective capacity. Curves A, B and C show the cell voltages of discharge at 70, 32 and 3 deg. Fahrenheit, respectively, the rate being 500 amperes. Attention is drawn to the increase in open-circuit and charging voltages, which vary inversely with temperature, and to the increase in the temperature on discharge at this abnormal rate. The temperature of a battery drops when it is discharged at a normal or moderate rate. It rises, however, with abnormally high rates of discharge and at an accelerating rate both for lower initial temperatures and for the continuation of individual discharges. In one minute the following effective outputs were obtained for the different temperatures: 70 deg., 11.44 watt-hours; 32 deg., 9.84 watt-hours; 3 deg., 7.84 watt-hours.

The difference in shape of curve C from that of A and B is due to the rapid rise in acid temperature as shown by the difference between initial and final readings of 3 and 46 deg.

The voltage and specific gravity during charge vary inversely with the temperature, whereas discharge voltage, ampere-hour capacity and efficiency vary directly with temperature. Internal ohmic resistance, too, actually does increase with very low temperature.

Cause of Capacity Loss.

The temporary loss of capacity in storage batteries from low temperature is due to both physical and chemical actions and may be likened to the sluggishness of the human muscles when thoroughly chilled. Furthermore, there is an internal drop in temperature that accompanies discharges at normal rates. Abnormal rates of discharge, how-



Curves Showing Relation of Temperature and Cell Voltage.

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ever, raise the temperature until it mounts very rapidly toward the end of discharge at a high rate. Charging produces an increase of temperature, depending upon the proportion of charging current absorbed in the electrolytic action, so that after a battery is fairly well charged, a continuation of the same rate produces a greater proportion of heat than during the early part of charge. Low temperatures have no injurious effect upon storage batteries other than to curtail the capacity temporarily. High temperatures, however, shorten battery life both because of the effect on the thin wood separators and because the lead and antimony are attacked by sulphuric acid when hot, but are not when cold.

We observe, then, these conditions:

1. Maximum capacity is now needed from present battery equipments.
2. The attempt to obtain maximum capacity results in overcharging.
3. Overcharging produces heat.
4. High discharge rates needed for starting engines produce heat.
5. High temperature is injurious to batteries.

Need Larger Batteries.

The inevitable conclusion therefore is that larger batteries are needed to give the results demanded at present and to satisfy car owners with their longer service. In general batteries will give longer life when kept in a slightly undercharged condition than when kept overcharged. This applies certainly to those used in regulating or "floating" service, as on automobiles, if not so strongly to batteries in other service. One of the most puzzling things in automobile engineering, is the determination of life and capacity characteristics of storage batteries. Some tests have recently been made that seem to point the way toward a simple and inexpensive method of determining such characteristics.

Capacity Characteristics.

Any desired number of battery cells are connected in series and alternately charged and discharged, a clock switch being set to give any proportion of charge and discharge periods; the rate for each period is regulated in the respective circuit. All battery cells should be of the same capacity and should be connected in series throughout the test. A recording ammeter should be placed in the circuit in order to preserve a history of the cycles; thermometers should be placed in one cell of each battery; voltage readings should be taken; first, to determine whether the discharge period has been proportioned so that batteries are not discharged below a proper point and then, at intervals during the test, to know whether there is any lack of uniformity among the different cells. All voltage readings should be taken on individual cells and not on complete batteries so as to avoid observing average instead of unit conditions.

It is important in moderate or warm weather, or if tests are to be conducted at high rates, to provide artificial ventilation by means of forced draft. In a general way, it is satisfactory to use just as high rates of charge and discharge as may be desired provided the battery temperature does not exceed 110 deg. Fahrenheit at any time. A careful record of the number of cycles should be kept and capacity tests should be taken at intervals, as for instance at the end of 15, 30, 45 and 60 cycles.

These capacity tests should be taken with great care, first, to keep the discharge rate in amperes constant; second, to read cell voltages at such intervals that proper curves can be plotted; and, third, to stop the test when cells have reached the point at which the drop of the voltage curve is too steep to be useful. The previous treatment of the battery should be recorded in connection with every capacity test; that is, the number of operating cycles to which it was subjected preceding the test and the rate and length of charge before the test began. Initial and final readings of both specific gravity and temperature should be recorded.

Much interesting information is contained in the table, showing specific gravity, temperature and time readings, for a series of tests on the same battery at temperatures from 3 to 70 degrees Fahr. for rates of discharge from 100 to 500 amperes. Another paper, in fact, might be written on these results and the lessons they teach.

Canada Our Best Customer.

Canada was the principal foreign market for American passenger motor cars during the fiscal year ended June 30, 1917, the number shipped to that country being 14,421, valued at $11,143,740. The United Kingdom and France led in the purchases of commercial motor cars, the shipments to those countries being: United Kingdom, 6,525 cars, valued at $17,061,105; France, 4,264 cars, valued at $13,854,903.

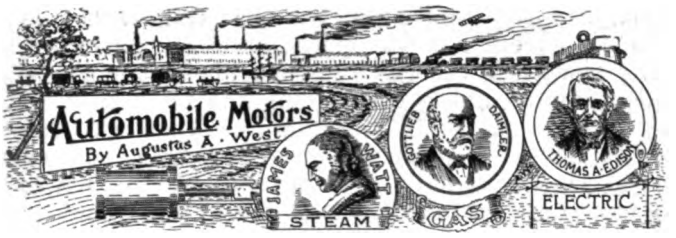
Million Dollar Boulevard.

The million-dollar boulevard at Belleville, Ill., has been completed and was dedicated and formally opened to traffic recently. The road is said to be the longest continuous stretch of its kind in the country.

COMING EVENTS.

Akron, Ohio, December 3-8.—Show, Akron Auto Show Association.
Springfield, Mass., December 3-9.—Show, United Shows Co.
New York, N. Y., January 3-4, 1918.—Quarterly Meeting, Automobile Electrical Association.
New York, N. Y., January 5-12.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.
New York, N. Y., January 11-16.—Meeting of National Association of Automobile Accessory Jobbers.
Washington, D. C., January 11-18.—Carnival and Open House Week, Automobile Trade Association of Washington.
Philadelphia, Pa., January 11-19.—Show, Philadelphia Automobile Trade Association.
Providence, R. I., January 11-19.—Show, R. I. Licensed Automobile Dealers' Association.
Montreal, Can., January 19-26.—National Motor Show of Eastern Canada, Montreal Automobile Trade Association.
York, Pa., January 21-26.—Automobile Show, the York Auto Dealers' Association.
Scranton, Pa., January 21-26.—Show, Scranton Motor Trades Association.
Portland, Ore., January 21-26.—Show, Motor Car Dealers' Association.
Mifflintown, Pa., January 22-26.—Show, Automobile Trades Association.
Allentown, Pa., January 23-28.—Show, Lehigh Auto Trades Association.
Chicago, Ill., January 26-February 2.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.
Minneapolis, Minn., February 2-9.—Show, Minneapolis Auto Trades Association.
Kansas City, Mo., February 9-16.—Show, Kansas City Motor Car Dealers' Association.
St. Louis, Mo., February 11-16.—Show, St. Louis Automobile Manufacturers' & Dealers' Association.
San Francisco, Cal., February 16-26.—Second Annual Automobile Show, San Francisco Automobile Dealers' Association.
Springfield, Ohio, February 18-23.—Show, Springfield Auto Trade Association.
Syracuse, N. Y., February 18-23.—Show, Syracuse Automobile Dealers' Association.
Pittsfield, Mass., February 18-23.—Show, State Guard.
Grand Rapids, Mich., February 18-23.—Show, Automobile Business Association.
Boston, Mass., March 2-9.—Automobile Show, Boston Automobile Dealers' Association.

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Three men are credited in history as having helped to bring to commercial success the several motive powers of steam, gas and electricity. Watt is known as the "father of the modern steam engine," and since his time the only great improvement has been in using the exhaust from the first cylinder to drive a piston in another cylinder, called compounding, and this is done two, three and four times in marine engines. Of minor value have been the balanced steam piston valve, the partially rotating valve of George H. Corliss and the commercial steam turbines of De Laval, Parsons and Curtis.

Gottlieb Daimler is called the "father of the automobile," although George B. Selden was among the early pioneers in gasoline-propelled carriages, and many automobile manufacturers paid him royalties for years, except Henry Ford, whose fight in the law courts over the Selden patents was successful.

Thomas A. Edison, as an inventor in so many lines, stands out prominently among his fellow men, and no one will dispute his right to first place in electrical inventions.

Early Methods of Transportation.

For centuries man's good friend, the horse, was used to draw chariots and other vehicles. The first great improvement over the sled runners of the ancients and the tree boughs of the Indians was the invention of the round wheel. A wheel is a form of lever, and when power is applied to any part of it, it turns. The larger its diameter the faster it will revolve, and a large wheel requires more power than a smaller one.

Long before the advent of the steam locomotive there were more or less successful attempts made to propel road vehicles by steam power. These date from the steam carriage of Captain Cugnot, in 1769, but as early as 1678 Abbe Hautefeuille suggested a gun-powder motor for carriages. This dates the use of an explosive gas before an expansive gas, (steam). Nothing practical resulted from the use of gas motors until the discovery of gas, distilled from coal, by Murdock at the end of the eighteenth century.

Steam automobiles may be said to date from Cugnot's carriage in 1769 and the gas engine from the device of Lenoir in 1860, but the commercial adaptation of the gas engine to road vehicles has been claimed for either Daimler or Selden. The history of the electric motor includes many inventors, that might start with Henry's electro magnet, the well-designed motors of Davenport and their development by Edison, Field and Sprague, although the list should include the names of other successful inventors.

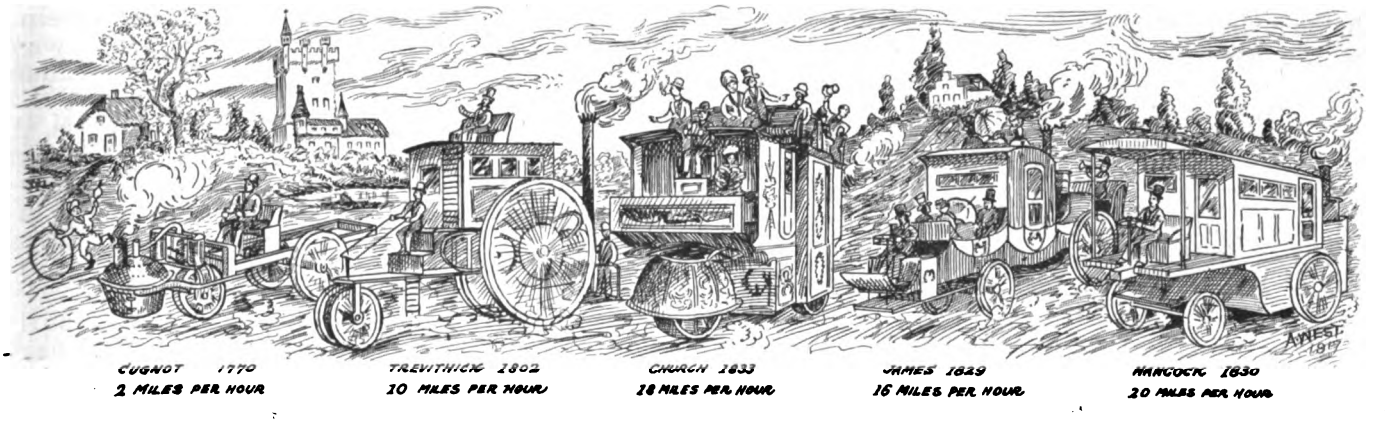
The Steam Engine.

The history of the steam engine begins with the steam toys described by Hero of Alexandria, in a book published two centuries before Christ. Later, in 1615, Salomon de Caus devised a form of steam-operated water pump without a piston. In 1629 Giovanni Branca, of Lorreto, Italy, produced a complete steam engine having a fire box, water boiler and a steam nozzle that directed steam against a form of paddle wheel or turbine. In his writings he claimed much useful merit for his engine, but it must have been very wasteful of steam, although in recent years De Laval developed this idea into a very practical high-speed motor by using a number of steam nozzles of inverted-funnel shape, that directed steam from the side onto a plurality of U-shaped vanes.

In 1693 Thomas Savery made the first successful steam engine. It consisted of two oval vessels placed side by side and having a pipe connection to a steam boiler. The lower parts were connected by tubes and valves. Steam from the boiler entered one vessel, driving out the air. The steam was then condensed and a vacuum formed by letting water play over the surface of the vessel. When the valve was opened this vacuum drew water up from below until the vessel was full. The valve was closed and steam again admitted, so that on opening the second valve the water was forced out through the delivery pipe. The two vessels worked alternately. Of the two boilers, one supplied steam and the other forced water into the steam delivery boiler. No piston was used.

The Piston Engine.

Next came the Newcomen piston engine in 1705, which was an enlargement of the Savery device. Steam acted on the lower side of the piston and a counter weight and heavy pump rod raised the piston. A jet of water was then directed into the cylinder, condensing the steam, creating a vacuum and the piston was drawn or sucked downward. Another stream of water was also played on top the piston. Thus condensing or vacuum engines came before



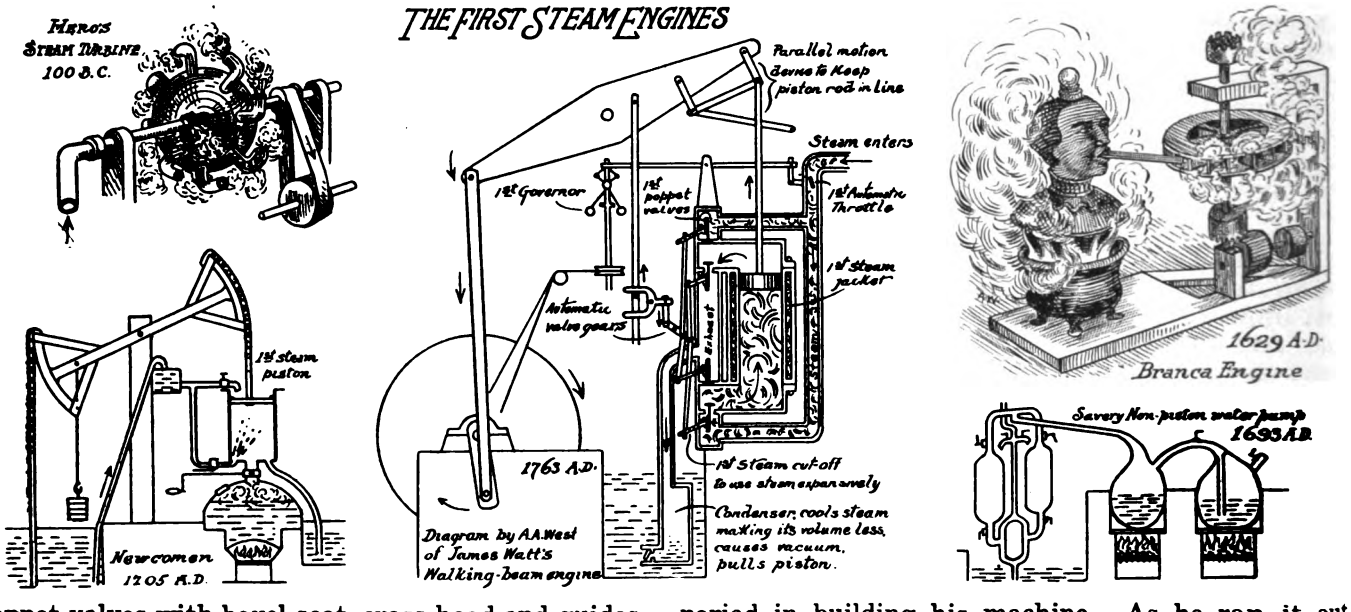
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steam expansion engines. Today expansion of steam is made more use of than steam contraction, or "condensation of steam."

Enter James Watt.

Thus we see that Newcomen improved the device of Savery. Now come the epoch-making improvements in the steam engine. In 1763 a small model of Newcomen's engine was taken to the instrument shop of James Watt, in Glasgow, Scotland. Watt was a great genius and he made the steam engine the prime mover, until the gas and electric engine came many years afterward. Newcomen used automatic valves, invented by a lazy mine boy, but to Watt we are indebted for the poppet valve, ball-arm governor, automatic throttle, cut-off, steam jacket and other improvements.

Watt was 27 years old when he started his steam engine inventing in 1763. In 1766 he formed a co-partnership with Matthew Boulton and in 1784 Boulton and Watt erected in London a pair of steam engines that drove twenty pairs of millstones. Watt equipped them with a new flywheel, glass water gauge, mercury steam gauges, "fly-ball" governor, poppet valves with bevel seat, cross-head and guides, and several other minor improvements.



In Watt's day the term horsepower came into vogue in connection with engine power, because the early steam engines were used to replace horse-actuated mine water pumps. It was then figured that a horse could pull up a weight of 33,000 pounds a height of one foot in one minute of time. Today we call it 33,000 foot pounds per minute.

As compared with the present four-cycle gas engine, the modern steam engine is a one-cycle engine (a cycle being one-half a revolution of the crank shaft) and a steam engine gets a power stroke on each side of the piston.

Coming to the modern steam engine automobile, we find that in 1889 Leon Serpollet brought out his flash boiler, which was used in modified form by Thorncroft, Ofeldt, Walker, Geneva Carriage, Lane, Stanley, White and in the present Doble steam automobile.

Steel Was High in Cost.

The French military engineer, Nicholas Joseph Cugnot, undertook the invention of a steam-driven carriage in 1767 and 1769. At that time steel was unknown except hand-tempered steel for knife and sword blades. Steel was an expensive luxury, being made by hand up to 1855, when the price of steel was $350 a ton. In 1855 Henry Bessemer tried the experiment of injecting air into a crucible of molten metal. He finally built a stationary vessel, 3 feet in diameter by 3 feet high, out of fire brick.

This "converter," as it was called, was enclosed in a box known as the blast box, from which pipes, or tuyeres, entered the sides of the converter at the bottom. A pipe connected the air-blowing engine and the blast-box. Near the top of the converter was a vent hole for the flame produced by the operation. Great commotion took place when air was forced into the converter, the oxidation of the carbon and silicon producing a miniature volcano. Later came the Martins-Siemens "open-hearth" process, which has now a greater vogue than the Bessemer method, owing to the greater proportion of ores being more suited to the Martins-Siemens treatment.

Cugnot used such metals as were common at that period in building his machine. As he ran it out on the road near his workshop, the French citizens were amazed at its chug, chug, and it traveled at the great speed of two miles per hour for 15 minutes, when he stopped and refilled the water tank. While operating it he tried to turn it around in the road. Being top heavy, it canted and ran into a building, overturning and was wrecked. Quite a number have been wrecked on our roads in more recent years. In 1771 Cugnot built the carriage shown herein, which won him a pension from Napoleon, but it was never used for hauling cannon, as intended, because of the French Revolution. The machine is preserved in the Conservatoire des Arts et Metiers in Paris.

In 1787 the British engineer, William Murdock, built a steam tricycle. In 1802 came the steam carriage of Richard Trevithick. In 1826 Sir Goldsworthy made a steam carriage that ran 20 miles per hour and had the first "flash boiler," or combination boiler-tube-fire-box.

Between 1829 and 1838, Walter Hancock built nine steam carriages and these were used commercially. Then there were the steam carriages of Russell, James and Church.

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AMONG MICHIGAN GARAGES.

Starting in Traffic—Adjusting the Carburetor—Loose Connections.

BY JAMES F. HOBART, M. E.

A certain driver was observed to always start very easily and promptly after having been stopped at a street crossing by the traffic officer. A friend, who also drove an automobile, found that by the time he got started after the officer motioned him to proceed that his friend would be half a block away, asked the gentleman how he managed to get started before the officer had time to let his hand fall after giving the go-ahead signal.

"It's just this way," said the quick starter: "When I stop my car I place it in low speed, then when the officer says 'go ahead,' I just let in the clutch, press down the accelerator a bit, and I am off and away without having to get the lever out of neutral. It is a good dodge, and saves me a whole lot of time when I am in a hurry and when I want to get started before the other fellow."

A man came into a repair shop with a car which limped at times and at other times ran very well. A search was established for the trouble and more than an hour was spent vainly before the cause of the trouble was discovered in a loose electrical connection.

The parts which should have been screwed solidly together were found to be separated, even when seemingly the screw was tightened fully. This apparent paradox was found to be the result of oxidization. The connection had become loosened and a corroding moisture had gotten into the connection and rusted the screw, the nut, and also the connection which should have been clamped between them.

After a study of the parts it appeared that the metal had oxidized enough so that when the nut was seemingly screwed down tight upon the connector that it really bore upon the coating of oxide instead of against the connector, which remained slightly loose.

It was further discovered that when the automobile was going up hill the connector would hang in a way which secured good contact, but while the machine was going down hill the contact between the parts was often broken by the "hang" of the connector. Thus the car often misfired when running down hill, but worked fairly well while going up hill, save at times when rough spots and the jolting of the car threw the rusted connections apart.

Truly, electricity lives up to the words of the man who said: "You don't know when you've got it or when you haven't got it!"

Adjusting the Carburetor.

Recently an auto was heard standing in the street running in a most peculiar manner. For three or four puffs the exhaust would be fast and then gradually slow down and the sound grow fainter and fainter until the end of a cycle, when the engine would start fast again, the exhaust "bark" harshly for three or four puffs and then dwindle down again.

"Bill is just adjusting the carburetor," said the owner of the car as he came into the house. "The carburetor has not worked very well lately, so Bill has been adjusting it about all day and hasn't got it working right yet."

"Yes, and he won't get it to work right," spoke up a gentleman in the room. The carburetor is one thing about an automobile which should be let alone. If no "adjusting" is done after the appliance comes from the factory, none will be needed. It is only after some person has "monkeyed" with the carburetor that something needs doing to it, and I cannot express myself too strongly in regard to the matter that carburetors should be left severely and entirely alone insofar as adjustments are concerned. It is all well enough to take care of the carburetor and keep out or remove any water or other foreign substances which may have gotten into it, also to see that the float is o. k. and working properly. These things should not be called "adjustments." Better call it the care necessary for the proper working of the very necessary attachment.

Then let the rest of the carburetor severely alone and fire any chauffeur or mechanic who dares place a wrench upon the carburetor to make "adjustments" therein. Do this and your car will never act like the one outside which continues to vibrate seemingly between influenza and the asthma!" And thus speaking the gentleman, who proved to be a prominent manufacturer of automobiles, went his way and left the automobile owner thinking deeply of carburetors and of his wheezing car and "adjustments."

When a man is continually "tinkering" around his car, using wrench and hammer just for the purpose of "seeing what he can do," there is every chance that he will get a whole lot of things "out of whack" and put the car into far worse shape than before he commenced to tinker.

It is all right to make little repairs, and they should be made "just before they are needed." Then the car will always be in commission, ready for the hardest service which should be demanded of it, and the repair bills will be the lowest possible. But such repairs are far different from the "tinkering" which some people inflict upon their cars. For examples of both, take the matter of inlet valves. The "tinkerer" may take out the valves, look at them, imagine perhaps that the valve stems have been sprung and attempt to straighten them, and perhaps thereby doing actual damage to the valves, which were really in good condition before he "tinkered" with them.

The man who actually repairs his automobile will, upon looking the valves over, find out if they close tightly or not. If they prove leaky, he will proceed to grind in the leaky valves and will not worry himself about possible crookedness in valve stems which are as straight and as true as they can be made.

Such is the difference between the two classes of men. One really does what is needed and does it before the wear has become great enough to cause much loss of compression. The "tinkerer," on the other hand, is pretty sure to get out of adjustment parts of the mechanism. Such men are a great benefit to the service stations, garages and repair shops, yes, and to automobile manufacturers, too, for one of these men will wear out two or three cars to one worn out by the man who makes only necessary repairs and who makes them "just before they are needed."

When a car driver complains that he cannot get more than nine or ten miles per gallon of gasoline, then look twice to make sure that he is not one of the "tinkerers" mentioned in a preceding paragraph.

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Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

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Member of the Associated Business Papers.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK NOVEMBER, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THEFTS OF MOTOR CARS ARE INCREASING.

From January 1 to October 15, 1917, the police department of New York City reports that 1,725 automobiles were stolen, within the city limits.

This is an increase of 40 per cent over a similar period in 1916. Arthur Woods, police commissioner, has requested the corporation counsel to draft a law compelling car drivers to lock their machines when they are left in the streets, for any purpose.

It seems that most of the cars were stolen between the hours of 11 p. m. and 5 a. m. The police have been instructed to take all cars left in the streets unattended to the nearest police station and hold them until the operators claim them, and when that happens they will be served with a summons to appear in court.

There are so many excellent devices on the market for locking cars that it seems strange that any car owner would for a moment think of leaving his car without locking it.

VALUE OF DEMONSTRATIONS.

Dealers should not overlook the possibilities afforded by the proper display of winter equipment, supplies, etc. The "silent salesmen" method of showing goods is being highly developed, particularly in the large cities, and explains to a certain extent why one dealer is more successful than another. Of course, salesmanship is a big factor in sales, but the attention of the prospect must first be secured. For example, the dealer handling a winter top or enclosure will achieve greater success if he shows the top in actual service or on a car. Similarly those devices and equipment in demand in the winter should be displayed and on the car when possible. The majority of purchasing owners are practical. They desire to see the article or device installed or attached and in operation when possible.

DIFFICULT STARTING OF ENGINE.

To start an engine in cold weather is not always easy, particularly those engines not equipped with priming cocks or devices for enriching the mixture. It means tampering with the adjustment of the needle valve of the carburetor. The new owner, however, hesitates to change the carburetor adjustment, and as a result he expends much energy in attempting to start the engine. If agents or dealers would instruct the new owner in adjusting the carburetor for starting when cold, and with the popular type of car mark the dash adjusting device for starting, there would be less complaints noted and more satisfied owners.

EASILY ACQUIRED KNOWLEDGE.

New devices for reducing the cost of motor vehicle operation and maintenance, for simplifying its repair, are being brought ut daily. The owner who would keep maintenance cost at the minimum, who would enjoy the comforts and conveniences made possible by modern equipment, and the dealer and repairman who would simplify the repair of motor cars, should keep advised as to the new devices being marketed. Every dealer, repairman and garageman should be in a position to supply his customers with exact information as to any new device, accessory or equipment, knowledge that is easily acquired by reading the advertising as well as the reading sections of our publication.

THE OUNCE OF PRECAUTION.

An occasional inspection of the components of the chassis, particularly the steering gear, wheels, etc., those parts upon which safety depends, may avoid the possibility of a serious accident. It is not uncommon to read in the daily press that the accident was due to the steering gear "going wrong" or a wheel coming off. A search for possible loose nuts, bolts, etc., and the application of the wrench, will do much toward avoiding the possibility of accidents.

BRAKING IN AN EMERGENCY.

Eternal vigilance is the price of safety. The driver of the motor car, particularly the operator of a machine in crowded traffic, who drives with the foot used for braking either on the accelerator or on the floor, is not prepared to make a quick stop in a sudden emergency. Many times it is necessary to bring the car to a full stop in a fraction of a second. This cannot be done if the foot is not in close proximity or actually on the brake pedal.

A FOOLISH PRACTICE.

In these days when the government and people are grappling with economic conditions, when money, food, clothing and material are pressing needs, it seems sheer waste to spend money on Christmas presents that the recipient does not want or cannot

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put to a useful purpose. The practice of the American public to make Christmas gifts just for the sake of making a gift, is a foolish one that should be discouraged in these times. An enormous saving can be effected by the use of good, common sense. If one must make a gift, let it be one that is practical, a gift that is a necessity not a luxury. Of course, we must except children, for with them Christmas is, oh, well, it's Christmas.



This department is maintained for the protection of our readers—especially our reckless readers, if we have any.
The object is to encourage every operator of a motor vehicle to be careful and avoid accidents, especially the inexcusable accident of a collision at a railway crossing.

The number of inexcusable accidents, those resulting from collisions with railroad trains, is increasing. At Hazelton, Pa., recently, the Buffalo flyer of the Pennsylvania railroad struck an automobile, killing three outright and injuring two other occupants. The accident occurred in the day time, and although the view of the tracks was obscured at the point where the crossing was located, that could be no excuse, as the driver should have stopped his car and made an investigation.

While attempting to cross a railroad track at Perth Amboy, N. J., just at night, recently, a jitney bus was struck by a train and two of its occupants killed. The driver ignored the bell signal, which was ringing, and took his chances on crossing in time to avoid the train.

One man was killed and one injured at Mt. Holly, N. J., recently. They were struck by a freight train at a railroad crossing. The alarm bell was ringing, but the driver claimed he did not hear it. He should have stopped until he had a chance to see the track.

At Hoquiam, Wash., recently, an automobile in which a woman and her baby daughter were riding stalled on the railroad track, and both were killed. Three others were seriously injured, including the driver.

Caused by Liquor.—It goes without saying that any man who drinks even moderately has no business to drive a motor car. He not only endangers his own life, but the lives of those with him. At Norfolk, Va., a big touring car was wrecked while being driven at reckless speed by a man who was under the influence of liquor. Previous to the car being wrecked, it had collided with three automobiles and a buggy.

Speed Results Fatally.—Going at a high rate of speed at Newark, N. J., recently, a car plunged through the guard gates of an open draw-bridge into the Passaic river. One of the two men in the car was drowned. This is the second accident at the same bridge. Last spring seven young men attending an academy in Montclair, N. J., running a car at a high rate of speed, went through the guard gate and into the river. Three of the young men were drowned. Both of these accidents, of course, resulted from carelessness.

Running Too Fast at a Curve.—Lack of care on the part of car drivers at sharp curves results in many serious accidents. The other day one woman was killed and three others seriously injured at a curve when the driver tried to make a quick turn with a heavy touring car in a thick fog. The nut retaining the left front wheel had worked loose, and at the turn the wheel flew off. The machine plunged down an embankment, crashed against a tree, and was overturned. This accident not only shows the importance of care at curves but also the necessity of looking over one's car frequently for loose nuts or anything else that may be out of order.

Too Much Speed.—At Valdosta, Ga., five negroes were riding in a car at a high rate of speed when a hog darted into the road, and in attempting to avoid the animal the driver was thrown through the windshield and literally beheaded. The car, it was said, made three distinct somersaults.

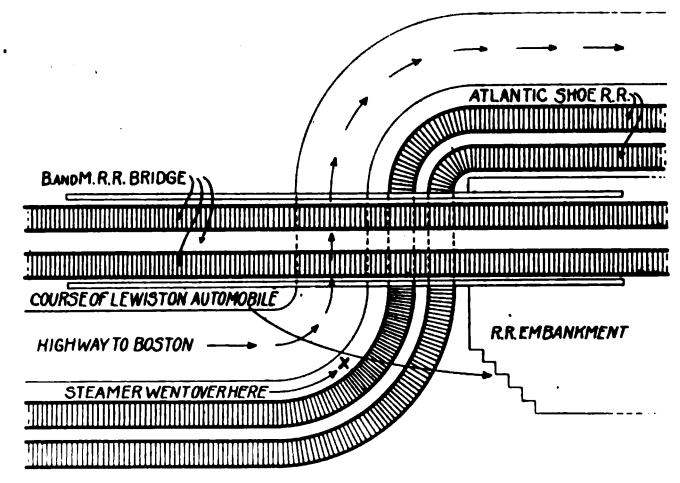
Caused by Skidding.—One woman was killed and five other persons seriously injured at Thompsonville, Conn., recently, when a car in which they were riding, though going at a low rate of speed, skidded upon the glassy surface of the road and finally turned turtle. A case where chains were needed.

Due to Speeding.—One woman was knocked unconscious and three other people were more or less injured at Billerica, Mass., when the touring car in which they were riding plunged down an embankment.

While running at a speed of 70 miles an hour in a suburb of Chicago, Ill., over the Dixie highway, two men were killed and four seriously injured when the car skidded and overturned.

A Dangerous Crossing.

From F. B. Randall, Maine.—Your valued magazine gives me a lot of good information, especially the Trouble Department, which is certainly worth the price of a year's subscription. I like to read of the other fellow's experiences, as I know that experience is our best teacher. While reading your Lessons for Drivers just now, thought I would write



A Dangerous Curve on Road from Portland to Boston.

of one of the most dangerous places on the road from Portland to Boston, known as Dead Man's Curve, which was under the Boston & Maine rail-

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road bridge in the town of Wells. Here three Lewiston women and one man met instant death, and another Lewiston man who was driving a large car miraculously escaped with his life recently as they were bound for Ayer, Mass., to visit a friend who is training there. As near as can be learned from the driver, the steering gear suddenly went wrong, the car leaving the road, plunging over an embankment, turning turtle and throwing its passengers headlong against the railroad embankment, which is a solid granite wall. Tonight's paper describes another narrow escape that happened to a steam car at the same place last night, when one rear wheel dropped over the four-foot embankment between the highway and the tracks of the Atlantic Shore Line railway which run alongside of the road and under the Boston & Maine railroad bridge. The selectmen of Wells have petitioned the Public Utilities Commission to see what can be done to abolish the curve and make the road straight and safe for travel.

M. A. M. IS ACTIVE.

Adopts Program for New York Meetings—Rules on Pirate Parts.

Closely following the first credit convention to be held by the Motor and Accessory Manufacturers at Cleveland, O., recently comes the announcement that at the monthly meeting the organization decided that action against the pirate parts manufacturer is a matter for the individual manufacturer only. According to their counsel, the best method of attacking the pirate part maker is to sue him when he creates damage, the attorney holding that it is an individual problem of individual fraud.

The annual banquet of the association will take place January 9 at New York and the following committee has charge of the arrangements: Wm. M. Sweet, chairman; E. H. Broadwell, T. J. Wetzel, J. H. Foster, Christian Girl and C. E. Thompson. The program for the show week in New York is as follows: Wednesday, January 9, 9:30 a. m., meeting of the executive committee, M. A. M. offices; 10 a. m., meeting of banquet committee; 10:30 a. m., meeting of finance committee; 11 a. m., meeting of board of directors; 3 p. m., fourteenth annual meeting, Waldorf-Astoria. The meeting of the board of directors for the election of officers will be held Thursday, January 10, at 2:30 p. m.

The following new members were elected: Menominee Electric Products, Inc., New York City; G. L. W. Spring Oiler Co., San Diego, Cal.; Central Steel Co., Massilon, O., and Kales Stamping Co., Detroit.

Technical School for Mechanics.

The annual report of the Technical School for Automobile Draftsmen and Mechanics, 20 West 44th street, New York City, shows that the year ending August 31 was one of the best since the establishment of the school in 1880. The school is the result of the demand of the automobile industry for trained men, and since its inception has been and is given the support of leading manufacturers. During the fiscal year there were eight day and 56 evening students. Of the evening class 38 were body makers, nine general woodworkers, eight draftsmen, two foremen, one timekeeper, one office man and one superintendent. The annual exhibition of drawings was well attended.

The following is the report for the work accomplished during the past year, September 1, 1916, to August 31, 1917, inclusive:

New students, 51; drawings received, 1,135; examination papers received, 170; lesson papers sent out, 2,551; rating cards sent to students, 1,305; letters sent to students, 1,465; letters received from students, 1,407.

Dodges Win in Ford Suit.

The suit of John F. and Horace E. Dodge, stockholders in the Ford Motor Co., and against that concern, has been decided in favor of the plaintiffs. The suit was brought to compel the Ford company to disburse the accumulated dividends to the stockholders instead of utilizing the money to increase the business. It is said that about $60,000,000 was involved.

The Dodge brothers, who are stockholders of the Ford Motor Company, attempted by injunction to prevent Ford from using his company's profits to erect great blast furnaces at River Rouge, near Detroit.

Ford, in a formal statement made public some time ago, and in his testimony at the trial of the suit, declared that he would appeal the case to the United States Supreme Court if the lower court's decisions were against him.

It was charged by the Dodge brothers that Ford was supreme in directing the business of the Ford Motor Company, and that the minority stockholders had no voice in the affairs of the company. Ford denied this charge. One of the officers of the company testified that it was not uncommon for the company to spend from one to five million dollars for materials, without asking for the stockholders' approval.

NEW BOOKS RECEIVED.

Acknowledgment is made of the following books and house publications:

The Japanese Salesman. Japan Sales Co., New York City. Monthly publication for acquainting American business concerns with prices, qualities and general market conditions in Japan, etc.

Glossary of Aviation Terms. By First Lieutenant Victor W. Page, U. R. S., and First Lieutenant Paul Montariol, French Flying Corps. The Norman Henley Pub. Co, New York City. Contains list of common aeronautical terms in English with French equivalents, and in French with corresponding English words. The text is in four sections, these dealing with flying field terms, the airplane and its parts, engine parts and tools and shop terms. Price $1.00.

How to Sell Automobiles. By C. D. Paxson, Cleveland, O. Outlines in detail and comprehensively the knowledge necessary to sell motor vehicles. Price $1.00.

Lubrication. The Texas Co., New York City. Monthly. Contains interesting data on lubrication, oil, etc.

Rules of the Road. The Greer College of Motoring, 1521 Wabash avenue, Chicago, Ill. Contains a digest of local and state motoring laws. Free copies will be mailed upon request.

Concrete Highway Magazine. Portland Cement Association, 111 West Washington street, Chicago, Ill. Deals with the use and service of concrete highways, etc.

Auto Suggestions. The Northwestern Chemical Co., Marietta, O. A monthly publication of interest to both the motorist and the dealer. As the name implies, it contains timely suggestions.

Drill Chips. Cleveland Twist Drill Co., Cleveland, O. Illustrates types of drills and has other interesting information.

Chevrolet Review. Chevrolet Motor Co., Detroit, Mich. Monthly publication devoted to interests of company.

The Haynes Pioneer. Haynes Automobile Co., Kokomo, Ind. Monthly house organ.

Duplex Doings. Duplex Truck Co., Lansing, Mich. Issued monthly and deals with the doings of the product of this concern.

The Stewart Lever. Stewart-Warner Speedometer Corp. Ten cents the issue. House organ.

New Departure News. The New Departure Mfg. Co., Bristol, Conn. Issued weekly by and for the employees of this company.

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This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2241 The Delco Circuits, Etc.

From R. A. Perez, California.—As you have all kinds of wiring diagrams, I wish you would look up that for the 1914 Cadillac.

You will see by said diagram that the storage battery is grounded from the positive terminal. What I desire is a complete explanation of said diagram. I will give you my understanding of it and request you to correct me if my understanding is not correct.

(1) The current from a storage battery leaves the positive terminal and returns to the negative.

(2) The storage battery being used for lighting purposes when the engine is not running, it leaves the battery from the positive following the frame, thence through the ground of the various lights, thence the switch at contacts 1, 2 and 3, thence the circuit breaker, thence to negative of battery.

(3) When using the starter the current flows from positive to frame, thence to ground of motor, thence through brush and commutator of motor, thence to negative.

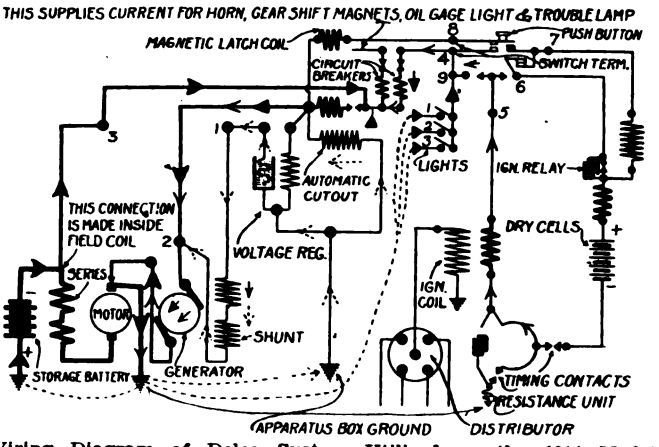
(4) When the engine is started and running under 300 revolutions the current flows from positive to frame, thence through engine case to timer, thence to ignition coil, thence to switch at contact points 5, 9, 4, thence through circuit breaker, thence to negative.

(5) When engine is speeded up above 300 revolutions, the generator comes into play and is used for the ignition and for charging the battery. The current flows (for ignition) from the generator terminal No. 2 to automatic cut-out contact No. 1, coming out through terminal No. 2; thence through circuit breaker, thence through switch on dash at contacts 4, 9, 5; thence through ignition coil, thence through timer, thence to ground, and thence to generator ground and back to generator commutator.

(6) While the above is going on the excess current, when voltage is above 6½, flows from generator terminal No. 2 through shunt, thence to generator terminal No. 1, thence through voltage regulator terminal No. 3, thence through automatic cut-out No. 1, thence to ground, thence to positive of storage, thereby charging same, thence out through negative, thence to terminal No. 3 of generator.

(7) When running the car at night the storage battery furnishes the current for the lamps, thence is flowing from the positive of the storage battery to the frame, etc., but at the same time with the engine going over 300 revolutions the generator is furnishing current from the ignition as above outlined (5), and is also charging the storage as above outlined (6), and is also charging the storage battery as mentioned in (6). Hence, under these conditions, there is a current flowing from the storage battery positive to ground, and a counter current flowing from generator to ground, thence to positive of storage battery. I have never seen the inside of the switch on the dash and am curious to know the mode of making the various closing contacts. Would appreciate a wiring plan of same.

Reply.—Questions 1, 2, 3 and 4 of this system, the Delco, are answered properly. The answers 5, 6 and 7, show you have a good idea of the functions of the parts mentioned, but you have the current going in the opposite direction to the different circuits. The positive generator is connected or grounded to the frame of the car and from this



Wiring Diagram of Delco System Utilized on the 1914 Model Cadillac and Showing the Paths of the Current.

connection, or ground, the current is distributed through the different closed circuits. When the car is run with the lights turned off, the current will travel through the frame of the car to the ground connection of the storage battery, to the ground connection of the ignition and the ground connection of the shunt field and through these circuits back to terminal No. 2 of the motor generator or top of the generator frame. The circuits are shown in the accompanying drawing, the heavy arrows indicating the charging circuit, the light arrows the ignition circuit and the dotted arrows the shunt field circuit. Should the lamps be turned on the circuit through the different lamps will be as shown by the dotted lines. It is assumed that the circuits shown are with the generator generating in excess of the amount of current used in the different circuits. However, should the load be greater than the amount of current generated, the additional current would be supplied from the storage battery. The makers of the system will not supply other than the diagram shown herewith and wiring diagram.

2242 Weights, Gear Ratios, Etc.

From Walter Carrico, Idaho.—I would like to know the weight of the 1916 model Studebaker, four and six-cylinder, also the gear reduction on the low

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and intermediate speed, also at what number of revolutions per minute does the engine produce its maximum power. Please describe in a general way what important changes have been made in the engines since 1915. I expect to buy a six-cylinder Studebaker.

Reply.—The weight of the 1916 model, four-cylinder Studebaker is, according to the maker, 2,770 pounds. That of the six-cylinder car is 2,970 pounds. The transmission gear ratio for the both models when operating on the low speed is 3.64 to 1, and 2 to 1 on the second or intermediate speed. The maximum horsepower of the four-cylinder engine is developed at 1,800 r. p. m.. at which speed the four-cylinder unit develops 40 horsepower and the six-cylinder from 50 to 55. The changes made in the engines between 1915 and 1916 are an increase in bore from 3½ inches to 3⅞, the use of a crankshaft of larger diameter and various refinements.

2243 Would Change Wheels.

Dr. H. W. Saylor, Nebraska.—Please inform me whether or not I could put 30 x 3-inch wheels and tires on my Ford roadster. Would I get more power and possibly less speed? Would it make much difference in tire cost, enough to pay for the change? Would like the proposition discussed.

Reply.—The size wheels and tires can be used. J. F. Shaffmaster answers this question insofar as practicability is concerned. He obtained the desired sizes by trading wheels with another Ford owner; that is, he swapped his rear wheels for the front wheels, thus obtaining the size desired. The change is made by removing the wheels without the hubs from the front of one car and the rear of another. The 30 x 3 are placed on one machine and the 30 x 3½ on the other.

2244 Has Oiling Trouble.

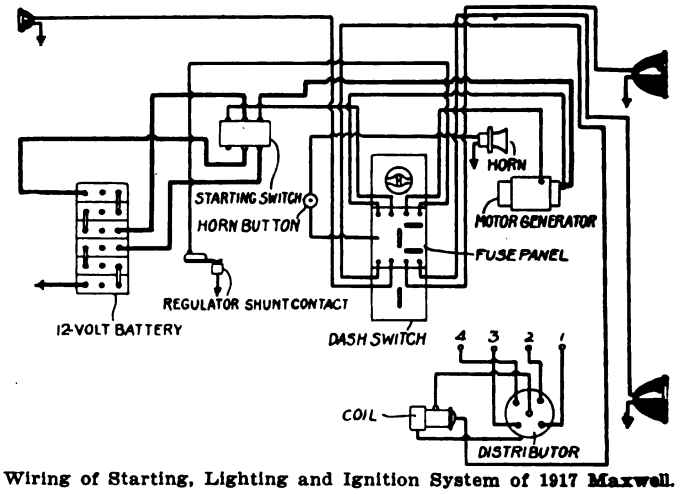
From Charles C. Davis, West Virginia.—1—I have a 490 Chevrolet and am having trouble with the spark plugs. These carbonize and foul with oil. They will not spark without cleaning. Would you advise the use of some form of non-leak rings? 2—Is Johnson's carbon remover good for an engine? 3—Can I have a hand lever emergency brake installed on the car? 4—If I use four-inch tires on the rear wheels will it kill the power? 5—Could the pump or oiling system throw too much oil? The garage man said he could groove and bore holes in the pistons and that it would stop the plugs from fouling.

Reply.—Yes, providing they are properly installed and the cylinder walls are in good condition. 2—Yes. 3—The brake can be installed on all models except the 490. The cost is between $30 and $50, according to the concern doing the work. Every repairman cannot do this work, as it requires a special bracket, etc. The factory service station is best equipped to do this work. 4—Larger tires means increasing the diameter of the driving wheels, and a larger wheel takes more power to revolve it. Oversize tires will slightly decrease the hill-climbing ability of the car. 5—No. The lubrication system is a combined splash and pump. The pump maintains the supply in the troughs into which the connecting rods dip. Decreasing the stroke of the pump will not obtain the result you desire. Your trouble can be remedied or cured by having the repairman cut a groove or drill a hole in the trough so that the height or level of the oil is reduced. About ⅛-inch reduction is generally employed.

2245 Work for the Manufacturer.

From Dewey S. Krohn, Montana.—What can be done with the trip register on a Stewart Speedometer, magnetic type? The trip will show six or eight times as much mileage as the season mileage shows, which is correct. I have been advised to take it up with the manufacturers, but thought it would be too much trouble for a little thing like that. How can the case be taken apart? What care should a Simms-Huff motor generator have? How is the Maxwell 1917 touring car wired?

Reply.—We would advise that you either send the speedometer to the manufacturer or to one of his service stations. The correcting of the trouble mentioned is best left to those familiar with the instrument. Complete instructions for the care of the lighting and starting system mentioned can be obtained from the maker, the Simms Magneto Co., East Orange, N. J., the Maxwell Motor Co., Inc., or the agent of the car. To publish the instructions would require considerable space. The wiring diagram is reproduced herewith.



Wiring of Starting, Lighting and Ignition System of 1917 Maxwell.

2246 Would Increase Compression.

From Amos Barr, Washington.—1—What method should be used to build up on pistons of a Reo 4 motor to increased compression? 2—How much would it be safe to increase compression without causing preignition? 3.—A motor with built up pistons and Never Leak rings will have what advantage in power, speed, flexibility and economy over same type of motor which has had the same service and has not been worked over? The motor in question is a Reo 4, 1914 model, with a 4-inch bore and low compression. I am somewhat of a mechanic, but have never tackled a job of just this kind before.

Reply.—Your questions have largely to do with engineering and designing. Theoretically, an increase in compression pressure will obtain an increase in efficiency, but this is practically true only up to a certain point. The amount of compression that can be used is limited. It is held that it is not practical to construct engines that will operate properly under very high pressures rapidly imposed by explosion. Another objection is that the rise

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in temperature of the mixture resulting from compression may be easily sufficient to explode the mixture before the piston has completed its stroke. This pre-ignition is possible even with low compression if any part of the clearance is not water-jacketed. Lucke states that the compression pressures of from 45 to 95 pounds per square inch are safe as regards the danger of pre-ignition. We would suggest that you take up the matter of changing over your engine with the maker of the car before attempting the innovation suggested. Insofar as the advantages of your proposed alterations are concerned, it is difficult to predict what results you would obtain, because there are several other factors which would have to be considered in increasing your compression. To discuss the subject as it should be would take up considerable space and, as we have previously stated, the information desired is strictly technical and should be obtained from the engineer of the factory making the car.

2247 **A Fuel Saver.**

From William Roberts, New Hampshire.—I have an Overland 83B touring car, and would like to know if the contrivance for letting in more air that is put on the intake manifold is any advantage. One man I know says it saves gas and gives more power. Also would the Wilmo Manifold be an advantage on my car?

Reply.—The use of air drawn in by the suction stroke of the piston and mixed with the mixture is held to obtain greater efficiency from the mixture. The Wilmo manifold has, according to tests made under the auspices of the Automobile Association of America, greatly increased the mileage obtained with a gallon of fuel. This efficiency is due to the heating of the mixture by means of the exhaust gases, thereby obtaining a homogeneous mixture, etc.

2248 **Has Obtained Good Service.**

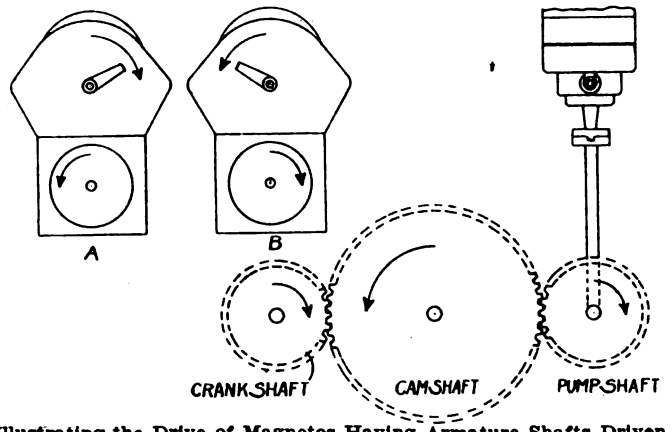
From F. G. Nickerson, Massachusetts.—Would you advise me to do any overhauling and tightening up of the engine of a car that has been driven 11,000 miles, is still running perfectly and has never been adjusted or repaired? Although I have good power, would it not be to my advantage to put in new piston rings for the coming season if I intend to keep the car? On account of these satisfactory conditions and no knocks of any kind, I am inclined to think it is a good idea to let the engine alone.

Reply.—If your car is giving satisfaction, has not lost power, etc., it is not advisable to tamper with it. If, as you say, the engine has been operated over 11,000 miles it might be a good plan to have the carbon removed, the valves reground and the timing checked up. If you are to use the car another season it would not do any harm to go over it and make such adjustments as are required to compensate for wear, renew the supply of lubricants, etc.

2249 **Concerning Magnetos.**

From T. F. King, Tennessee.—We have in our garage an old style Buick and it has a high-tension magneto, a Bosch DU4. This magneto will give a good spark when rotated to the right, but will not spark when rotated left-hand. Now, before I took this magneto off it gave a good spark, and this has got my goat as well as two other mechanics. The engine drives the magneto shaft opposite to that of the crankshaft. If you can help me on this problem I will certainly appreciate it.

Reply.—The Bosch DU4 magneto should have a mark, an arrow, indicating the direction it should be driven at or near the tapered part of the driving shaft. All of these magnetos are designed to run in one direction only; that is, either clockwise (right) or anti-clockwise (left). The direction is determined by viewing the magneto from the driving or shaft end. If the instrument does not give a spark when the armature is rotated to the left, but does when turned to the right, indicates that the magneto is to be driven clockwise. This can be checked by the arrow or mark above referred to. Unless we are mistaken, the car referred to



Illustrating the Drive of Magnetos Having Armature Shafts Driven Clockwise and Anti-Clockwise.

takes the drive for the magneto through the pump shaft. If such be the case and the valves are in the same side as the magneto, you would have a condition obtaining as indicated in the accompanying drawing which shows the crankshaft, camshaft and pumpshaft gears. As may be noted, the crankshaft rotates clockwise. The camshaft turns in the opposite direction, but the pumpshaft rotates in the same direction as does the crankshaft, which is clockwise. The feature confusing to many in installing magnetos is the failure to realize that a magneto driving clockwise will appear to be driven anti-clockwise when viewed from the distributor and breaker box end. The drawing at A shows the distributor and breaker box end. The breaker mechanism, which is secured to and revolves with the armature shaft is, in this case, shown by the arrow to be rotating anti-clockwise. But the armature shaft is being driven clockwise when viewed from the driving end. The sketch at B illustrates a magneto driven anti-clockwise, and the arrow on the breaker box shows that the breaker mechanism is turning to the right. In both cases the distributor rotates in an opposite direction; that is, opposite to the direction of the driving shaft when viewed from the distributor end. As previously pointed out, the Bosch instrument is made to be driven in one direction only.

2250 **Where to Locate Ring.**

From John E. Wood, New York.—In order to prevent excessive consumption of lubricating in my model 4H Lexington, I am considering replacing one

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piston ring in each cylinder with a Gill ring. Will you kindly let me know whether I should place the new ring on the top or the bottom of the piston to obtain the best results? A letter from one of your readers fully explained the results of some experiments along this line several months ago, but I am unable to locate the back number containing it.

Reply.—The majority of manufacturers of rings of this type advise placing the ring at the bottom of the piston when one only is employed. The article referred to was published in the December (1916) issue, page 52. The contributor of the article states that he found by experience that the use of a single ring at the top of the piston did not prevent the oil trouble, that the cylinder continued to flood with lubricant. By placing the ring at the bottom and using another patent ring at the top the oil trouble was cured. Another mechanic found by tests that good results were not obtained by using a single ring and placing it at the bottom of the piston. We would advise that you use at least two new rings, one at the top and the other at the bottom of the piston. It would be even more satisfactory to utilize new rings throughout; that is, a ring for every groove in the piston, three or four as the case may be. As a rule, the use of a single ring only partially solves the problem, and when one has a piston ring out he might as well make a thorough job and use new rings throughout. The extra cost involved is well worth the difference. If this is not done it is advisable to use the rings mentioned at the top and bottom and a new one-piece ring, if desired, in the middle groove. The failure of some motorists to obtain the results desired with patented rings is largely due to trying to make one ring do the work of several.

2251 **Kerosene to Prevent Freezing.**

From Henry Albert, Michigan.—I read your magazine with a great deal of interest and believe the Automobile Dealer and Repairer the best publication for both owner and repairman. I have as yet never had any occasion to consult your Trouble Department as I seem to get a lot of information from the answers you publish for the other fellow. I am driving a Hupmobile, model N touring car, on which there is used a thermo-syphon cooling system. Having had considerable trouble last winter with freezing, I would like to know whether it would be practical in your opinion to drain the water from the radiator and use kerosene instead. I have often heard of kerosene being used successfully, but have always doubted the wisdom of it. I might say that I have used large quantities of alcohol, but it does not seem to make a satisfactory mixture, which I presume is due to the absence of a water pump. I also use a radiator cover. I drive the car all winter and keep it in a cold garage. Kerosene would seem to make an ideal anti-freeze if, indeed, it would not cause any trouble.

Reply.—Kerosene and other oils have been utilized in the cooling system of a motor vehicle, but we do not recommend its use, particularly with the passenger vehicle. Kerosene will affect the rubber tubing, gives off a disagreeable odor and readily soils clothing, etc. If you experience trouble with the alcohol solution, why not try some of the prepared solutions? Several of these have a very high boiling point, do not affect the tubing or evaporate when heated. The subject of anti-freezing solutions was thoroughly discussed in the October number.

2252 **Desires Operating Costs.**

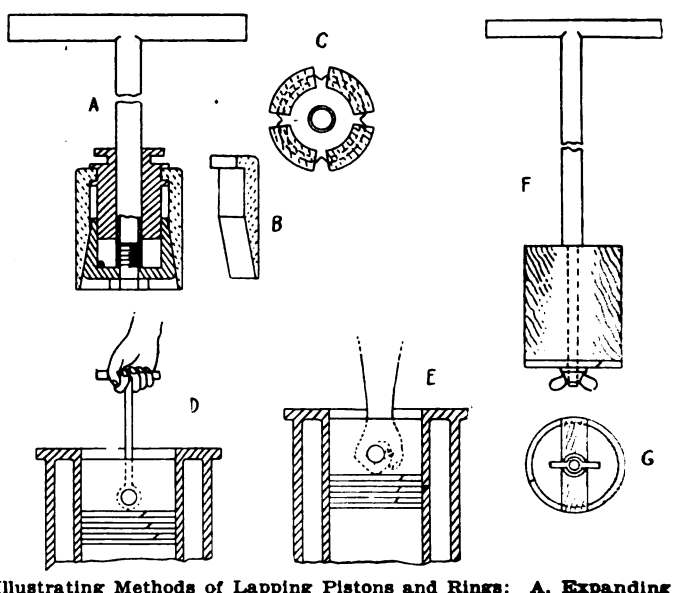
W. E. Baker, Minnesota.—Kindly advise what it costs to run the average 2,500-pound car per mile, including depreciation and interest on investment. What would you consider a fair average charge per mile for livery work? How much per hour?

Reply.—It is not practical to supply cost figures for a 2,500-pound car, for the simple reason one machine may cost considerably more to operate than another of similar capacity; that is, the cost of operation and maintenance may be more or less. Cars vary considerably. Some vehicles will obtain a certain number of miles to a gallon of fuel, while another make of the same weight will average considerably less. Similarly, one car may be harder on tires than another of similar weight, horsepower, capacity, etc. We would suggest that if you have a certain make or makes in consideration, that you investigate the operating costs of these. The agent or manufacturer will supply you with figures which can be checked up. There is no fixed charge for mileage other than in cities or towns having laws to regulate these charges. Prices in sections not regulated by law vary considerably, as does the price per hour. The price to charge can best be determined by local conditions, competition, etc.

2253 **Lapping Pistons and Rings.**

From Charles J. Sparrenberger, New York.—I would like complete information for lapping in pistons and rings. Are they lapped together or is each ring lapped separately and the piston by itself?

Reply.—The method to employ depends on the condition of the cylinder surfaces, rings, pistons, etc. If the cylinder surfaces are in good condition



Illustrating Methods of Lapping Pistons and Rings: A, Expanding Type of Piston; B and C, Lead Quadrant and Sectional View; D, Using Connecting Rod with Piston; E, Using Wristpin for Handle; F and G, Wooden Plug for Retaining Ring.

only the rings need be lapped, the lapping being done to obtain a snug fit with the cylinder walls or surfaces. The process consists of moving the rings up and down in the cylinder and using an abrasive of ground glass and oil or oil and the finest

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of carborundum. When the rings bear all around, the work is completed. To simplify the work, make a plug of yellow pine to fit easily the cylinder and square one end as shown at G. Place the ring on this end and retain it by a batten as shown in the drawing and use a screw to secure the batten. Smear the cylinder walls with the abrasive and operate as previously explained. Lapping should not be continued for a long period on one side. Turn the ring occasionally. After lapping, clean ring with gasoline and fit to the piston groove if a new piston is to be used or even an old one. If the cylinders are scored and are to be lapped, the work is done with an old piston and not the new one. Using the new piston would mean that too much would be likely to be worn away in the process. There are several devices used for lapping. Two of these are shown at D and E, and consist of using the wristpin as a handle, while the sketch E shows how the work is done by hand. An old piston can be used or an expanding design made as shown at A. When the walls of the cylinder are badly scored it is best to use the expanding type of piston. This information relates to the cast iron pistons and not aluminum. The former should be about .001-inch smaller than the bore for each inch of piston diameter, at the top. If aluminum pistons are used the clearance, average, is about .002-inch per inch piston diameter. There is little, if any, lapping required with the patented type of rings unless the cylinder walls be badly scored or out of true.

2254 Dealing With Welding.

From C. R. Thompson, Colorado.—I have a Metz 22 runabout, model 1914. The bearings of the countershaft holding the friction wheel at each end are badly worn and will have to be replaced. Lubrication is by cup grease. The friction wheel has one spoke cracked, also the cavity holding the lock key, a part of the wheel proper. Can the material be welded and will it hold? Do you consider lubrication of these parts by cup grease is sufficient? Can oil be used to an advantage in the grease cups, or would you recommend a different or thinner quality of grease?

Reply.—Welding by the oxy-acetylene process should make the part as strong if not stronger than before the break. Lubrication by the grease cup method is satisfactory, provided the supply is replenished and used according to the instructions of the maker of the car. It is doubtful if you could use an oil in the cups with any degree of success. As to the proper grease to use, would suggest that that recommended by the manufacturer of the car be used.

2255 Gearset Is Noisy.

From L. F. Hardesley, West Virginia.—I have a 1915, model 34 Allen car. It has a grinding noise in the first and second speed. There is no noise when in high. I have installed a new countershaft, main shaft, intermediate gear, bearings, shifting rods and forks, but the noise continues. Can you advise me as to what is the trouble?

Reply.—The fact that the noise is absent when operating in the high or direct speed indicates that the gears of the countershaft and main shaft are not aligned or do not mesh properly. Remove all of the lubricant from the gearcase, clean the gears, and jack up a rear wheel. Start engine, engage the first or the second speed, and let in the clutch. This will enable you to locate the gear or gears at fault by the noise. Examine the mesh of the new second speed gear and the gear with which it meshes on the countershaft. If the last named gear be badly worn its teeth may not mesh smoothly with those of the new gear.

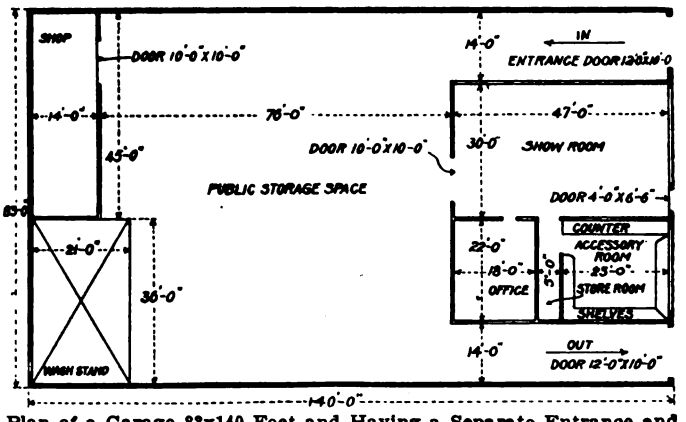
2256 Is Wasting Fuel.

From R. C. Miller, Florida.—Will you kindly help me out of my troubles as you have helped others? I have a model 42 Overland with Bosch magneto and model L Schebler carburetor. Do not use any batteries. The engine starts easy and runs well, but when I close the throttle and throw off the switch the engine rocks two or three times before it stops. As the engine stops it blows back through the carburetor, blowing gasoline clear out of the carburetor and causing a waste of the fuel, about ¼ pint. I had the car repaired by a good mechanic and installed a new carburetor of the same type, but the results are the same. Can you tell me the cause and the remedy?

Reply.—The blowing back through the carburetor is caused by the air displaced by a piston moving upward on the compression stroke, at which time the intake valves should be firmly seated. If the valves do not seat properly or are out of time, there is an opportunity for the compression escaping past the valves and out through the intake manifold and carburetor to the outer air. If the height of the fuel in the float chamber be unduly high an excess amount of gasoline will be swept out by the air.

2257 Desires Garage Plan.

From W. U. Mussina, Pennsylvania.—What information can you give me on the construction of a garage 83 x 140 feet in the center of a block, with



Plan of a Garage 83x140 Feet and Having a Separate Entrance and Exit.

no rear exit to house a showroom, accessory room, shop and public storage? Any points you can give me will be appreciated.

Reply.—The accompanying illustration shows a plan providing a separate entrance and exit and with dimensions.

2258 Fitting a Shaft Pinion.

From Clarence Grosse, Minnesota.—I am having considerable trouble with the differential of a 1915 Maxwell. The trouble appears to be caused by the

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drive shaft pinion working loose on the shaft and a piece the length and depth of the keyhole breaks away and cracks the sleeve, creating more trouble. This has happened six times during the summer. I have used new parts every time and those supplied by the company. How can I adjust this trouble? Can I get and use a heavier shaft to fit this car?

Reply.—The pinion of this car fits on a taper shaft and a Woodruff type of key is used to retain it. In replacing an old pinion with a new one care must be taken to fit it properly. Many times it will be found necessary to use a little fine emery and oil on the shaft and pinion to obtain the fit; that is, grind the parts to enable moving the pinion up on the shaft where it belongs. The key must fit properly. If too high the pinion will ride on it and, carrying all the load, the break will occur as stated. If the key be too loose, the pinion will move on the shaft. The fitting of a pinion requires experience, and if you are not familiar with the work we would suggest that you have it done by either the service station of the company or by an expert familiar with the Maxwell construction.

2259 **Anti-Freezing Solutions.**

B. J. Dodge & Company, Wisconsin.—I have a Dodge touring car, 1915 model. A doctor near here who drives a lot uses kerosene oil in his radiator in cold weather to prevent freezing. Kindly advise merits and demerits of using kerosene oil. Would also ask what can be used successfully to pack smaller cylinder of hand air tire pump—the cap or stuffing screw. Have used candle wicking, but does not seem to hold. Pump is O. K. but for this air hole. Kindly advise practicability of inner liners to old tire casings.

Reply.—The subject of the use of kerosene in the cooling system is discussed in the reply to a similar question in this department. Leather is used for a packing in many pumps. One can be made, using the old member for a pattern, or one secured from any automobile supply house. Duplicate packings can be obtained from the maker of the pump if the supply house does not carry them in stock. Inner liners when properly fitted should make possible obtaining considerable mileage from a worn shoe. The mileage, of course, will depend upon the condition of the casing.

2260 **Would Use Trailer.**

From J. Chauncey, Pennsylvania.—We have a 1916 6-46 seven-passenger touring car. Would it be possible to attach a trailer of any kind to this car? In your judgment, what would be a proper load for the trailer to haul when the car has seven passengers in it; that is, on level macadam and at a speed of 15 or 20 miles per hour? For example, would it be advisable to put seven passengers in the car and then put eight or ten 14-year-old boys in a trailer and take the whole crowd on a ride of 10 or 20 miles on good macadam? I have been a subscriber of your excellent magazine for several years, and I find it interesting and instructive.

Reply.—Trailers are used and hauled by passenger cars and with varying loads. We have no data as to tests or experiments conducted with cars hauling trailers of various capacities and cannot give you other than a general reply to your question. The weight of the trailer loaded with ten boys would have to be taken into consideration, also the effect of starting on the car. If the load be hauled on a good, level road and care exercised in starting the machine, no serious results should be anticipated. With the car loaded to capacity; that is, with seven passengers, it is obvious that any overload will impose stresses upon the mechanism. Care must be taken in attaching the trailer to the car, to avoid the possibility of undesirable strains being imposed on the rear axle, etc.

2261 **Another Piston Question.**

From H. H. High, Kansas.—I have a Ford and wish to fit oversize pistons and prefer not to have the block rebored. I understand that rebored cylinders are not always the same size and a good fit. I have seen mechanics here in the local garages lapping in oversize pistons in new blocks, and they tell me that they sometimes find it necessary to put different size pistons in the same block. The custom here is to cover the oversize piston with valve grinding compound and then push it up and down and around in the cylinder until it would go completely through. I do not like this method, as it seems to me that the grinding compound would wear the piston out of round at the same time it was wearing the cylinder to fit. Could I use a cylinder lap, a lead plug, or an old piston and obtain the desired fit?

Reply.—The subject of lapping in pistons and rings is discussed in the answer to Charles J. Sparranger.

2262 **Estimating Horsepower.**

From W. H. Salzman, Colorado.—Will you please explain how many horsepower can be driven from a 32-volt, 15-ampere generator? I know this is out of the automobile line, but I trust to receive a reply in your next issue.

Reply.—The actual horsepower you would obtain with the generator depends upon its efficiency. This will vary according to the type of unit. The output of the generator is, according to the usual method of figuring, 480 watts. This is obtained by multiplying the volts and amperes, 32 times 15 equals 480. Inasmuch as 746 watts equals a horsepower, the output of the generator will be .64 horsepower, which is obtained by dividing the watts of the generator by 760. With these small units it is doubtful if you would secure much over 50 per cent. efficiency when driving a motor.

2263 **Hard to Start If Warm.**

From J. M. Bigham, North Carolina.—My 1917 Ford is not hard to start when cool, but is very difficult to crank when hot or immediately after a long run. Why?

Reply.—Assuming that the spark is as it should be and the mixture is correct, the failure to start may be ascribed to either the cylinder being flooded, and which could be caused by throwing off the switch and opening the throttle wide and with a rich mixture, or the gaps of the plugs becoming fouled with soot or oil. Try shutting off the throttle and screwing down the needle valve until it closes, after which spin the crankshaft to pump out the cylinders. An examination of the plugs after a run would indicate if the gaps be fouled.

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2264 **Would Use Graphite.**

From O. W. Chamberlin, South Dakota. — I am considering installing a graphite lubricator on my auto and tractor, but have been advised that graphite will heat the engine. Is this true?

Reply.—The proper use of graphite will not injure the parts to be lubricated, nor will it cause heating. Graphite fills the pores of the frictional surfaces and decreases the friction. The Joseph Dixon Crucible Co., Jersey City, N. J., issue an interesting brochure on this subject, and it explains the proper grade of graphite to use for different purposes.

2265 **Is Using Too Much Gas.**

From W. J. Easthurn, New Jersey.—I am having trouble with my 1912 Mitchell, which has a Splitdorf magneto and Stromberg carburetor. The engine runs all right at low speed and at high, but when I desire to accelerate from low to a high speed I have to slip the clutch to let the engine pick up. The engine misses and there is an awful black smoke at the exhaust. It acts as if it loads up. I have put in six new valve guides and tried to adjust the carburetor, but without success. This trouble occurs when running slowly and I pick up the engine, and it occurs no matter how easy I feed the gas. I hope you can advise me what to do.

Reply.—The presence of black smoke indicates the use of too much fuel in proportion to air, or, in other words, you have an excessively rich mixture. Either cut down the supply of fuel or increase the amount of air. Examine the float of the carburetor and note if the level of the fuel is correct. Make sure that the supply of fuel to the float chamber is regular and that the flow is not restricted.

2266 **Has Hissing Sound.**

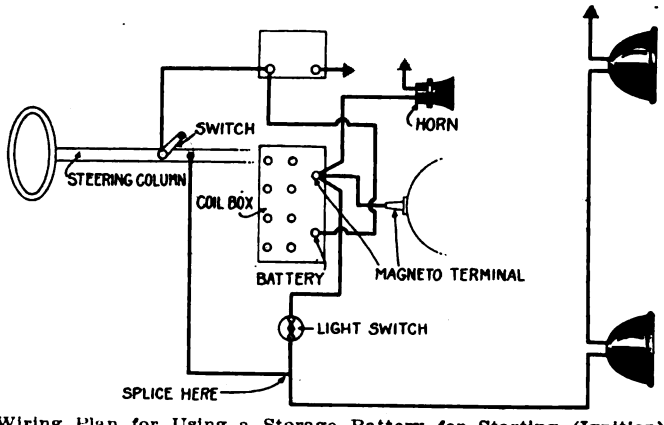
From E. P. Bossard, Canada.—I have a new Dodge car, 1917, which I have run only 750 miles. There is a hissing sound which appears to come from one of the cylinders. The leak seems to be down into the crankcase, and can be heard through the breather pipe. What would cause this, and what is the easiest way to fixe it up?

Reply.—Your trouble is undoubtedly due to leakage past the rings. A simple test for this trouble, which allows the gases to escape into the crankcase, is to crank the engine slowly by hand with the switch off and when the engine is hot. If any leaks exist they will be indicated by a mist-like vapor escaping from the breather. The remedy is to examine the cylinder and locate the exact cause of the trouble. The compression of the cylinder can be tested by using a compression gauge.

2267 **Battery Lighting for Ford.**

From J. R. Fowler, Arizona.—Can I put a small storage battery on my Model T 1916 Ford and use it for lights, also for starting in cold weather? Could I put a switch on the steering column and switch the lights onto the magneto for ordinary speeds and good roads when the magneto light is sufficient?

Reply. — The accompanying diagram shows a method of wiring for making use of the battery current for starting and lighting. One lead from the battery is grounded and the other is led to the coil terminal marked "Battery." For lighting, a wire is carried from the battery to the switch on the steering column, thence to a point between the headlights and regular lighting switch. The splice



Wiring Plan for Using a Storage Battery for Starting (Ignition) and Lighting.

should be soldered and carefully taped, as the system is of the grounded type. It will be essential to use bulbs of the same voltage as the battery.

2268 **Bearing Adjustment.**

From J. M. McKenzie, Nova Scotia.—I wish information as to the best way to take up the wear in the rear bearing or crankshaft of a 1916 Maxwell. I wrote the Maxwell Co. and they said it was a simple matter; just remove the shim, that it could be done through the oil part hole at the bottom of the engine. I tried it and could not get the blearing clamp screws out more than half way. Please advise as to what I will require to take up the bearing and without taking out the crankshaft, etc. I am a long way from a garage and have to make my own repairs.

Reply.—With this model Maxwell you will have to practically take the engine down to get at the bearings mentioned. This means that the engine will have to come out of the frame, the block removed, etc. There is no other way to remedy the bearing trouble. Inasmuch as you will have to disassemble the engine it will afford you an opportunity to give the power plant a thorough overhaul.

2269 **Recharging Ford Magnets.**

From Ernest Anderson, Kansas.—I saw in a copy of your magazine some time ago, directions for recharging a Ford magneto without removing the engine. I have been unable to find it again. Will you please write and let me know how to do it? I have a 32-volt storage battery of 16 cells. Please let me know full particulars.

Reply.—The article referred to was published in the January (1917) issue. Owing to the fact that the instructions occupied over two pages, lack of space prevents their reproduction. A copy of the issue has been mailed you.

Ed. Note.—While it is our policy to supply information to our readers, it is not always possible to reprint lengthy articles owing to the lack of space. Whenever back copies of the article are available, they will be mailed. This does not mean that it will always be possible to supply back copies, and subscribers should not take it for granted that back issues are available.

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2270 A Case of Compression.

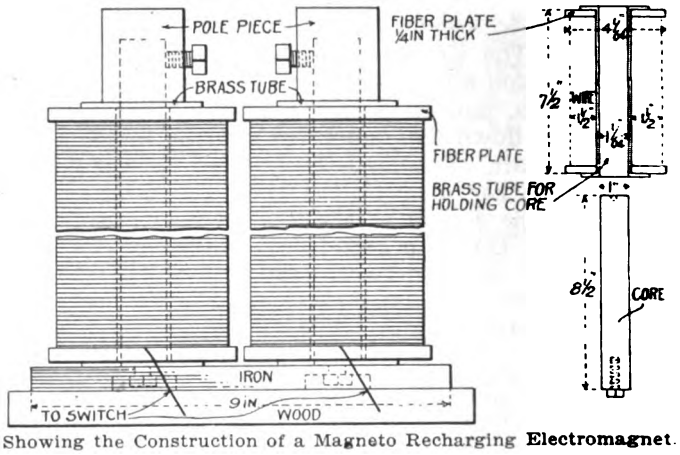
From E. F. Rider, Montana.—I have a 1913 Buick, model 25, and have had trouble with the No. 4 cylinder for three years. After the engine warms up it will run on four cylinders at any speed from six miles to 20 miles an hour on the high on a level road. But when you open up the throttle to make a grade the No. 4 cylinder will miss from six to twelve explosions, then pick up and run all right. The remaining cylinders run perfectly. Have changed the carburetor adjustment, but it makes no improvement. Have removed carbon, overhauled engine, fitted non-leak rings, put in a new switch, spark plugs, but without improvement. Compression is good, as are gaskets. Spark seems to be all right. Clearance between valve stems and tappets the same on all cylinders.

Reply.—If the components of the engine are in a properly working condition and the trouble is confined to one cylinder, and the missing occurs only when you accelerate suddenly, your trouble is probably due to too wide a gap of the spark plug in that cylinder. If the gap be too wide, misfiring will occur when the throttle is opened suddenly, particularly after running slowly. The acceleration admits a large amount of mixture and increases or raises the compression point, the resistance increasing with the pressure. Try a smaller gap with the plug and note results. If this fails to cure the trouble, examine carefully the wire leading from the source of current supply to the spark plug, the high-tension cable. This may leak current, a small leak, perhaps, and one that causes the intensified current to take the path of least resistance. As the compression increases, so does the resistance above referred to. Consequently a greater pressure of current is essential to overcome this resistance and that of the gap of the plug.

2271 Nearly One Dozen Questions.

From F. G. Elfring, Illinois.—I have a model 24 Oakland Roadster. 1—Is it practical to connect the auxiliary air intake to the exhaust on a model L Schebler? 2—Would it mean greater efficiency? 3—This roadster has exceptional getaway, which some of the latest cars haven't got. Is this due to the carburetor, same being oversize? I think it is a 1⅜-inch. 4—Could I put on a smaller size carburetor and still secure the same results? 5—Is it possible to put cork inserts in any type of multiple disc clutch? 6—Will a magneto lose its magnetism through age, although never used? 7—How can I remagnetize a low-tension magneto? 8—Can a two-wire and a grounded system be used on an auto at the same time? 9—I have a round Splitdorf coil, the terminals are marked D D 3. Could I connect this coil to a model D Remy Mag.? 10—How often should piston rings be replaced in an engine that has had perfect care? 11—Would underslinging of full eliptic springs tend to make riding qualities easier?

Reply.—1—Utilizing the heat of the exhaust would be beneficial, as the fuel will be more thoroughly vaporized and the mixture made more homogeneous. 2—Yes. 3—Probably. 4—It is doubtful. 5—Cork inserts would not be practical with every type of disc clutch. The clutch would have to be designed for their use. 6—No. Unless the magnets be removed or injured their magnetism will not be affected by age when not in service. 7—An accompanying illustration shows the construction of a magneto recharging electromagnet. If not made correctly the results will be very unsatisfactory. It is for service with a 110-volt direct current lighting circuit. If an alternating current be employed a rectifier must be used between the circuit and the coils. Inasmuch as the dimensions of the components are given, these will not require discussion. The core is of soft iron and two are used. Both are drilled at the bottom for a retaining screw which is employed to keep them in firm contact with the base plate, which is of steel 4½ x 9 inches. Two blocks of steel 1¾ x 2 x 4 inches are drilled to take the cores, and set screws are used in the side to permit of clamping them tightly against the core to form pole pieces. The brass tube should be about 1/16-inch thick at the side, and has flanges at each end, these projecting over to retain insulating plates. The hole through the center of the brass member should be such as to permit the core to fit freely. Twenty-two pounds of No. 20 B. & S. gauge insulated copper wire is needed, 11 pounds being wound around each brass tube, winding one coil in one direction



Showing the Construction of a Magneto Recharging **Electromagnet**.

and the other in the opposite way. Five or six inches should be allowed for connections before starting the winding. After winding the coils, shellac them thoroughly and wind with tape. Attach the cores to the base plate, slip the coils over the cores and attach the pole pieces, using the set screws as previously mentioned. In charging, the magnet is placed on the top of the pole pieces, the north pole of the magnet to be charged being placed on the south pole of the core of the electromagnet and the south pole of the magnet on the core of the north pole of the electromagnet. The polarity can be determined by making use of the fact that poles alike repel each other and unlike attract each other. The period for closing the switch of the circuit is about five seconds, and three periods are required. The time required to charge the magnets varies from 30 to 60 seconds. Vibration should be set up in each magnet during the charging period, and this is secured by tapping each magnet lightly on each side near the top. Two hammers of not over six ounces each are used. After completing the final period remove the magnet and place a bar or keeper across the open end. 8—A one and two-wire system cannot be used for the one lighting and starting system. 9—Would not advise connecting the coil

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of one make of a magneto with another type of magneto, for the reason the winding is very likely to be different; that is, the Splitdorf coil is wound particularly for the Splitdorf magneto. We do not say that such a connection cannot be made, but advise taking the matter up with the maker of the Remy magneto. 10—This would depend on the condition of the cylinders, piston and old rings. Rings should be replaced when needed, and this is determined by conditions. 11—Locating the spring as mentioned would obtain a lower center of gravity. It is doubtful if it would.

2272 **Installing Spotlight.**

From W. T. Widup, Indiana. — Through your valued publication I found a searchlight to suit me, the Howe. I should like you to tell me the most practical way of wiring same to the electrical system of a Haynes 34, light six, 1916. I do all of my adjusting and repairing, but am not quite up on the wiring.

Reply.—To connect a spotlight in the lighting system of the Haynes model 34 observe the following directions. An indicating circuit breaker is used on this model, the indicating target being plainly mounted on the cowl board. The lighting switch is also inserted in the face of the indicating breaker. By removing the four screws which hold this face to the cowl, the circuit breaker and light switch may be easily removed. The two wires leading from the spotlight should be connected to the two lower connections of the circuit breaker. These are marked by the letter B, which stands for battery, and also are marked with the polarity symbols of the battery. A sketch is not provided because the information contained herein should be ample for the work.

2273 **Another Case of Smoking.**

From William Brown, Paterson, New Jersey.—I have a 1914 Baby Grand Chevrolet. How can the oiling system be regulated so it won't fill the dippers in crankcase too full? It has an oil sight feed, double pipes with a screw cock halfway between the engine and the sight feed glass on the dash. The engine smokes with but one quart of oil in the crankcase.

Reply.—The ends of the rods dip into the lubricant in troughs. Reduce the height of the oil in the troughs as explained elsewhere in this department.

2274 **Several Electrical Problems.**

From Wakeman's Garage, Indiana.—Please answer the following questions: 1—What about the installation of a Ford magneto that will make the lights flicker? 2—What would be the result of placing the magneto coil assembly a few thousandths closer on one side than on the other? 3—What would be the result of not placing the magneto pole ends in a perfect circle? 4—Would any of the above cause hard starting? 5—What would be the result of a weak commutator spring?

Reply.—1—Flickering of the headlights usually is taken as an indication of loose connections in the lighting circuit. In such case the wiring should be gone over very carefully and the connections and lamp sockets inspected, also the connections to the switch. 2—The distance between the magnet clamps and the magneto coil spools should be 1/32-inch for mechanical reasons. If the gap were to be increased so that the distance between the magnets and the coil spools would be over 1/32 inch, then the result would be a decrease in the total current output and a loss in efficiency. 3—The third question is not entirely clear to us. If you refer to the result of placing the coil assembly so that it would not be concentric with the magnets on the flywheel, it would be impossible to get them far enough away to impair the efficiency of the magneto inasmuch as the contact area is more than sufficient to allow for the ⅛-inch difference. 5—None of the conditions raised in your question would cause difficult starting. 6—The weak commutator spring would cause missing of the engine, particularly at high speeds. The trouble would be aggravated if the contact blocks and fibre ring are worn and irregular.

2275 **Coal Oil in Radiator.**

From J. R. Cooper, Kansas.—Is it advisable to use coal oil in the cooling system of an Overland car for winter use? What is the danger of fire? Is it advisable to thin the lubricating oil for the crankcase?

Reply.—Relative to the use of kerosene in the cooling system, we do not advise its use. There is no danger of fire if used properly. Relative to thinning the cylinder oil with kerosene, would advise that you use a lubricant recommended by the car maker for winter service. Practically every oil refiner issues information dealing with the proper grade of oil to use during the winter.

2276 **Would Remove the Battery.**

From Subscriber, New Hampshire.—I would like to have you advise me if it is practical to remove the battery from my 1912 Cadillac and run the car without it. The starting and lighting system is a Delco.

Reply.—The car can be operated without the battery provided you take steps to prevent generation of the current by the dynamo. Either disconnect the drive of the generator or motor-generator, or remove the unit. The maker of the system does not recommend running the car with the battery disconnected or removed, as serious damage to the system may result.

2277 **Theory of the Spark.**

From George W. Smith, Connecticut.—I have been told that a retarded spark helps the engine in hill climbing, but I cannot grasp the theory of it. I should think it would be just the other way. It is the process inside of the cylinder that puzzles me in this regard. I own and drive a seven-passenger Cole 8, 1915 model. I am rather inexperienced in driving. The car negotiates hills easily and rarely ever requires a shift from high to second. When climbing a stiff hill on the high gear and the car begins to slow down a little (the fullest flow of gasoline being applied) and I do not feel the necessity of shifting gears; does the retarding of the spark assist the engine? If so, please explain why. And how far is it safe to throw back the spark lever? In ordinary driving, uphill and down, I carry the spark lever advanced fully four-fifths along the

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quadrant. Should the retardation of the spark be gradual in such case? Or is there any mechanical error in correct driving in throwing it back suddenly? My spark lever is never at zero. Is advanced one-third even in starting.

Reply.—The function of the spark lever on a motor car is to afford the operator manual control of the time of the spark; that is, to advance or retard the time of the spark in order to compensate for the various engine and piston speeds. The device regulating or timing the spark is so set that with the spark lever fully retarded the spark will occur in the combustion chamber of the cylinder when the piston has completed the compression stroke and is at the top of the cylinder. The setting is not always exactly dead center. It may be slightly before or slightly after, it depending on the timing. Theoretically, the spark is supposed to occur when the charge is fully compressed and the piston approximately at top dead center, but in practice it occurs earlier through advancing of the spark lever, and this advance, as it is called, is necessary to permit the flame created by the spark to spread through the compressed mixture. In other words, an allowance is made for expansion of the gases. Assuming that it requires 1/240 of a second for the flame to spread through the mixture, etc., and the piston is traveling at 1,500 feet the minute. At this rate the piston would have completed a part of its stroke (downward or firing) before the gases expanded sufficiently to exert a pressure on the piston. Consequently, if the spark is not advanced or started earlier, there would be a loss in energy. At slow engine speeds the advance is slight, increasing as the speed of the engine increases. So it will be seen that the advance or retard of the spark causes the spark to occur earlier or later. The spark should be advanced according to the speed of the engine, and no definite rule can be given for the amount of advance. The proper amount is best determined by the operator and by the way the engine pulls. When the spark is advanced too much it is usually indicated by a knock. It is best to gradually retard and advance the spark. The slowing down on the grade as mentioned is due to the load imposed on the engine. The retarding of the spark will not increase the speed or power.

Shifts Ford Wheels.

From J. F. Shaffmaster, Michigan.—Note your answer to No. 2213 regarding inquiry as to use of 3-inch tires on rear wheels of Ford. My experience proves to my entire satisfaction that 3-inch tires on Ford rear wheels are O. K., provided they fit the rims. I traded my rear wheels for a neighbor's front wheels nearly two years ago, and find that a good make of 3-inch tire lasts me just as long as 3½-inch tire on the old wheels. They also last much longer when driving in frozen ruts.

An Efficient Fan Belt.

From C. W. Risden, California.—I was especially interested in the article entitled "Automobile Engine Cooling," as I have experienced considerable trouble in making my fan satisfactory. I use a Stevens-Duryea, 1915 model, and although it has fan pulleys of large size (about 5 x 8 inches) using a flat belt 1¼ inches wide and about 30 inches long, I could not make a belt last but for a short time, which was probably due to a certain extent to the amount of throttle I had open when starting the car, and which was made necessary by the condition I found my generator in. However, my belts would either come unstitched or break, even though we tried different kinds of oil, so in desperation I concluded to try something else. I applied four lengths of 5/16-inch round belting, fastening the ends with a link, as is customary with round belting, my theory being that perhaps the broad flat belt retained the heat, also collected more foreign matter than was necessary. It also required sticking and stitching, both of which caused me considerable trouble, and as I ride without a pan, if the belt should break I would lose it, which would mean a loss of about $3.00 and I would be entirely without the use of my fan until I could obtain another belt. Whereas with a round belt the heat is eliminated much better, foreign matter is not collected, and the belt does not stretch on one side more than on the other; the round belting is applied easier and if breaking should occur it would be only a matter of about 35 cents per belt, and you would still have the remaining ones to operate the fan and hold it in position, allowing the missing one to be replaced when convenient. It also has the advantage of allowing you to use different kinds of round belting and to determine the lasting value of each. Last but not least, if the belt should get tangled up in any of the machinery, it would create less damage than one of full width. Although I have not used the round belt as long as a flat belt usually lasts, I am satisfied that they are much superior, and as I am keeping track, should you care to know how they work out, I shall be very glad to advise you. I very much appreciate the very many valuable points I obtain from your journal.

Show Increase in Electric Motors.

According to statistics of the electrical industry there were produced 11,880 electric motors for automobile use in 1914, a total strength of 36,858 horsepower. Inasmuch as the figures for motors for automobile use are not classified, it is not possible to determine how many of these reported were for driving purposes and how many for starting and lighting.

The smaller number compared with the evidently much larger number of cars equipped with electrical motors for starting purposes leads to the conclusion that it is primarily the total of driving motors for electric automobiles. These 11,880 motors were produced by ten establishments, and compare with 2,796, of 12,471 horsepower, of 1909.

High Cost of Leather.

Leather, like every commodity, has advanced in price and is one of the factors responsible for the H. C. of L. An interesting bit of information on the subject of leather is supplied by the maker of fabrikoid, the Du Pont Fabrikoid Co. The little band of leather, the sweatband of the hat, uses up 44,270,833 square feet of material every year or a total of 55,000,000 feet when an allowance for waste is made. These figures are based on the estimate that there were made in this country in 1916 10,624,406 dozens of hats and caps requiring 265,625,000 feet of leather two inches wide and 25 long. This material would make the tops of 20,000,000 pairs of shoes.

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Praises Trouble Department.

From D. C. Bays, Colorado.—I thought I would give H. W. Slawson and others my experience with fouled spark plugs. The first of August, 1916, I bought a Ford runabout and could not get over 10 miles without cleaning the spark plugs. I took it back to the dealer several times to see what could be done, and he kept wanting me to try it a while longer to see if it would not get over the trouble by usage. He put in center fire spark plugs, which helped some. After the car had been run about 1,000 miles they took the pistons out and filed off the upper edge of the rings, making them round, leaving the lower edges sharp under the theory that the lower edges would scrape the oil back while the upper edges could not scrape it up into the combustion chamber. It has since given good satisfaction. Afterwards I replaced the upper ring on each piston with a leak-proof ring and now I often drive the car 3,000 miles or more without taking out the spark plugs. I am sending the above to you to print if you think it will be of any benefit to the many readers of your magazine. One item alone is often worth the subscription price of your magazine.

Explains Puzzling Knock.

From R. H. Reed, North Dakota.—I believe I can give C. T. Pierce of Virginia, inquirer No. 2227, some light on his Ford trouble. Have had some few cars in my shop with the very same trouble, and invariably have found it in the crankshaft. The shaft is either out of true or it is loose in one of the three bearings, a trouble not easily detected by just the feel of things. By removing the shaft and placing it in a lathe one can soon locate a bent shaft. If such is the case a new shaft will be necessary. But before replacing new shaft remove babbitt from center bearing complete. Now fit up end bearings to just a nice snug fit then rebabbitt center bearing and you have a good job.

NEW TYPE OF CORD TIRE.

The Carlisle Uses Large Diameter Cords Separated by Mass of Rubber.

A new type of cord pneumatic tire, one presenting many interesting and novel features, has been brought out by the Carlisle Cord Tire Co., New York City. It is the result of the efforts of F. B. Carlisle, and differs radically from other constructions in that the carcass is constructed from single unbroken strands of large diameter cotton cord having a tensile strength of 235 pounds.

One of the several interesting features of the tire is that there are but two plies of cord, and at no point in the construction do these cords touch another. They are separated and surrounded by a thick mass of rubber. This, the maker points out, eliminates almost all internal friction, obtaining a cool tire under the severest kind of service. It is further stated that the construction, which is patented, is so made by the special machines that the cord has perfectly even tension at every point.

Held to Eliminate Friction.

The makers point out that shocks are evenly distributed around the circumference of the tire, that friction between the cords is avoided, and that driving with the shoe deflated will not cause separation of the cord, rubber or tread. One of the advantages emphasized of the Carlisle tire is that it may be retreaded easily and with the ordinary tire



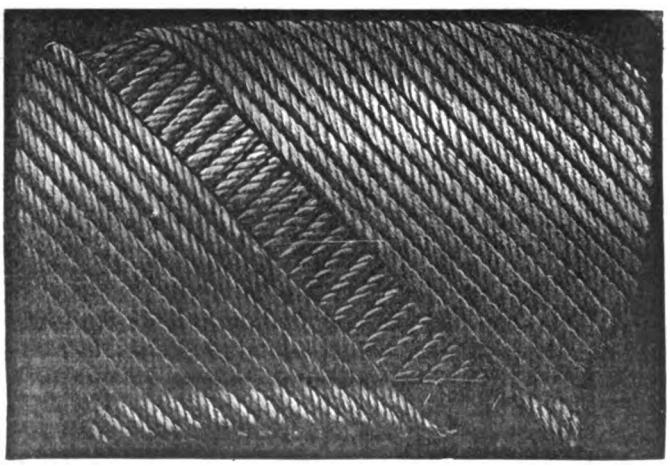
The Carlisle Cord Tire. Note How Each Cord Is Surrounded by Rubber and Separated, a Construction Eliminating Friction.

repair shop equipment; in fact, the company advocates retreading.

The company has erected a large factory at Andover, Mass., and is producing the tire in standard sizes and styles. The Carlisle tire is made in straight side, clincher and quick detachable without variations and accommodates the several styles of rim sections. It is marketed in a non-skid form, termed the Lightning, so-called because the two angular depressions running around the tire closely resemble a streak of forked lightning. It is said to afford the maximum of anti-skid efficiency, combining the grip of the angular rubber channel, the non-side-skid vacuum and the smooth running qualities of the plain tread. Protuberances are noticeable by their absence.

Officials Well Known.

The officers of the company include men well and favorably known in the automobile industry. J. S. Bretz is president; F. B. Carlisle, vice-president; Frank Williams, treasurer, and Frank R. Serles, secretary. Charles A. Gilbert, well known on the Pacific coast and in the tire industry, is general sales manager. The offices of the company are at 250 West 54th street, New York City.



Showing the Large Diameter Cords Used in the Construction of the Carlisle Tire.

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REPAIRING FORD RADIUS RODS.

From James Baldwin, Indiana.—I am supplying sketches showing how I make repairs on the Ford radius rods, the brazed type. These can be determined by the center punch mark on the side near

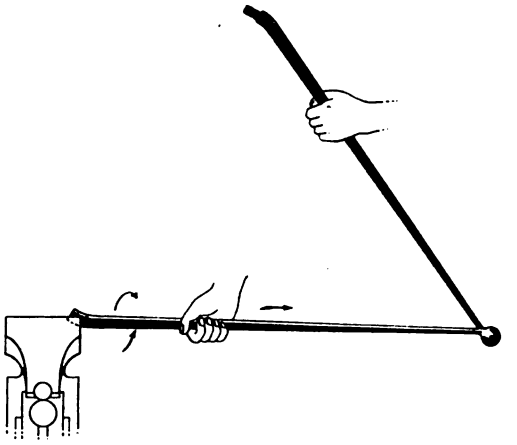


Fig. 1—Illustrating How James Baldwin Disassembles Ford Radius Rod by Heating and the Vise.

the shoulder of the end, and many times the brazing marks can be easily seen. This type of radius rod on the Ford is not provided with a pin to hold the rod or parts together securely, although some imagine that the rods are pinned.

Unbrazing the Work.

It is assumed that the end has been broken and must be repaired. Heat the end hot enough to separate the parts or to unbraze them. This is accomplished by heating the end red hot. Next place the end in the vise as shown at Fig. 1, and by a twisting and pulling movement the parts will separate. Do not suddenly cool the extracted end, as it is steel and you will want to use it again. Of course, if the end cannot be removed it will be necessary to get one from some discarded radius rod. It may be that the part will be so secured that the brazing cannot be started.

Repairing Modern Rods.

Fig. 2 illustrates a method of repairing the Ford radius rod now on the market, the type having the welded ends. Obtain a discarded radius rod of the same make which can be ascertained by the size and in which the punch marks are missing. Saw or cut off 5½ inches from the fork. Measure the

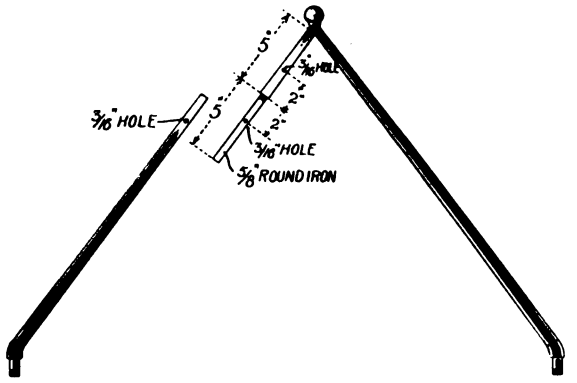


Fig. 2—A Method of Repairing Modern Type of Ford Radius Rod by Using Round Iron, Drilling and Riveting.

end of the extra rod with which the repair is to be made and make sure the ends line up before riveting. Be sure that both ends of the forks are exactly the same length. This is important.

Next take a piece of round iron of the same inside diameter as the tubing and drive it in to a depth of two inches. Drill a 3/16-inch hole and rivet firmly. The other part or free rod is now driven over the round iron, the hole drilled and the parts riveted. This will hold securely and makes a good job.

Make a Shrink Fit.

Fig. 3 shows the method of inserting and driving the parts together, also the dimensions of the rod, holes, etc. Before driving the rod in the tube the latter should be heated red hot and placed in the vise. The heating causes the tube to expand, and when the metal cools the walls of the tube will grip the rod securely. It is suggested the end be beveled slightly; that is, the part fitting the tube. This allows it to clear much better. The holes in tubing should be countersunk.

Automobile Mechanics Wanted.

The government has issued an appeal for volunteers for the Gas and Flame Service Regiment. The appeal is made to men between the ages of 18 and 40 years. All men between the ages of 21 and 31 years who have not been called in the draft are eligible. The men specially needed are analytical, research and manufacturing chemists, powdermen, men experienced in the production of gas, machinists, automobile repair men, men who can operate

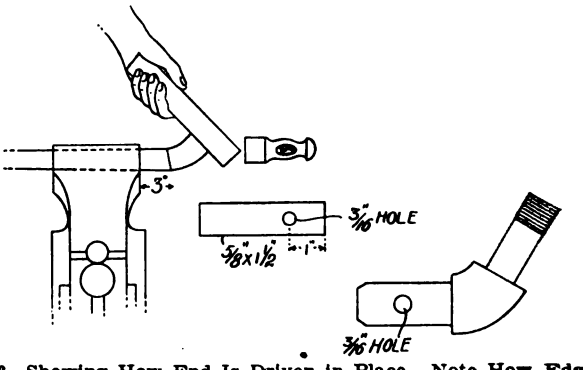


Fig. 3—Showing How End Is Driven in Place. Note How Edge of End is Beveled.

or repair gas or steam engines, pipe fitters, electricians, designers, interpreters, carpenters, blacksmiths, plumbers, boilermakers, and chauffeurs.

All men must first enlist as privates, the rate of pay being $33 per month and all expenses. Men with necessary experience may be assigned to special duties, which will carry increased pay ranging from $40.20 to $96 per month. Colonel A. A. Fries, Corps of Engineers, who is now in France, will command the Thirtieth Engineers. Any army recruiting office will furnish the necessary information to men who desire to volunteer for the Gas and Flame Service.

Home-Made Fuel Funnel.

The disadvantages of using unstrained gasoline are well known and many owners will not allow the fuel tanks to be replenished at a garage utilizing a funnel fitted with metal screen or filter. Such a funnel is practical, however, provided the screen is fine enough and is no coarser than 120 mesh, as water and sediment will not pass through it. A home-made funnel for the garage can be easily made by soldering a section of 120-mesh screen in the bottom of the funnel.

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COLLECTING THE MONEY.

Suggestions for Extending Credits, Obtaining Ratings and Form Letters.

BY FRANK FARRINGTON.

In hundreds of calls upon retail dealers throughout the country my question, "What one thing about the management of your business causes you more trouble than anything else?" has been almost uniformly met with the reply, "Credits; collecting what folks owe us."

Practically all merchants who have trouble with the credit side of their business find its source in the difficulty they have in getting the money people owe them. It is necessary to see that the "poor pay" people do not get in too deep, that they pay up promptly, and that folks with plenty of money pay promptly too. There is no profit in any sale until the money is in the cash register.

Losses and Poor Accounts.

It is all right to seek relief from losses on poor accounts by doing a cash business, but there will always be people who cannot pay spot cash and are willing to pay something extra for the privilege of taking more or less time on the account. Without doubt people will buy more freely for credit and the ideal way to make the business big and successful is not the spot cash way. Rather it is through the use of a limited credit with prompt collections.

The smaller a bill, the easier it is paid. As somebody has put it, "A short horse is soon curried." When a bill gets to where it is out of proportion to the customer's pay check, then it begins to drag, and the dragging bill does not wear itself out in the dragging, though it may wear out the dealer's patience.

Value of Time Limit.

By fixing an absolute time limit on all accounts, declining to allow anyone to continue to buy on credit when the bill has not been taken care of within that limit, say, 30 or 60 days, nobody can get in debt to you for more than the purchases of that period. This short-term credit plan is the best way of handling the credit business. It reveals people before their accounts get too large, and those to whom longer credit may desirably be extended can be taken care of by having them clean up the old account by giving a note or a due bill, with or without interest.

The big thing is to get everybody to come around at least once a month and agree about the account and its immediate or its future payment. When you get in touch with a credit customer once a month and discuss with him the account he is running, your chance of loss is reduced.

When a man starts an account it is up to the dealer to know his financial standing and something about his income, also his past reputation for paying promptly. This is where a credit bureau established by some such local organization as the chamber of commerce is good.

Record of Credits.

Such a credit bureau keeps a record of those who ask for credit. The members can get this information at any time and each member may keep a card index with a card for each customer, going to headquarters for information with which to start a card about any new applicant, and passing on to headquarters any new information coming to hand or developing in experience with the family.

These credit bureaus may also act as collection agencies, and since they represent most of the stores in town, for a man to refuse to honor his account with one member may result in credit being refused him by all the members. In fact, the threat of turning the account over to the credit bureau will rarely fail to bring in the delinquent debtor to take up the question of payment in some manner.

One such organization sends out notices to all the people in town when starting its credit bureau and these notices are letters stating that such a central source of information about credit ratings is being established and it is requested that the recipient make a statement to the bureau of his reasons for claiming he is entitled to credit. This gives the bureau a standing with the public at once and makes it apparent that it wants to play fair with everybody.

The First Letter.

The first letter this association sends to the man whose account is placed with it for collection is very friendly and takes the position that there is some misunderstanding and asks him to go and see his creditor and get the matter adjusted. Further notes are more pointed and the final notice states that in so many days the organization's attorney will take action.

But not every community has a credit bureau and some men prefer to work independently, anyway. For such, personal calls and personal letters are the best collecting mediums. It is the personal touch that saves the account. If you can go and see a man and each time get either a little payment or a promise of payment on a certain date, and if you go to see him on that date, this method will produce results.

In the first place, when a man starts an account, there should be no delay in sending him a bill the first of the month following. If he starts the account the middle of the month, send out your monthly statement just the same on the first of the month. Get him accustomed to that monthly bill. Show him you believe that "short credits make long friends." If he is the type of man who cannot endure having his bill presented promptly, he is probably the type from whom you will collect only with difficulty and perhaps his trade is not worth the trouble.

Be Frank With Customer.

If you expect accounts to be settled monthly, explain that fact at first when the account is started. Don't leave anything to be taken for granted, and see that your employees understand that no new account is to be opened without an explanation that there is to be a monthly settlement. Whatever the conditions under which you are to collect, make those conditions plain right at the start and you will save a lot of trouble.

Whether you have a time limit on accounts or not, send out bills promptly and follow them with regular monthly statements. Perhaps the larger part of your customers receive their pay at some other time than the first of the month. Adjust statement day to pay day.

The first bill or two needs no comment perhaps unless it be a printed or stamped heading to the

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effect that accounts are payable monthly. After it becomes evident that the debtor is not going to take care of the bill properly, then comes the opportunity to write collection letters and this is where the merchant may show his ingenuity or his knowledge of human nature. Better than any form letter is one written especially for the purpose in mind, adapted to fit the individual instance. The letters given below are suggestive of the line of attack to be followed:

FIRST LETTER.

Dear Sir.—You will be interested in knowing just how much your account with us is at the present time.

It is against our policy to allow anyone to run an account more than 60 days, but possibly we have neglected to tell you about this.

We are sending this bill because it is now due and because we feel it unfair to extend greater favor to one customer than to others.

May we have your check in a day or two?

Cordially yours,

SECOND LETTER.

Dear Sir.—The high cost of living hits us two.

We cannot afford to extend credit in the old-fashioned way. Goods cost us much more and we have to pay for them in less time.

In order to do business without increasing prices unnecessarily, we must ask prompt settlements from our customers.

We are sure you will see the justice of this and remit promptly for the enclosed bill.

Cordially yours,

Perhaps you do not want to start in as mildly as this with the creditor you have in mind. Then you can begin with letter number three where it begins to put the screws on a little.

THIRD LETTER.

Dear Mr. Haskins.—You surely must have received our bill with a request for an early settlement.

Perhaps you are unable to settle the account in full and for that reason have not called or sent a check.

It is important to us that we get the matter adjusted in some way, so we are going to ask you to call and make a payment on the account or arrange for taking care of it later.

Of course you realize that a business man cannot neglect such a request for attention to a debt without affecting his credit.

Let us get together on this right away and have a friendly adjustment of the manner of settlement.

Cordially yours,

FOURTH LETTER.

Dear Mr. Haskins.—You still owe us $43.

If we did not know you for an honest man, it would certainly seem very strange that you have paid no attention whatever to our requests for a settlement.

Is there some mistake in the account? Are you unable to pay the bill now? Have you been unfairly treated at any time by us?

Whatever the reason for paying no attention to our requests for a settlement, please come in or write us about it and let us get together on the matter.

We cannot let the account run on indefinitely and we believe you will admit that you have had more time now than we ought to have to give our trade.

Don't postpone action in this matter. You really cannot afford to do so.

Yours very truly,

FIFTH LETTER.

Dear Sir.—It is costing us 6 per cent. to carry your account.

We cannot afford to carry the additional expense of uncollectible accounts, and we are determined not to do so.

Your bill amounts to $43.

We are willing to do anything that is right about arranging a settlement, but we are determined not to carry the account longer if you are not even willing to come in and talk the matter over with us.

Unless we hear from you (see you) about this within five days, you may look for an opportunity to settle with our attorney.

Please don't compel us to take this step. We much prefer to adjust the matter with you ourselves.

Yours truly,

NEW RULING ON CAR TAX.

Machines Held for Retail Sales Exclusively Are Exempt—Changes Taxed.

A new ruling has been made by the Treasury Department relative to the tax on motor cars. New machines which dealers have been holding for retail sale and have been in stock since October 4 are not to be taxed where a dealer does only a retail business or where he does both wholesale and retail, but maintains separate departments. The former ruling was that all passenger and commercial cars held for sale on and after October 4 should be taxable at 1½ per cent. The more recent ruling is as follows:

First—Any dealer or distributer who completes a vehicle and offers it for sale is subject to the 3 per cent. tax. This applies to a dealer adding a new body to a chassis or any person converting a touring car into truck by adding an attachment.

Second—Trucks and cars sold to the government will not be tax exempt. Manufacturers to get the tax must add it to the price of the goods before selling to the government.

Third—A dealer who is both a wholesaler and retailer and handles two different makes of cars under two separate contracts, with one contract providing for retailing only, is exempt from the floor tax on cars under the retail contract, but he pays the tax on all cars on his floor under the contract were he a wholesaler and retailer without separate contracts.

Fourth—Those car manufacturers selling through branches and whose branches are a part of the parent company and not separate corporations must pay the 3 per cent. tax on the sale price received whether wholesale price or list price.

Purchaser Not Responsible.

According to a recent decision, when a dealer ships by railroad to a buyer the latter is entitled to protection and the shipper is responsible for goods lost or damaged in transportation.

A dealer sold tires valued at nearly $100, and which were to be shipped from New York to Allenhurst, N. J., by express. The buyer paid in advance, and the seller shipped them without declaring their value, which had the effect of limiting the express company's liability to $50.

The tires were lost on the way, and the buyer notified the dealer, who made a second shipment. When the dealer attempted to collect for the second shipment the buyer refused to pay, claiming that because of the dealer's negligence he could get only $50 for the goods for which he had paid nearly $100. The dealer thereupon sued the buyer for the amount of the second shipment, but the court refused judgment against the buyer, saying:

"Unless otherwise authorized by the buyer, the seller must make such contract with the carrier on behalf of the buyer as may be reasonable, having regard to the nature of the goods and the other circumstances of the case. If the seller omit so to do, and the goods are lost or damaged in course of transit, the buyer may decline to treat the delivery to the carrier as a delivery to himself, or may hold the seller responsible in damages."

The court pointed out that some time ago a case was decided in the same way, where an agent shipped an automobile and accepted a bill of lading in which liability was limited to $100—116 Northeastern, 781.

Why Bulbs Discolor.

After considerable service the electric light bulbs utilized in car lighting become discolored, black. This is due to the heat making the filament evaporate, sublime (to pass from a solid to a gaseous state, and again condense to a solid form), and the particles settle on the inside of the bulb. Less current is consumed when in this condition, as the filament is thinner. The light, however, is less efficient, for most of it is absorbed before it gets out.

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TRUCKS IMPROVE SERVICE.

One-Ton Cars Replace Three Two-Horse Teams and Increase Deliveries.

BY C. P. SHATTUCK, M. E.

There are two factors that are rapidly revolutionizing delivery methods in New York City and its surrounding territory, and these are service and competition. The public is largely responsible for that service now obtaining in this large city, for the people of Greater New York and surrounding territory have been educated to that service which obtains merchandise on the same day as purchased.

As a result of the demand for this service many business concerns have been practically obliged to replace their horse-drawn equipment with the more tireless, rapid and efficient commercial car. In other words, many concerns have found the gasoline propelled vehicle indispensable in serving clients formerly taken care of by the more slower moving horse or express service.

Competition is a factor in merchandising. The large wholesale house or the concern acting as a distributor for manufacturers find that their customers now expect delivery by motor vehicles because it is more rapid than with the horse and because the wholesaler's rival has motor equipment. As a result of this competition a number of concerns are experimenting with the use of the commercial car. Some of these have achieved the results desired, that of efficient and economical service, while others have found transportation by the automobile more expensive. Invariably when such be the case it will be found that the merchant is not operating his car or cars efficiently, that his routing and loading methods are those utilized with the horse-drawn equipment and which do not permit of the motor car being operated at its maximum capacity.

An example of how a commercial car may be operated successfully is noted in the case of Joseph Wild & Co., New York City. This concern manufactures and imports oriental rugs and carpets and does an extensive business in mats, matting, linoleum, wall hangings, robes, feltings, etc., having been established since 1873.

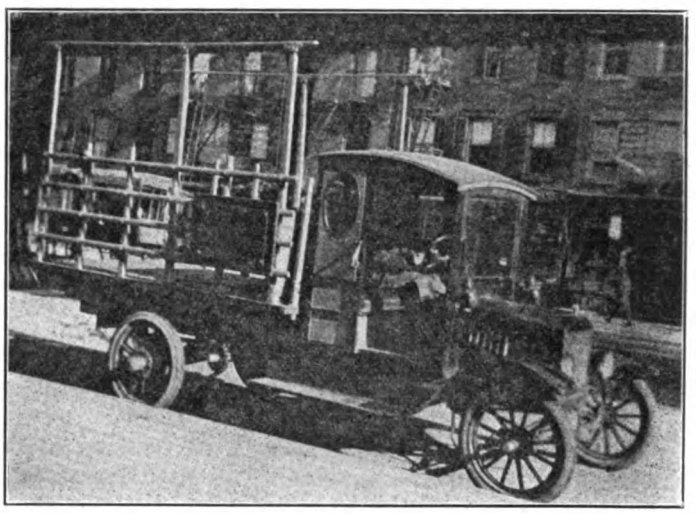
Supplying as it does both the retail and wholesale trade, the company is frequently compelled to make prompt delivereies, these including many special orders. Although large capacity trucks are utilized for transporting goods to and from the roads, etc., the company had, up to within two years ago, relied upon horses to make city deliveries and an express service for suburban service.

After investigating the possibilities of the delivery type of motor car the company purchased two one-ton Smith Form-a-Trucks, made by the Smith Motor Truck Corp., Chicago, Ill. One of these machines was placed in service in New York, where it is utilized for making city deliveries and supplying the trade in the metropolitan districts and Long Island City. In the afternoon the car serves the retail trade in the lower part of the city, also makes a number of trips over the bridge to the Brooklyn districts where the factory is located. In addition to this work the machine hauls goods from the factory to the warehouse and carries capacity loads from railroads, etc., to warehouse and store. The second Smith Form-a-Truck is employed at Staten Island at the plant of the American Linoleum Mfg. Co., for which Joseph Wild & Co. is distributor. This truck hauls goods to and from tidewater, etc. The machines are equipped with the conventional type of stake body.

An example of the service being obtained with these cars is the fuel and oil utilized during last month. The New York City car used 112 gallons of gasoline, 12 quarts of oil and traveled 1,099 miles. This is about 12 miles to a gallon of gas and 100 miles to a quart of lubricant, an excellent showing when it is considered that much of the work is in heavy traffic.

The two cars not only have replaced three two-horse teams and eliminated much express service, but have greatly increased the radius of delivery. The improvement in service is also pronounced. The company believes in employing high-grade drivers and these are thorough mechanics, having fitted themselves for the positions.

The company also has in service a Ford truck unit made by Hayes-Diefenderfer, New York City. This machine has been in service two years, during which period the only time that has been lost was during an overhaul. The driver of this car is a thorough mechanic, and the machine has given the best of service since the day it was placed in commission. It is used to make trips to New Jersey, replaces express service, transports capacity loads and has proved a time and money saver.



Smith Form-a-Truck in service with Joseph Wild & Co.

Omaha A. T. A. Elects Officers.

At the annual meeting of the Omaha Automobile Trade Association, which holds its thirteenth annual show February 25-March 2, inclusive, J. T. Stewart, 2d, was elected president. Guy L. Smith was chosen vice-president, and Clarke G. Powell, secretary-treasurer. These, with Lee Huff and E. R. Wilson, constitute the board of directors for the ensuing year.

To Teach Women Mechanics.

A pleasure car distributor in St. Louis, Mo., is conducting a school to teach women how to operate and repair motor cars. According to his statistics those who have registered for war service know little about the repair of a car. The figures show that 37 per cent. know how to drive and only three per cent. know the automobile mechanically.

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PASSENGER CAR A NON-ESSENTIAL.

War Industries Board So Rules and Proposes to Take Over Factories.

The announcement of the War Industries Board proposing to restrict the production of passenger cars from 40 to 75 per cent. by prohibiting the shipment of steel to automobile manufacturers, and to take over wholly or in part factories for munition purposes, came as a distinct shock to the members of the industry and its allied trades. The proposed action of the board and on the ground that passenger cars are "luxuries and non-essentials," is particularly disappointing to those members of the industry who at the outbreak of the war offered their services and plants to the government.

That the product of the industry, the third greatest in the country, should be classified as a "non-essential and a luxury," that those responsible for this ruling should overlook the fact that it has been proven that 80 per cent. of the so-called "pleasure cars" are utilized commercially, are features of the ruling that indicates that little if any consideration is being given to an industry patriotic enough to curtail its production from 25 to 40 per cent. in order to co-operate with the government. (A number of factories have given over equipment for the manufacture of munitions, etc.)

In defining the passenger car as a "luxury and non-essential" the Board must have been influenced by the fact that many owners utilizing their cars six days a week for business purposes employ them on Sunday for pleasure. This is a practice not alone confined to the motorist of the city but to the farmer. If an automobile used under these conditions be a luxury then the work horse used on Sunday to haul the family surrey must be a "non-essential."

The shortage of steel is said to be one of the reasons for the drastic ruling of the Board. According to one of the greatest authorities on steel only five per cent. of the annual output is utilized by the automobile industry. It is also stated that the production of steel can be increased 10 per cent. within 90 days, that it is not a question of a shortage of materials such as chromium, vanadium or other chemicals needed in the steels, but rather a question of efficiency of labor. A thorough investigation of the steel industry is suggested and will be welcomed by the automobile industry.

Not only will the car manufacturer be dealt a severe blow if the proposed drastic measures be carried out, but approximately 53,000 garages, dealers and those handling motor vehicles will be affected. The small business man or the large one, for that matter, cannot adjust themselves instantly to the conditions that would obtain from the proposed plan of the War Industries Board. The investment of the small dealer or garage man is as important as that of the manufacturer with hundreds of thousands of dollars involved, and the small dealer is entitled to consideration.

It is to be hoped that the committee appointed by the automobile industry and which represents the National Automobile Chamber of Commerce, Motor and Accessory Manufacturers and the trade, will, in the coming conferences with the War Industries Board, convince that body that the product of the third greatest industry in the country should not be classified as "luxuries and non-essentials," that the rating of the passenger car in the same class as pianos, moving pictures, etc., is most unfair to an industry which to a man is behind the government in its present time of need.

There can be no question as to the patriotism of the automobile industry and its allied branches. There is no doubt that should the occasion arise the industry would 100 per cent. co-operate with the government. The present problem is not one of patriotism. It is a case of where, if the proposed plans are consummated, an industry rated at $1,300,000,000 is not given time to adjust itself to new conditions, to make the conversion gradually as it should be made.

May Have to Pass a Test.

The increasing number of accidents in the State of New York, many of which occur at grade crossings despite the warnings of the railroad companies to drivers who persist in trying to cross ahead of rapidly moving trains, may result in a law being passed compelling every driver to pass a test as to his ability, etc.

In an effort to decrease the number of accidents the Secretary of State is to show a series of moving pictures illustrating the right and wrong way to approach a street car taking on or discharging passengers, and the man who attempts to cross the railroad track ahead of a train, etc. Among the scenes are those showing the congestion of traffic in New York City and how it is handled by the traffic squad. Special attention is given to women, who are daily swelling the ranks of expert motor drivers.

The pictures do not spare the careless pedestrian or the absent-minded stroller who crosses the street at any angle, while the boy who darts in and out in the traffic of the busy street is taught a salutary lesson. The pictures are to be released and shown in the moving picture houses throughout the country.

Increase Wisconsin Fees.

Receipts for motor vehicle license fees of all classes reported by the State of Wisconsin for the fiscal year ending August 1, amounted to $834,142, compared with a gross of $575,798 for the previous fiscal year. The cost of administration was $39,069, and after this sum is deducted 25 per cent. is placed in the State highway fund and 75 per cent. is redistributed pro rata among the seventy-two counties of the State where licenses originated. During the new fiscal year, receipts will increase even more, as the annual license fee for private owners has been increased from $5 to $10 per annum, effective January 1, 1918.

To Aid in Fuel Saving.

One Chicago gas company has been using 80,000,000 gallons of petroleum oil yearly in making illuminating gas. This is slightly more than the navy's consumption of oil last year, the oil being used to enrich water gas. The company will now erect a new plant in which gas will be made from coal on the by-product principle, producing illuminating gas without the use of petroleum, yielding benzol, toluol, and other coal-tar derivatives, and also half a million tons of coke yearly for household consumption.

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NUMBER THE STEERING COLUMN.

Says Plan Would Greatly Reduce Number of Cars Stolen.

The police department of New York is giving considerable attention to the stolen car problem. During the first six months of the present year 874 machines were reported as stolen. Of these 758 were recovered, and 283 arrests were made, leaving 116 cars still missing. Of the 758 recovered, 164 are listed as doubtful cases of theft, because they were recovered within 24 hours, many only a short distance from the place where they were taken, and nothing had been removed from them.

Secretary of State Hugo, who has been studying the problem with the heads of the police department, makes a novel suggestion for making it a simple matter to identify the stolen car. He suggests that the engine number be affixed also on the steering column of the machine.

"This is a part of the automobile," he says, "which is rarely, if ever, changed, and the numbering of this part to correspond with the engine number would serve several purposes.

"In case of theft, it would prove of great value in identifying the car. Also, it would act as a deterrent, as the removal of this number by the thief would be readily discernible.

"Again, it would save the purchaser of a car a great deal of trouble in making application for registration, as the number would be easily located.

"The affixing of the motor number at a point, say, six inches below the steering wheel would entail little if any extra expense on the part of the manufacturers. I believe this is a matter which might properly be presented to the manufacturers by the dealers through whom the cars are sold, and make the suggestion accordingly."

The manager of a large insurance company endorses the plan and believes that the owner can do much toward reducing the number of thefts. He says:

"The owner himself can do a great deal more than is usually done toward mitigating the automobile theft evil. The carelessness shown by scores of owners in leaving their cars unprotected and unlocked in the streets is amazing. There is no locking device that the expert motor car thief cannot beat, if he is determined to steal a car and has the opportunity to do so. Nevertheless it is a valuable preventive, and if observed more carefully it would reduce by a large proportion the number of cars reported stolen, but which have been used for joy riding. Many cars which technically have been stolen are recovered within 24 hours. Meanwhile an alarm has been sent to every police precinct in the city. The owner is miserable because he believes his car has actually gone, and if insured he prepares to collect as early as possible from the company. If the owner had merely been thoughtful enough to lock his car it would have stopped the average joy-rider from going off with it."

Cleveland After Auto Thieves.

The police of Cleveland, O., are conducting a vigorous campaign against automobile thieves. Recently they established a dead line around the city just outside of the business district, utilizing over 100 policemen and officers divided into squads, and every main road was guarded. These squads stopped every car as it approached and the driver was asked "What's your license number?"

If the driver knew, or if the party in the car were obviously a man and his family, the car was permitted to proceed. In cases of suspicion the car was run around the corner into an "inquisition zone" for further questioning of the occupants, and in some cases the cars were run to the nearest precinct station before a clean bill of health was issued.

In practically all instances motorists submitted good-naturedly, realizing that unusual methods were needed to cope with the extraordinary prevalence of theft.

Oil Exports Increasing.

More mineral oils were exported from the United States during the fiscal year 1917 than ever before, the total amounting to 2,749,438,434 gallons, valued at $230,953,149, according to figures made public by the Bureau of Foreign and Domestic Commerce of the Department of Commerce. This was an increase of approximately 300,000,000 gallons and $65,000,000 over 1916 and about 470,000,000 gallons and $79,000,000 over 1914, the last normal year before the war. Only a small percentage of the total exported was crude oil.

The war has had the effect of reducing the exports of illuminating oil. Exports of gas and fuel oil have more than doubled in quantity and value in the last three years, increasing from 475,153,205 gallons valued at $13,747,863 in 1914 to 1,040,671,713 gallons valued at $32,473,872 in 1917. The exports of gasoline and lubricating oils have also increased substantially.

Tractors to Aid Farmers.

When the newly appointed State Food Control Commission of New York begins its duties it is expected that one of the first steps to be taken will be the purchase of 50 gasoline tractors with their necessary plows and fittings. These are to be placed among the farmers of the state and will be largely used to prepare the ground for next season's wheat.

By the regulations governing their use, no charge for rental is to be made to those desiring their services, but the man whose ground is cultivated by a state-owned tractor is charged for the gasoline used and for the operator's time. Fully 1,000,000 bushels of grain will be raised on the ground prepared during the next few weeks by these machines if the plans for their most effective use are followed out.

Cause of High Speed Slipping.

One of the troubles sometimes experienced with cars that have seen considerable service is the high speed slipping out of engagement. This is caused by worn jaw clutches or dogs of the intermediate gear which are meshed with the constant mesh gear when utilizing the high. The trouble can generally be overcome by grinding the clutches to restore their contours.

Motorcycles are now admitted to the Yosemite National Park. They were barred as some of the roads were considered too steep and dangerous for their use. These roads have been improved.

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A Non-Skid Road.

In the mountainous districts of western Maryland an experiment is being conducted, and closely watched, on what is claimed to be a non-skid surface. This road is a tar-bound macadam on a water-bound macadam foundation. Several grades of tar binder as a surface treatment have been previously used, but under heavy rolling and continued traffic the binder has flushed up through the stone chip covering, making a smooth surface which became very slippery when wet.

This year a special grade of Pontar was used on the surface as a binder, and it is hoped a non-skid surface has resulted, for up to the present time the results have been very encouraging. The binding material used has not flushed up under the roller and traffic as have previous treatments, and the resulting surface pitted, somewhat after the fashion of smallpox markings. Under wet weather conditions this has proven a great benefit, as the skidding of automobiles and trucks has been greatly reduced, and the footing is much safer for horses. This experiment is being watched with great interest to see how effective it is under winter conditions of ice and sleet.

Novel Touring Equipment.

A motorist with considerable experience in transcontinental touring has designed and constructed a novel automobile clothes press and a full length bed. The press consists of a khaki bag with wide mouth, into which is sewn three cross bars or curtain poles, the whole being inclosed by a wide flap. From the three curtain bars are hung from three to six regulation coat, trouser and skirt hangers. The entire unit being suspended by two metal hooks from the rear top bow in the tonneau, permits carrying a number of suits suspended full length and free from dust and wrinkles.

The full length automobile bed is suspended crosswise in the car just above the tops of the seats, leaving the tonneau and back seat for a dressing room for the two occupants. A 10x18 khaki container, spiked at the four corners, serves in daytime to carry the entire bedding outfit, lashed securely to the running board, while at night it covers the entire car, making the sleeping quarters snug even in a rainstorm.

Yellow, but Just as Good.

It is suggested that our gasoline supply may be increased considerably if motorists will overcome an unwarranted prejudice against yellowish gasoline. In the early days of the oil industry poor refining methods were responsible for the production of yellowish kerosenes and gasolines, which were sometimes dangerous. This led the public to demand that gasoline be "water white," and the prejudice has hindered the development of cracking processes which produce perfectly safe gasoline with a slightly yellowish tinge. Another handicap in the industry, according to petroleum experts, is the necessity for refiners treating gasoline with sulphuric acid and caustic soda to remove unsaturated hydrocarbons which have high fuel value in an explosion engine. It is estimated that there is a loss of $10,000,000 a year in the United States through these prejudices, represented by 30,000,000 gallons of gasoline, 35,000 tons of sulphuric acid, and 3,500 tons of caustic soda.

Replenishes Oil Supply.

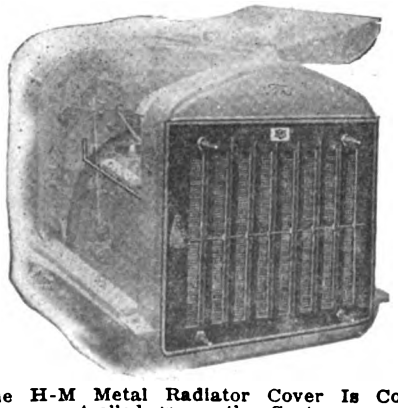
A reader who states he has experienced no carbon trouble for over 6,000 miles attributes his freedom from carbon troubles to the changing of the oil supply in the crankcase every 1,000 miles. The lubricating system is thoroughly cleaned and new oil employed. While this means a loss of a gallon or more of oil every so often, the cost is compensated for by greater efficiency from the engine. Oil will lose its lubricating qualities after it has been in service a certain length of time.

You can buy a nice car for about a hundred iron men. Of course, the ones with engines in cost more.

NEW AND INTERESTING THINGS IN MOTORDOM

The H. M. Metal Radiator Cover.

The latest device for winter touring



The H-M Metal Radiator Cover Is Controlled From the Seat.

is the H-M metal radiator cover for Ford cars. One of the most important features of this radiator cover is the fact that it is operated from the dash of the car, thus eliminating the necessity for the motorist leaving his seat and walking to the front of the car to adjust the cover.

Another important point is the adjustment feature. The cover may be entirely closed, half, three-quarter, quarter closed or entirely open, depending upon weather conditions, and can be instantly changed from one position to another by means of a pivot in the dash of the car.

The H-M metal radiator cover is made of sheet metal divided into eight adjustable shutters operated as one. It is attached to the radiator with springs, assuring a tight fit at all times and doing away with the possibility of rattling.

They are staunchly constructed and may be used many seasons, therefore are most economical to buy. The H-M Manufacturing Co., Indianapolis, Ind., are the makers of this practical device.

A Baby Seat Attachment for Automobiles.

The Perfection Mfg. Co., 2700 N. Leffingwell avenue, St. Louis, Mo., are manufacturing and marketing a unique contrivance known as the Rock-a-Bye auto seat. It consists of a brown washable duck basket mounted on an enameled steel frame, the basket containing two holes through which the baby's legs are inserted. Two small steel cleats, three inches long, are furnished with the outfit, which can be permanently attached to the back of the front seat of any automobile in a few minutes, and in which the hooks of the Rock-a-Bye seat are engaged and sustained. All parts that come in contact with the polished surface of the auto are protected by means of soft rubber, preventing entirely the marring or scratching of even the most highly polished surfaces. The Rock-a-Bye seat is easily and quickly attached at any time by simply inserting the

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hooks in the slots and detached by lifting the hooks out of the slots. When not in use, the Rock-a-Bye folds up and easily fits under the seat of the automobile. The Rock-a-Bye auto seat weighs four pounds and is not only safe, sanitary and low priced, but affords baby a

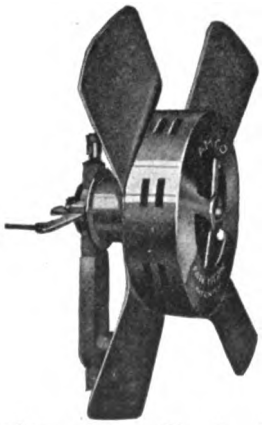


The Rock-a-Bye Auto Seat.

comfortable permanent place in any automobile instead of being jammed between the occupants anywhere as heretofore. It relieves mothers of a great deal of care when out riding.

A Signal With Tone Range.

Desirable as such a feature is acknowledged to be, there has never been an automobile warning signal with a range of tone, except the extremely high-priced musical instruments. A unique, new device, illustrated below, has now been put on the market. The Fanhorn, as this distinctive type of signal is termed, is designed to emit tones whose volume and penetrativeness is in direct proportion to the car speed. This result is achieved by the simple expedient of making the Fanhorn a part of the fan of the engine, in fact, the entire device is merely substituted for the present fan on any car, with no other alterations. It is claimed that the cooling efficiency of most cars is increased by the Fanhorn. The tone of the Fanhorn is best described as a cross between a whistle and a whoop, with the acknowledged effectiveness of both—instant attention and rousing urge to action. The tone is pleasing as well



The Fanhorn—A New Warning Signal.

as commanding. As the pitch changes with the engine or car speed, maximum carrying power is obtained at highest speeds, an ideal arrangement. The position of this new type of signal, at the extreme front of the engine, avoids obstructions to the sound. The Fanhorn is said to be impervious to wiring and battery troubles, worn contacts, weak diaphragms and kindred ailments. It is entirely different from the usual siren because the full volume of sound is instantly available without "working up" to it and no effort is required on the part of the driver, other than pushing a button. City drivers especially will realize the advantages of a signal that cannot be operated in their absence from the car. Pressure on the button automatically admits air into the apertures of the Fanhorn drum, also sets into motion an internal, revolving slotted disc, which produces the warning tone. The Art Metal Manufacturing Co., Cleveland, O., makers of AMCO automobile specialties, manufacture the Fanhorn. It will be marketed through the dealers authorized to handle "AMCO" specialties in every city. The manufacturers guarantee the material and workmanship of the new signal for a full year, and stand back of the dealer on a broad money-back-if-not-satisfied policy. The appropriate selling slogan of the Fanhorn will be "Sells on Sound."

Perfection 5-In-One Vitalizers.

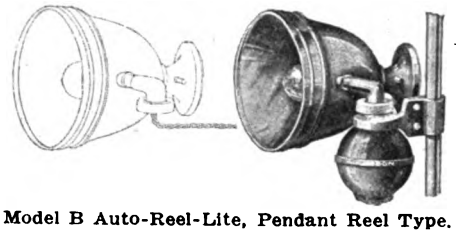
The Snyder Products Co., 4046 Washington boulevard, Chicago, Ill., is now manufacturing and marketing the Perfection 5-In-One vitalizers, formerly handled by the American Spring & Tire Co. This device is described by the manufacturers as the greatest heating unit built for vaporizing gasoline. It is a combination device, comprising as it does, a primer super-heater, electric super-heater, decarbonizer and gas economizer, and it is claimed that it will greatly increase the power and mileage of the car, also causing less carbon and less trouble. It instantly vaporizes gasoline, irrespective of temperatures. Readers who are interested should write direct to the manufacturer for prices and complete information.

Make Your Ford a Winter Car.

Above is the very attractive heading used by the J. & B. Mfg. Co., Pittsfield, Mass., in their latest advertisement. This announcement calls attention to the J. & B. gasoline injector. If your Ford car is equipped with this device, one or more light pulls on the "injector ring" which projects through the radiator will spray gasoline directly into the manifold at the intake ports of the cylinders, making starting the engine as easy as on a hot day. The retail price of this device east of the Mississippi is $3.00 net, and in the West the price is $3.25 net. Readers who are interested should send their inquiries and orders direct to the manufacturers, the J. & B. Mfg. Co., Pittsfield, Mass.

The Auto-Reel-Spot-Lite.

We illustrate the Auto-Reel-Spot-Lite. This is a novel extension trouble light. When attached to the windshield it is a dirigible searchlight which is absolutely effective. In addition, this lamp is attached to 12 feet of extension cord so that it can be lifted from its bracket and removed for the purpose of inspecting any part of the car. The convenience of such a device when a car breaks down on the road or for night work in the garage is too obvious to need explanation. While touring the dirigible searchlight feature may be used for locating ditches, marking the edge of the roadway, illuminating dangerous corners and turns, turning around or backing the car, reading road signs, house numbers, etc. In camp this lamp could be hung on a convenient tree or tent pole and gives a brilliant illumination covering the wide area, and every motorist, auto-camper, farmer and motor-boat enthusiast will certainly appreciate the

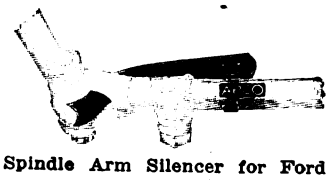


Model B Auto-Reel-Lite, Pendant Reel Type.

automatic extension feature which does away with the less reliable pocket flashlight and the uncertain and dangerous use of matches and candles. This device is manufactured by the Anderson Electric Specialty Co., 562-564 W. Van Buren street, Chicago, Ill., to whom all inquiries should be addressed.

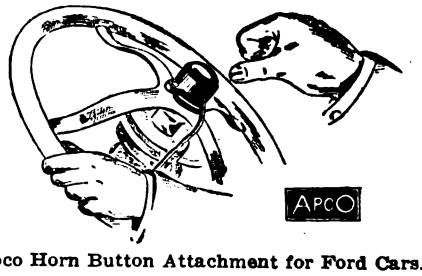
Two New Apco Specialties.

The extensive line of specialties for the Ford car and made by the Apco Mfg. Co., Providence, R. I., has been augmented by a spindle arm anti-rattler or



Apco Spindle Arm Silencer for Ford Cars.

silencer. The bushing of this part wears very quickly and when worn is the cause of that lost motion which makes the front wheels wobble and sets up an annoying rattle. The Apco silencer prevents these troubles and consists of two heavy formed springs which are easily and quickly attached with the fingers. They come two to a set, are finished in black enamel, and sell at 40 cents the set. The horn button attachment which places a button for sounding the electric horn on the top of the steering column or center of wheel, is now being supplied with a neat button whereas for-



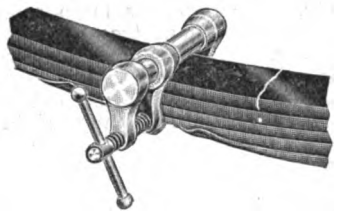
Apco Horn Button Attachment for Ford Cars.

merly use was made of the Ford button. This device comes complete with wires, etc., and is a valuable addition to the car as the driver does not have to remove his hand from the wheel to sound the horn. The new attachment sells at 50 cents complete or attachment without button 25 cents.

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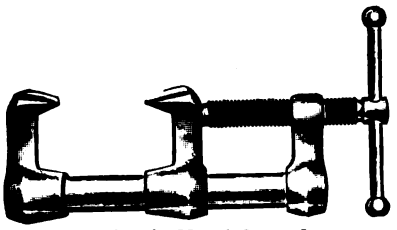
Knowlson's Spring Spreaders.

The Spring Leaf Lubricator Co., Ann Arbor, Mich., is making a new spring spreader in addition to their regular tool. It lists at $1.00, and is known as Knowlson's No. 3. It is attractive,



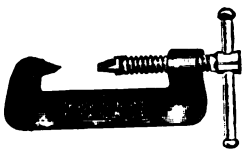
Knowlson's Spreader Applied to Spring.

strong, durable and is made upon correct lines. The yoke is drop forged, highly polished in oil and has a mottled or gun metal finish, while the screw and handle are dull nickel plate. It will span springs of 3 inches wide or under. It is essential that in the care of the car or truck the springs should have every attention. To allow them to rust not only produces the annoying squeaking, but a heavy jolt is almost sure to break them. The quiet running car is the car with its springs regularly lubricated, and with a Knowlson spring spreader it is an easy matter to keep the springs properly lubricated. The Knowlson No. 1



Knowlson's No. 1 Spreader.

spring spreader, their standard tool, is made of drop forgings, nickel plated and highly polished. It lists at $1.50. The proper lubricant for springs is a heavy grease or a grease and graphite mixture. Oil will, for a short time, stop the squeaking, but the operation of oiling has to be repeated too often to obtain the desired results. A heavy grease is preferable owing to its lasting qualities.



Knowlson's No. 3 Spring Spreader.

The No. 1 tool, as a temporary repair clamp, cannot be improved upon and should be in the tool kit of every car. Should you have the misfortune to break a spring, this tool will bind it securely, allowing you to proceed or return in safety. It takes but a moment to attach it.

Curtis Correct Pressure Tire Filling Station.

The Curtis Pneumatic Machinery Co., St. Louis, Missouri, is placing on the market a tire filling device for garages, and there has been such a demand for this article that it has been almost impossible to fill orders. The company, however, expects to be in a position to make deliveries on this machine in time for the season of 1918, and it will be exhibited at the New York and Chicago shows. Some improvements have been made in the tire filling station which makes it even more desirable. The same company also makes the well known line of Curtis garage air compressors. These compressors are made in five different sizes of simple machines and over 125 combinations of electrically driven outfits. The distinguishing feature for the garage equipment is the control of the splash oiling system, which so effectively regulates the cylinder lubrication that oily vapor is prevented from going into the tires.

Tinol Flux Paste.

This is a specialty which should interest every repairman. It is not a new and untried article, but has been on the market for many years. This flux paste does not eat or rust copper, brass, iron, steel or any metal as it is absolutely noncorrosive. Tinol flux paste has a new and important action; as it evaporates it leaves behind it a thin coating and clean, bright tin, to which the solder adheres readily. It will instantly tin a new clean iron. This paste will not injure the most delicate fabrics, such as the silk insulation on electric wires and it has so little irritating action, that it can be spread with the fingers. This flux paste is manufactured by Hess & Son, 1031 Chestnut street, Philadelphia, Pa., to whom all inquiries should be addressed.

B-W Ammeters.

The B-W direct current ammeters are sturdily constructed, so that they will retain accuracy under the most severe conditions. These ammeters are handsome in appearance and are made in both the flush and surface types. They are finished in bright nickel or black rubberoid, as desired. The retail price of this ammeter is $1.90 and it is manufactured by the Ballman-Whitten Mfg. Co., 2867 Gravois Avenue, St. Louis, Missouri. This company will be glad to send complete illustrated catalog to all readers who may be interested.

Twitchell Gauges as Xmas Presents.

The perplexing problem of what to give to a motoring friend as a Xmas present is made very easy of solution by the Twitchell Gauge Co., Chicago, Ill., which has prepared a special holly and mistletoe box for use by dealers in "dressing up" the exterior of the container in which the gauge is ordinarily sold. These decorative covers are furnished free to the trade and make a strong appeal when displayed on counters or in the windows.

Bearings Co. Comes to New York.

The Bearings Co. of Pennsylvania, have opened a branch office in the heart of automobile row, 1864 Broadway, New York City. Their growing business enforced this expansion. A complete stock of bearings is maintained for the accommodation of their trade in the metropolitan district. A sales agency has been installed at 293 Halsey street, Newark, N. J., under the direction of the New York branch. P. C. Christman is in charge.

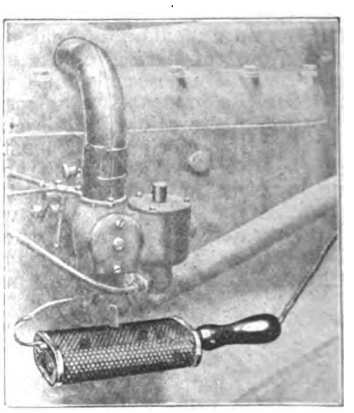
The Presto Electric Heater.

We illustrate a very practical and useful device, called the Presto electric heater, the object of which is to keep the automobile engine and carburetor warm in the coldest weather. Many cars are kept in cold garages, at the risk of



Presto Electric Heater.

cracked cylinders and burst pipes, but if in an unheated garage this danger is removed by the use of the Presto electric heater. The illustration gives an excellent idea of the appearance of this device and it is also shown applied to the engine. All the user has to do is to screw the plug into the nearest light socket, put the heater under the hood, close to the engine, carburetor or radiator, and go to bed, assured of the fact



Presto Heater Applied to Carburetor.

that when he goes to the garage in the morning he will find the engine warm, making starting easy. This convenience alone makes the price of the Presto electric heater insignificant to the average car owner. This invention is also a great seller for dealers. It is manufactured by the Metal Specialties Mfg. Co., 338-352 North Kedzie avenue, Chicago, Ill., to whom all correspondence should be addressed.

The Handy Terminal.

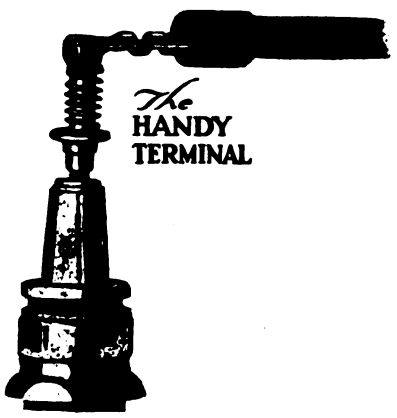
A. E. Francis, known to the racing world as "Smoky" and to the accessory trade as president of the Francis-Rand Co., has recently patented and placed

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on the market a terminal that it is claimed eliminates all terminal troubles. Mr. Francis found the need of such a terminal while in the racing game, it having been his unfortunate experience to have lost many an important race because of loose connections. He also knows what it is to have to fish a terminal nut from an oily crank case and to have his fingers burned in loosening the terminal nut. The Handy terminal is really a cable terminal and spark plug terminal all in one. The jaws of the Handy are threaded on the inside and engage the threads of the spark plug center bolt. One motion raises the ring, compresses the steel spring, releases the terminal and lifts it from the spark plug. There are no nuts to tighten or loosen or fish out of the drip pan. No tools are required. Can be attached or detached in one second.

Most ignition troubles can be traced directly to loose connections caused by vibration and jar. The Handy can't work loose—the greater the vibration the tighter the jaws of the Handy grip, the better the electrical contact.

The method of fastening the magneto cable insures a permanent connection. The ferrule is fitted to the cable and the



Made by Francis-Rand Co., Cleveland, O.

stripped wire firmly held by a copper clip, making a non-soldered connection that can't work loose.

The Handy is made in three sizes to fit every make of spark plug. Owners of all kinds of motor driven vehicles such as automobiles, trucks, aeroplanes, motorcycles will welcome this trouble proof terminal. The Handy sells for 25 cents each.

A New Window Regulator.

The Liberty Works, Egg Harbor, N. J., is manufacturing and marketing an improved window regulator suitable for any type of body, one of the chief features of which is the simplicity of installation and removal. When the wood is properly laid out, it is impossible to install the regulator improperly. No adjustment is required, nor fussing with a fence. In case it is necessary to remove the device, it can be lifted out of its socket as a unit in a few minutes without having to disturb the upholstery. Another feature of importance is the folding handle, the opening of which unlocks the device, and folding the handle locks it. There is no big hook handle to catch clothes or otherwise annoy.

A side or off-set drive is also provided for use in side quarters, by means of which the actuating handle is taken out of the way of the arm rest. The device is stated to weigh five pounds per pair less than any similar device now offered. It is of sturdy construction, all movable parts carried on ball bearing. Patents have been secured on the general construction of the device. Other patents are now pending covering the handle and method of installation.

Particulars will be cheerfully furnished to those who may be interested. This company also manufactures exclusive designs and patterns in bouquet holders and lighting fixtures, and special attention is directed to their tonneau bow light. By turning the body of the lamp the current is turned on or off.

Sanitary Wire Running Board Mat.

Every car owner knows the annoyance and disadvantage of using a car in muddy weather owing to the large amount of dirt which is carried to the floor of the car on the shoes of those using it. The sanitary wire door mat is designed to prevent this trouble. Just as the house owner places a mat in front of his outside door for guests to wipe their feet on, so is the Sanitary mat used by the motorist for wiping his shoes before he climbs into the car, and the utility of such an article is too obvious to need comment. The Sanitary wire running-board mat is made by the Sanitary Wire Door Mat Co., 413 South Lincoln street, Chicago, Ill. This mat will fit any make of car. It is substantially made of the best galvanized steel wire and it is a perfect remover of snow, water, ice, sand, clay, mud, grit, gravel or any substance that might become attached to the sole of the shoe. This mat will not clog or fill up. In plain galvanized the price is $1.25 or in enamelled rubber finish the price is $1.50. This is a quick seller for any dealer and correspondence is invited by the manufacturer.

Higgins Quality Springs For Replacement.

The Higgins Spring & Axle Co., of Racine, Wisconsin, is making a specialty of supplying automobile springs of every type for repair men. A large stock of springs, spring plates and spring clips are carried in stock and orders, however small, will be given careful attention and quick delivery is guaranteed. This company will send its attractive illustrated catalog containing a large amount of useful information regarding springs, to any of our readers who take the trouble to write for it.

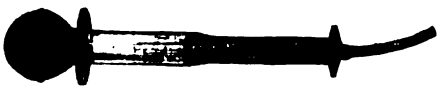
Monograms and Flag Emblems.

A full line of monograms and flag emblems also decalcamania transfer initials and monograms is manufactured by the Auto Monogram Supply Co., Dept. R, Niagara building, Newark, N. J.

All the monograms made by this company are artistic and thoroughly up-to-date and prices are reasonable. This makes a quick selling line for any dealer and correspondence from our readers is invited.

A Combination Hydrometer and Battery Filler.

The Workrite Mfg. Co., Cleveland, O., have recently placed on the market a hydrometer embodying a number of novel features. It is claimed for the Workrite hydrometer that it can be dropped without breaking. This feature is obtained by rubber collars placed at top and bottom of glass which prevents the glass from striking when dropped. The collar at the bottom is made square which permits of laying the hydrometer on an uneven surface and it will not roll off. A small rubber cube placed in bot-



Workrite Hydrometer.

tom of hydrometer acts as a cushion for the float to strike against when forcing acid back into the battery. It also prevents the float from shutting off the hole in bottom of hydrometer.

Perhaps the most striking and important feature of the Workrite lies in the fact that there is no rubber plug in the bottom of hydrometer which is the ordinary construction. As can be seen by the illustration, a rubber tube is attached to the bottom, thus eliminating any chance of this connection coming out and spilling the acid and breaking the float. The instrument sells at $1.00 each, by mail prepaid.

This company also markets a combination battery and filler outfit. It consists of a jar in which the regular hydrometer is kept permanently. The large rubber collar on the hydrometer makes the jar dust and evaporation proof. The jar is filled with distilled water, making a clean and convenient receptacle. After testing the battery the hydrometer is rinsed off into clean water, preventing deterioration of the rubber parts from the acid. The price of this combination outfit is $1.50 by mail prepaid.

The manufacturers of these devices claim that they use best quality of rubber fittings and that the bulb capacity is of unusual size. As the life of a storage battery depends to a great extent upon giving it proper care, motorists should be prepared to test their batteries regularly and keep them well filled



Workrite Combination Outfit.

with distilled water. This is especially true with winter approaching, as a battery will freeze at certain temperatures if it has not sufficient charge. On the jar mentioned above, the label contains full instructions for using the hydrometer in making tests and filling battery.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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JOHNSON'S CARBON REMOVER

Cures 80% of Engine Trouble

A dose of Johnson's Carbon Remover—The Engine Laxative—will make your motor run like it did the first 500 miles—quietly and full of "pep"—And your gasoline consumption will drop from 12% to 25%. You will save from $3.00 to $5.00 over any other method.



You Can Take the Hills on High Without a Knock

if you will keep your motor free from carbon with

JOHNSON'S CARBON REMOVER

That knocking in your engine—difficulty you have climbing hills—poor pick-up—pre-ignition and lack of power will all be overcome.

You Can Do It Yourself

For 25c—five minutes' time—and with no labor, you, yourself, can remove all carbon deposits. Pour an ounce of Johnson's Guaranteed Carbon Remover into each cylinder—allow it to remain two to twelve hours, then drive your car 10 or 15 miles. Results will surprise you.

Use It Every 1,000 Miles

If you will use Johnson's Carbon Remover at regular intervals, giving carbon no chance to accumulate, you will eliminate most valve trouble and your engine will always be at its highest efficiency.

If your dealer cannot supply you with Johnson's Carbon Remover, use attached coupon.

Write for our folder "Keeping Your Car Young"—it's free.

$1.00 Special Offer $1.00

S. C. JOHNSON & SON, Dept. AD11, Racine, Wis.

I enclose $1.00 for which please send me by prepaid express enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four-cylinder motor four times.

NAME.....

ADDRESS.....

CITY & STATE.....

MY DEALER IS.....

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JOHNSON'S PREPARED WAX

Now Made in Liquid Form

We are now making Johnson's Prepared Wax in ***Liquid Form*** as well as Paste—so that it may be more easily polished. Johnson's Prepared Wax ***Liquid*** is exactly the same as our Paste Wax except that it is a liquid. Apply with cloth, brush or spray.

Is Your Car Dirty, Grimy and Unsightly?

DO you know that you, yourself, can make it look almost like new and save the cost of revarnishing? All you need is Johnson's Cleaner and Johnson's Prepared Wax ***Liquid.***

JOHNSON'S CLEANER

entirely removes all stains, scum, road-oil, tar and grease from body, hood and fenders. It doesn't injure or scratch the finest varnish—simply cleans and prepares it for the Wax polish.

Absolutely Dust-Proof

Johnson's Prepared Wax Liquid gives a hard, dry, glasslike polish which does not collect or hold the dust. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches —prevents checking and cracking—sheds water and makes a "wash" last twice as long.

Johnson's Prepared Wax Liquid is very easy to use—it polishes instantly with but very little rubbing. You can go over a good sized car in half-an-hour.

Quarts.....**$1.40** **Pints**.....**$ .75**
East of the Rockies

If your dealer cannot furnish you with Johnson's Automobile Products, we will pay the expressage to any point in the United States east of the Rockies.

Write for our folder "Keeping Your Car Young"—it's free.

S. C. JOHNSON & SON, Dept. AD 11 Racine, Wis.



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Gordon "Jack Frost" Radiator and Engine Robe.

The "Jack Frost" Robe made by The J. P. Gordon Co., Columbus, O., is one of the most practical and necessary items of equipment for winter driving. It is so made that the curtain over the front of the radiator may be adjusted to any weather condition and closed entirely when the engine is not running, and when closed it will keep the engine and the water warm for several hours.

To get satisfactory service from a car



Divided Curtain Style for All Cars.

in cold weather it is necessary to keep the radiator well protected. The temperature of the water in the radiator and around the cylinders has much to do with engine efficiency as well as the quantity of gas used to get a mixture rich enough to develop proper power until the engine is thoroughly warmed up. Temperature has much to do also with battery economy, a cold motor is always hard to start and this is a needless drain on the batteries and the best way to overcome the trouble is by fitting a well made radiator and engine robe to the car which will retain the heat and keep the cold air out.

The Gordon "Jack Frost" robe is made in two parts, a jacket with curtain that completely covers the radiator and a robe to cover the hood. It is just as easy to raise the hood with the robe on as without it. Secure and convenient fastenings hold both parts in position so they can not be blown off or worked loose by vibration. The appearance is very neat and pleasing as the robe is carefully made from patterns in which every detail is worked out before robes drafted over them are permitted to leave the factory.



One-Piece Curtain Style for Fords.—Divided Curtains Supplied When Specified.

The materials used are the best obtainable for wear and warmth. The better grade is artificial leather and the cheaper one a special enamelled cloth. Both are lined with heavy heat retaining material.

The Gordon Co. manufacture "Jack Frost" robes in the divided curtain style illustrated for every American made car, also a special one-piece curtain for Ford cars which rolls from the bottom up and thus in no way interferes with cranking the engine.

Schrader Employees Patriotic.

Among the manufacturing concerns in the automobile industry which have distinguished themselves for the wholehearted support extended to the Government in its recent Liberty Loan campaign, the firm of A. Schrader's Son deserves particular mention. Although generous subscribers to the first loan, the employees responded with enthusiasm to the invitation to subscribe again, and when the list closed a total of $365,000 in subscriptions had been pledged. In addition to its money, the firm is also giving of its men. The service flag flying over the entrance of the Atlantic avenue factory shows that 54 employees have answered the call to the colors.

The Dover Electrical Soldering Iron.

In this connection we illustrate a soldering iron manufactured by the Dover Mfg. Co., Dover, O., New York office, 30 Church street. In describing this soldering iron the manufacturers say that the big essential fact about it is that the copper soldering point is connected with that famous and unbelievably perfect heating element which is revolutionizing electric heating practices —the "Vea Heating Element," controlled absolutely and exclusively by this company. The "Vea Heating Element" is a non-conductor of electricity but conducts heat as readily as cast iron. It is made in an electric furnace of approximately a temperature of 5,000 degrees.



Dover Electric Soldering Iron.

The soldering iron itself consists of a flanged copper core running the full length of the heating element. The resistent coils are wound around a thin vitrified clay tube. The "Vea" insulating material is forced in between the vitrified tube and the copper core, and between the coils and the steel casing, under tremendous hydraulic pressure. This absolutely prevents short-circuiting or burning out in the coils, making them indestructible, and gives a full and complete use of all the heat development. The entire heating element is permanently sealed in a steel casing. It is impossible for anyone to injure the iron by ignorant tampering. It should be borne in mind that this iron can be attached to any electric light fixture and will work perfectly. Our readers who have soldering to do should send for a descriptive circular and price list of these soldering irons, which are made in several different sizes. The special advantage in electrical soldering irons is that the heat is continuous as long as it is wanted, and no time is wasted, as in the case of the ordinary way of soldering, waiting for the iron to heat.

A Comprehensive Service Plan.

Simultaneously with the announcement of the opening of six new branches making 22 in all, although it has been in operation only a year, the Bearing Service Co., Detroit, Michigan, has made known the appointment of three traveling representatives who will establish some 450 agencies throughout the country within the next twelve months. The United States, east of the Rockies has been divided into three main sections in charge of the following men respectively: Harold Perkins, T. L. Hutchison and B. H. Boensch. These men started on September 10th from Boston, Kansas City and Detroit to inaugurate the work in the three branches. When they have completed the organization of these territories, they will move on to other branches in their respective sections. The plan is to establish agencies in a number of towns in each branch's territory. This connection will be with some responsible concern who will be fully supplied with all the technical bearing service data and who will represent the company in its immediate locality. The desire of the Bearings Service Co. is to bring its service within reach of every [illegible] dealer and garageman whoever [illegible] be. The 22 branches now in operation the great automobile centers of the try, therefore are being supplied with these agencies which will practically cover the entire country. The work on the Pacific Coast will be in charge of D. B. Bevier, Pacific [illegible] supervisor.

New Incorporation.

The Geo. D. Bailey Co., 1120 Michigan avenue, Chicago, Ill., has been incorporated for $25,000 under the laws of the State of Illinois with the following officers: president, Geo. D. Bailey; vice-president and general manager, C. [illegible] Ferguson; secretary, F. M. Stephen; treasurer, E. H. Ferguson.

The Bailey Co. manufacture the Bailey Ball Thrust Bearing, a bearing made to replace the flat thrust washers used as standard equipment at left (gear) side of the differential on the Ford and Chevrolet 490 cars. The Rayfield Coupling for magneto, generator and pump shafts is another product they are now marketing.

Heretofore, the Ahlberg Bearing Co. have been exclusive distributors of the Bailey products for the United States but now the latter company is to market the product direct through the jobber and dealers although the Ahlberg Co. will still continue to handle the line.

Speedometers Repaired.

The General Speedometer Repair Co., 51 West 63rd street, New York City, makes a specialty of repairing all makes of speedometers, horns and clocks, specializing on the following work: Stewart-Warner, Jones, Hoffecker, Johns-Manville, Sears-Cross, and Standard Speedometers—Klaxon, Newtone, Spurton, Long and Stewart horns. This company also maintains an official service station for the care and repair of the Van Sicklen and the Corbin Flexible speedometers. Careful attention will be paid to all orders and satisfactory work is guaranteed.

The Champion Shock Absorber.

This is a new device especially made for Ford cars which has been placed on the market by the Champion Shock Absorber Sales Co., 918 No. Senate avenue, Dept. K, Indianapolis, Ind. The device is illustrated this month in our advertising columns and if readers will consult the advertisement, they will get a good idea of the appearance and method of applying this shock absorber. Those interested should write for prices and full particulars direct to the manufacturers.

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Ford Starts and Brakes Like Big Car

Put a set of Cork Inserts in the Ford transmission and it acts like a different car. That bucking at the start—that lurch into reverse—the shivering and chattering under the brake—which embarass the driver and are hard on the car—all disappear. The Ford goes into low as smooth as you please. A light touch of the toe and braking begins instantly but smoothly. A sudden pressure in the emergency, and the car stops within a few feet, without chattering or rattling.

$3 per set of 3

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

TRANSMISSION LININGS FOR FORDS

op the slipping through the use of buttons of cork—a patented feature other lining can have. Cork never gets hard or polished. It's hard, olished linings that cause all the trouble in ordinary transmission linings. ork Insert Linings don't slip—don't grab. They make the smoothest, fest, most economical linings for the Ford transmission ever devised. ney give a better driving, better braking car, and a lining that outwears dinary linings three to one.

ord Motor Kept Cool—Fan Kept Fanning by Fan Belt That Doesn't Slip

nen the Ford fan belt runs as it ought, the Ford motor is kept cool and overheating is oided. But the fan can't fan properly if the belt is slipping and lays down on the job. e slippage of the ordinary Ford belt runs as high as 25% to 50%.

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

FAN BELT FOR FORDS

ps slipping. The buttons of cork, unaffacted by water or oil—grease or dirt—grip at the t turn of the motor and keep the fan fanning. Cork Insert Fan Belts outwear several inary fan belts and do the work better as long as they last.

Advance Automobile Accessories Corp.

Dept. K 5-1 56 East Randolph Street, Chicago

Dealers—Order from Your Jobber!

Order at least a dozen sets of Cork Inserts next time your jobber's salesman drops in. Cork Inserts mean better profits for you—better service and satisfaction for the user. They are the livest line in the field. Strongly advertised. Your customers know about them. Stock them and they'll move fast. Send coupon if your jobber can't supply you.

Dealer's Coupon Check and Mail Today

Advance Automobile Accessories Corp.
Dept. K 5-1 56 East Randolph St., Chicago

- ☐ Send one dozen sets of Advance Cork Insert Transmission Linings for Fords.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford. (Regular dealer discounts to apply.)

Name.....

City.....State.....

Jobber's Name.....

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Jiffy Vulcanizer.

A very clever and effective vulcanizing device for the use of manufacturers has been placed on the market by the Vulcanizer Mfg. Co., 131 North Seventh street, Philadelphia, Pa. This vulcanizer is extremely simple in its construction

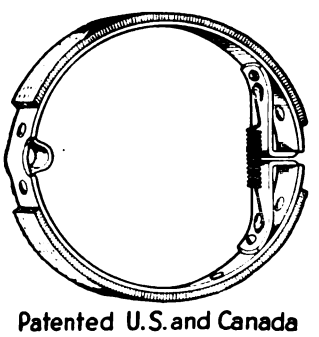


The Jiffy Vulcanizer.

and it will undoubtedly command a ready sale and take its place in the kit or tool box of thousands of motorists. With this vulcanizer a permanent repair can be made to the inner tube in from three to five minutes. With the machine a chemical wafer is furnished, which has just a sufficient amount of fuel, so that when the wafer is ignited, it will give the correct amount of heat to vulcanize the patch and thoroughly mend the tube in an absolutely satisfactory manner. Many vulcanizers for car owners are designed to use gasoline for fuel, but with this vulcanizer there is no flame, just a steady dependable heat at the right spot and for the right length of time and also at the correct temperature to do the vulcanizing properly. We feel sure that a good many of our readers will be interested in this very convenient device, which retails for only $2.00. It is also a quick seller for dealers, and the manufacturers will be glad to promptly respond to inquiries which may be sent in by our readers.

Perfection Steel Band Brake Shoes.

Perfection steel band brake shoes for Ford cars were first put on the market in 1915, a patent covering the device being issued June 6, 1916, to A. P. Worthington, 700 North Main street, Los Angeles, Cal. The shoe is made of ⅛ x 1-inch band steel. The ends of each piece are sheared and formed into ears for



Perfection Steel Band Brake Shoe for Fords.

the hub cam shaft to engage, the ear or brace thus formed is securely riveted to the body of the shoe, steel buckles are cut and formed, and riveted to opposite side of shoe, to receive bolt which holds the brake shoe to housing on axle. The shoes are lined with high grade, long asbestos fibre, woven with copper wire. Each shoe is trued up and fitted to a new brake drum, thus insuring a perfect fit with lining coming in contact with brake drum all the way around. This style of shoe has many advantages over the cast brake shoe. They have more braking surface, cannot be broken in use or in handling, can be relined at any time and a slight pressure of hand brake lever will tightly lock the rear wheels. With this style of shoe the car can be brought to a stop without the clatter and shake. The brake drums will last indefinitely as this style of shoe will not cut or wear away the drum. A very large number of Perfection steel band shoes are in use and are giving perfect satisfaction. The retail price is $2.00 per pair.

"Yankee" Push Brace.

Holding down the repairman's time and thus rendering an economical service to the automobile owner is one of the first considerations for the modern garage or repair shop. It is more essential in the days of high labor costs than ever before. An automobile has many nooks and corners which are inaccessible with ordinary tools, and providing a special tool for each of the many lighter operations, common in repairing, is not practical in the average shop or garage.

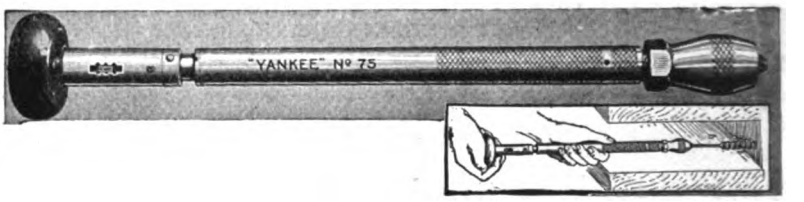
The "Yankee" push brace No. 75, manufactured by North Bros. Mfg. Co., Philadelphia, Pa., has many uses. While it is not adapted to the heavier work done by a breast drill, it is generally superior to the ordinary brace in rapidity and convenience, and by reason that it can be used in cramped places where a brace cannot. It will hold all the tools used in a bit-brace, but is operated by pushing on the handle.

In all light work around an automobile, such as about the dash where room is scarce, for drilling through metal bodies, etc., it is most handy. It is used to tap holes and drive screws, and with a socket wrench in the chuck it is frequently a convenience in tightening bolts and nuts.

The "Yankee" push brace is also achieving popularity among garagemen as a valve-grinding tool, as by use of the plain movement, when the chuck is revolved to the right while the handle is drawn out, and to the left while the handle is pushed in, the reciprocating motion so essential to thorough valve grinding is obtained. A coil spring placed beneath the valve, between the valve head and the valve guide, will facilitate the work. The two-thirds turn desirable in valve grinding can be produced by working the handle only about three inches up and down.

Those who have ground valves by twirling a screw driver between their hands will appreciate the saving of time and labor which the "Yankee" push brace makes possible. Simply pumping the handle completes the job in half the usual time, with a saving of effort and the producing of a better job.

The push brace has four movements—right-hand, left-hand; plain and ratchet.

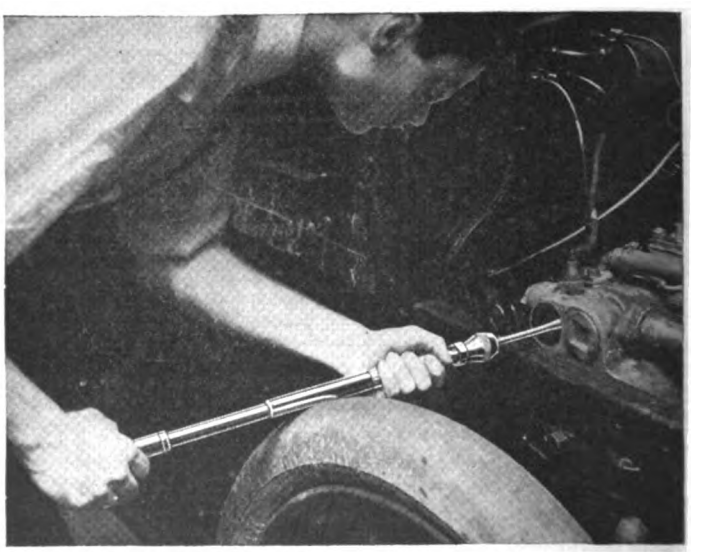


Yankee Push Brace No. 75.

The ratchet movement is employed for the occasional heavy work that cannot be done readily by the push movement. The spiral rod is of steel, grooved, and with 1½-inch nuts of hard bronze. Working parts are sleeve-protected against grit and dirt. The length of tool without bit, is 16¼ inches when closed, and 23½ inches when extended.

Ideal Hose Clamp.

A large line and reliable hose clamp for garages and dealers is manufactured by the Ideal Clamp Mfg. Co., 203-5 Bradford street, Brooklyn, N. Y. Dealers who are interested should write for prices and particulars in regard to the garage and dealers' assortments manufactured by this company.



Using the Yankee Push Drill for Valve Grinding.

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WINTER BUSINESS

COLD WEATHER MADE PROFITABLE

Here is your opportunity to make more profits, and be a leader in the auto accessory business.

Last Winter's sales record already broken. Jobbers and dealers will increase this record many times while cold weather is here.

Presto specialties keep moving and leave liberal margins of profits for you.

Here is the Blue Ribbon Winter Seller of them all.



Note the new Handle and Hook for all Makes of Cars.

Price, $4.00 In CANADA $6.00

The Presto Heater

has two new conveniences. The new swivel hook, that enables you to hang the heater anywhere under the hood. The handle allows you to move it from place to place while still hot.

The Presto Heater operates by connection with the nearest electric light socket. **Eliminates starting difficulties** winter mornings. Better than heating the garage, because the heat is delivered where most needed, under the hood. Consumes but a small amount of current, about 1c. per hour.



The Presto Line includes

DASH LAMPS
INSPECTION LAMPS
ELECTRIC CIGAR LIGHTERS
SWITCHES
CONNECTORS, Etc.

Sold by all leading jobbers and dealers everywhere.

Write for complete cataleg of over 100 real live accessories.

Metal Specialties Mfg. Co., Inc.
338-352 N. Kedzie Ave.
CHICAGO

Eastern Branch
16-24 West 61st Street
New York City
Western Branch
149 New Montgomery Street
San Francisco, Cal.

(17)

This sign in YOUR window



hooks you up with the advertising and reputation of



Sign is handsomely colored

Tuthill Titanic Lubricated Springs

Motorists know that the "Service Sign" pictured above means break-proof springs and 'top notch' spring service. They look for it on the dealer's window—it *brings* and *builds* business.

More spring replacements are made with Tuthill Titanics than all other makes put together.

Tuthill dealers are not required to carry heavy stocks of springs. Our distributors located at convenient points in every part of the United States carry *complete stocks* ready for immediate shipment.

Our proposition to dealers will interest you — write for it and name of nearest distributor. Ask for this business building sign and our poster price list.

Tuthill Spring Company
(Established 1880)
760 Polk Street **Chicago, Illinois**



THE **BENTON**
"THE CASE-HARDENED PLUG"

A New York State Dealer Says:

"Benton Plugs are too good for a garageman to sell, for if he sells a set, he sells no more spark plugs to that customer for three or four years. That is true, but I believe in giving my customers satisfaction."

Price, $1.00

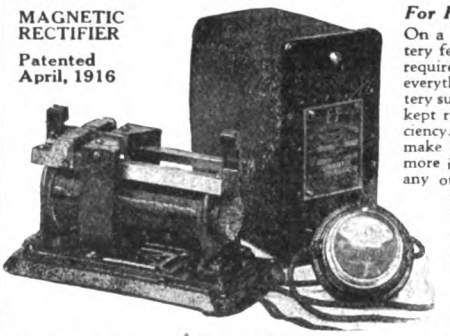
Write for our liberal Agency Proposition and a copy of Booklet shown



L. F. BENTON CO., Vergennes, Vermont
New York Office: 116 Nassau Street

F-F BATTERY BOOSTER

MAGNETIC RECTIFIER
Patented April, 1916



For Public or Private Use

On a frosty morning your battery feels sluggish, more time is required to start your engine, everything is cold and your battery suffers immeasurably if not kept right up to its proper efficiency. Fall and winter seasons make our "Battery Booster" of more importance to you than at any other time. Neglecting to keep the battery in your car fully charged is like losing dollars thru a hole in your pocket. Charges battery at night while in the car from an alternating current lamp socket.

$18 Complete, and up F. O. B. Cleveland

THE FRANCE MANUFACTURING CO., CLEVELAND, OHIO

Ask Your Dealer or Write for Bulletin No. 10

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New Plant of Hartford Machine Screw Co.

Large additions to the extensive plant of the Hartford Machine Screw Co., Hartford, Conn., have recently been completed. This plant now comprises over 200,000 square feet of floor space. Its exceptionally complete facilities cover the production of all varieties of turned metal parts, milled from the solid bar, ranging in size from 1-64-inch to six inches outside diameter. Besides screw machine products of every description, the Hartford Machine Screw Co. manufactures the well known Master spark plugs with calorite insulators; also Master power driven tire pumps.

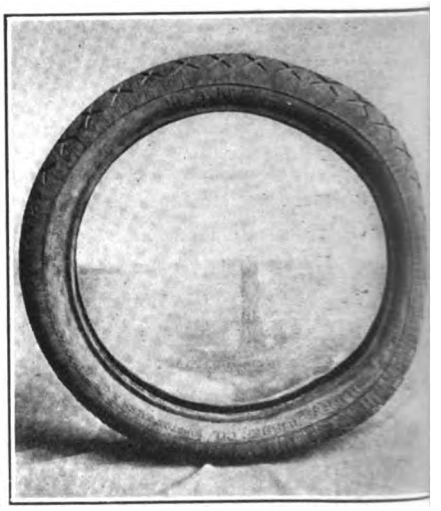
New Selling Plan for Dayton Rubber Co.

R. L. DeVoe, general sales manager of The Dayton Rubber Mfg. Co., has just given out a statement of the selling campaign for the 1918 season. The company has made rapid strides during the past year, working three shifts in the factory, and running 24 hours a day. Sales for the first six months of 1917 were greater than the total of 1916. The new plant which will more than double their capacity will be ready for occupancy by the middle of October. The company has been gradually supplementing its sales force and with the opening of three new branches next month, will employ 50 or more additional salesmen for the coming season. Other branches in principal cities will also be opened. The sales plan of the company is of very great interest to all dealers on account of the unusual advertising and selling co-operation which is offered. The pneumatic tire, which is known as the "Dayton Thoroughbred," is put out on quality basis backed with a sales and advertising campaign that will assure a dealer of a rapid turnover. The few hundred dealers who have been handling Dayton airless tires will welcome the announcement of a vast increase in the production of Ford sizes. A very extensive national advertising campaign has been outlined which will cover all national periodical, farm papers and large list of trade papers. The extensions that have been made places the Dayton Rubber Mfg. Co. as one of the few largest tire concerns in the country. On October 1st the company will pay its regular quarterly dividend at 7 per cent. per annum on the preferred stock.

A New Tire on the Market.

The Hanes Rubber Co., with a capital stock of $500,000, has been organized at Winston-Salem, N. C., to manufacture automobile tires and tubes. All the stock is held by two men. Two years have been spent in constructing the plant and purchasing the equipment. A scientific study was undertaken to ensure a plant to produce good tires as economically as possible. The first tire was turned out in August.

The Hanes company is making the Hanes plain tread, "Ground Gripper"



Hanes Automobile Tire.

non-skid tread, red tubes and gray tubes. A cord tire will be added to the line when the formula has been worked out to the satisfaction of the company.

The present equipment allows an output of 300 tires per day, but this capacity will be doubled when equipment now ordered is installed. The tires are made by the single cure, wrapped tread process.

The officers and owners of the company are: A. S. Hanes, for 11 years the head of the Hanes Hosiery Mills, and John W. Hanes, formerly with the American Tobacco Co. and the Delion Tire Co., of Trenton. Chris Miller, who has been with Dunlop in England and Continental in Germany, is general factory manager.

This represents the first effort on a large scale to establish a tire plant in the South, which many regard as a favorable location because of its proximity to the cotton fabric district. The Hanes are old hands in manufacturing and the progress of the company will be watched with interest in the trade. A heavy advertising effort will be used as a part of the selling plan.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Bearings

ATTENTION!

Ford Owners Garages Repair Shops

This is the Carburetor of today, for Mileage, Service and Speed.

Order before it is too late.

THE

MAYER CARBURETOR

Comes Complete and Can Be Installed in 20 Minutes

Thousands of Ford Cars are equipped with this instrument, and owners are sending us letters daily acknowledging its wonderful performance and giving from 25 to 30 miles on a gallon of gasoline.

A LIMITED AMOUNT OF TERRITORY IS STILL OPEN

For Live Wires, so let us get together without further delay. Write at once how much territory you require, and if same is not closed, an immediate reply will be sent to you outlining our agents policy and discounts.

$15.00

List Price.

J. C. GOREY & CO.

154 West 50th St., New York City

Tires

BUY EARLY AND SAVE MONEY

Double Tread Tires and Tubes

GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Size	Plain	Non-Skid	Tubes
28x3	$4.40	$4.95	$2.00
30x3	5.50	6.05	2.00
30x3½	6.60	7.15	2.50
32x3½	7.15	7.70	2.75
34x3½	8.25	8 80	3.00
30x4	7.70	8.25	2.75
32x4	8.80	9.35	3.00
33x4	8.80	9.90	3.50
34x4	8.80	9.90	3.50
35x4	9.90	11.00	3.60

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Size	Plain	Non-Skid	Tubes
36x4	$9.90	$11.00	$3.60
32x4½	9.90	11.00	3.75
34x4½	11.00	12.10	4.00
35x4½	11.00	12.10	4.10
36x4½	11.00	12.10	4.25
37x4½	12.10	13.20	4.35
34x5	11.00	12.10	4.50
35x5	13.20	14.30	5.00
36x5	13.20	14.30	5.00
37x5	13.75	14.85	5.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.

For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street NEW YORK CITY 112-A East 110 Street

THE HOME OF DOUBLE TREAD TIRES

BUY YOUR "SECONDS"

From a Reputable House

10,000 Seconds in Stock

FOR A SHORT TIME ONLY WE OFFER

		List	Our Price
28x3	Goodrich Pl. Tr.	$13.80	$7.98
30x3	Diamond N. S.	14.86	7.85
30x3½	Firestone N. S.	19.95	11.50
30x3½	Advance N. S.	18.25	11.50
33x4	Keystone N. S. S. S.	29.85	17.80
34x4	McGraw N. S. S. S.	31.25	20.50
35x4½	Firestone N. S. S. S.	48.60	25.00

Other Sizes at Low Prices

A Deposit of 20% with Orders. Balance C. O. D. with Privilege of Examination

Dealers - Write for our weekly stock list and our big discounts off list prices. Special price on Fisk first grade Red Tops.

JANDORF AUTOMOBILE CO.

1769 Broadway New York City

TIRES Fresh Stock ALL NON-SKID

Our Guarantee—4,000 Miles

30x3½	$11.00	34x4½	$23.65
32x3½	12.50	35x4½	24.75
33x4	17.18	36x4½	25.25
34x4	19.00	37x5	29.75

All Standard make Firsts at fair prices.

10% deposit required, 2% off if cash accompanies order.

LEON JAFFESS, Inc.

252 West 55th St., New York City 6106 Euclid Ave., Cleveland, O.

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$5.00	35x4	$9.00
30x3½	5.50	36x4	9.50
32x3½	6.50	36x4½	10.00
32x4	7.00	36x5	10.00
33x4	7.50	37x4½	10.00
34x4	8.00	37x5	10.50
34x4½	8.50		

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes

GINSBERG & BERKOWITZ, Inc.

236 WEST 48th STREET, NEW YORK.

We make liberal allowances for old tires

—— TO APPLY ——

On Purchasing Tyrian Tires

Guaranteed 4000 Miles.

Any 3 in. tire, regardless of condition, we allow $3.50

Any 3½ in., $4.00 4 in., $6.00

" 4½ in., 7.50 5 in., 10.00

Write us for price and full particulars

General Automobile Supply Company

1671-1673 Broadway New York City

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Tires

SPECIAL WINTER OFFER
—ON—
DOUBLE TREAD TIRES
AT A SAVING OF 75%

A Special Discount of 5% When Cash Accompanies Order. **We Also Give Special Discount to Dealers**

The following are our net prices on Doucle Tread Tires and New Tubes of Standard Makes kept on stock:

Size	Plain	Non-Skid	Tubes
28x3	$4.50	$5.00	$1.95
30x3	5.50	6.00	2.05
30x3½	6.60	7.35	2.40
32x3½	7.00	7.70	2.55
34x3½	7.70	8.25	2.70
31x4	7.70	8.25	3.15
32x4	7.70	8.25	3.35
33x4	8.80	9.50	3.45
34x4	9.90	10.50	3.60

Size	Plain	Non-Skid	Tubes
35x4	$9.00	$10.00	$3.70
36x4	9 00	10.00	3.80
34x4½	10.00	11.00	4.40
35x4½	10.00	11.00	4.50
36x4½	10.00	11.00	4.60
37x4½	10.00	11.00	4.75
35x5	11.00	12.00	5.35
36x5	11 00	12.00	5.45
37x5	11.00	12.00	5.55

For retreading your old tires, prices on request.

Make sure when ordering tires to state whether Q. D., Straight bead or Clincher type.

We carry a full line of New First and New Second Tires at a big saving. Write for prices mentioning sizes. Prices upon request.

TERMS: 10% DEPOSIT, BALANCE C. O. D.

I. JAFFESS

Two Stores, 1319A Fifth Avenue, 241 West 54th Street, NEW YORK CITY

DOUBLE TREAD TIRES

—GUARANTEED—

Size	Plain	Tubes	Size	Plain	Tubes
28x3	$5.00	$2.00	35x4	$9.75	$4.25
30x3	5.25	2.25	36x4	10.00	4.35
30x3½	7.00	2.50	34x4½	10.50	4.50
32x3½	7.50	2.90	35x4½	10.50	4.50
34x3½	8.00	3.00	36x4½	11.50	4.75
30x4	8.25	3.25	37x4½	12.00	4.90
32x4	8.50	3.30	35x5	12.00	5.00
33x4	9.00	3.75	36x5	12.50	5.25
34x4	9.50	4.00	37x5	13.00	5.50

For (Non-Skid sizes) up to 30x4, 50c Extra.

All other sizes $1.00 Extra.

Examine your worn tires when taking them off, and if the bead is not cut, ship them to us. We will remake them into a GOOD Double Tread Tire at 60% of the above prices.

When ordering, be sure to state what bead tire is required. Whether Q. D. Clincher or Straight Side.

10% Deposit required on C. O. D. orders.

SPECIAL Offer to Agents

Write for Catalogue

Get our special price on new tires.

M. Liben & Co.

205-A West 48th St. New York City

INSYDE TYRES,
inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.
AMERICAN ACCESSORIES CO., Dept. AD3, Cincinnati, Ohio

CUT PRICES

On Seconds and Factory Blemished Tires of Standard Makes

Prices You Won't Find Equalled Anywhere

Our Business is Done on Straight, Clean Cut Methods

OUR TIRE VALUES STAND RIGID COMPARISON

You May Return Any Tires Bought from Us if Not Sold within Thirty Days.

We Are Sole U. S. Agents for Mastic Strain Proof Red Inner Tubes. Guaranteed for One Year.

Write for Prices. We Sell Only to Dealers.

MANUFACTURERS SURPLUS TIRE CO.
788 Seventh Avenue, New York

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	You furnish 2 Casings	You furnish 1 Casing	We furnish Both Casings
28x3	$2.00	$3.00	$3.96
30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
37x5	5.00	9.00	12.00

Ship Your Old Tires by Prepaid Express
McDANIEL RUBBER CO.
613 Ohio Street **Cairo, Ill.**

Tires

DEALERS AND BUYERS
Send for prices on Good Factory Seconds
STAR RUBBER COMPANY
1781 Broadway Tel. 123 Columbus New York City

CHEAP DOUBLE TREAD
NEW AND SECOND HAND
Tires and Tubes
Write for Prices
JAFFE BROTHERS
260 West 54th Street NEW YORK CITY

Auto Accessories

AFFA SPECIALTIES

For FORD and Other Cars. They stop the rattles in the Steering Spindles, the Brake Rods, the Clevises, the Control Rods.

AFFA SPECIALTY COMPANY
34 SOUTHBRIDGE ST. WORCESTER, MASS.

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

BLOW-OUT PATCHES
ANY SIZE 22c. each in quantities
INTERSTATE RUBBER CO., 259 W. 15th St., PHILADELPHIA

We Still Have a Few 100-lb. Box Assortments

BOLTS, NUTS, SET SCREWS, RIVETS, FILISTER HEAD SCREWS, KEY STOCK, ETC., ETC.
$5.00 per 100 lbs.

We carry large stock piston rings, plain, also Inland patent rings, cork composition packing.
MAGNETO BALLS, $6.00 - 100 ASSORTED
Write for prices. *Anything required*
WESTCHESTER ACCESSORIES CO., Inc.,
1777 BROADWAY NEW YORK

Magnetos and Batteries

Hecht's Magneto Exchange

Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.

Expert Repairing of All Makes.

Express your Magneto, Starter and Generater to us Same will be repaired and returned same day as received.

Distributors and Service Station for
BERLING SWISS, NATIONAL and MICHIGAN MAGNETOS
— Also —
Esterline Generators, Norma Ball Bearings and all kinds of Parts carried in stock for all makes of Magnetos

230 WEST 49th STREET NEW YORK CITY

USED MAGNETOS
Bosch High Tension, $15 up
Save 50% to 75%
Herbert Aucock, 222 Columbus Ave., Boston, Mass.

Cylinders Reground

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave. Chicago, Ill.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 52 West 57th St., New York City.

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Piston Rings

CYLINDER GRINDING PISTONS
— AND —
RINGS

Largest Because Best.

Send for Price List.

Houpert Machine Co.
355 West 52nd Street
New York, N. Y.

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Great Sale of Auto Bodies

An Opportunity for Live Dealers

We announce one of the most important sales of new and rebuilt auto bodies that we have ever inaugurated. Every type of body is included and the list includes many fine examples of the coach builders' art, at the lowest prices ever quoted.

Touring Bodies **Raceabouts**
Roadsters **Landaulets**
Coupes **Sedans**
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Prices as low as $5.00—values that mean big profits to dealers. If you can drop in we will be pleased to show you the full line and quote you prices. Out-of-town dealers will receive full information on request. Let us know your requirements. We can save you *money*. Large stock of windshields, racing seats and tanks.

THE JANDORF AUTOMOBILE CO.
1763 Broadway **New York, N. Y.**

Radiators and Lamps

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.
HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
BRANCH: 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATORS REPAIRED
We also make and repair
FENDERS, HOODS and TANKS of all kinds.
DAVIS & SCHEGG CO., 2124 Broadway, New York

Gears and Parts

STODDARD DAYTON PARTS and GEARS FOR ALL MAKES OF CARS SEND IN YOUR OLD ONES
These parts are new parts.
THE DAYTON AUTO PARTS CO.
351 West 52nd Street, New York City **1623A McGee Street, Kansas City, Mo.**

COIL AND MAGNETO PARTS
Platinum—Tungsten
H. & L. MFG. COMPANY
33-35 Liberty Street **NEW YORK**

SAVE 50% TO 75% ON PARTS—Parts for Pope-Hartford, Columbia, Reo, Buick, Overland, Chalmers, Mitchell, Thomas, Oldsmobile, Maxwell, Stoddard-Dayton, Stevens-Duryea, Corbin, Cadillac and all others. Eiseman, Splitdorf and Remy magnetos, $5.00 to $10.00. Bosch high tension magnetos, $15.00 to $25.00. Also the Mea, Connecticut National, U. & H. and K. & W. magnetos in stock. Springs, wheels, axles, etc., for all cars. Connecticut Auto Parts Co., Inc., 1070 Main St., Hartford, Conn.

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WORLD'S LARGEST CYLINDER REPAIRING COMPANY
Over Sixteen Thousand Satisfied Customers

SCORED
(Porous and sand hole)
CYLINDERS

Repaired with Silver-Nickel Alloy
Fused Electrically by the "Lawrence Patent Process."
BEWARE OF IMITATION WORK
No Warping or Enlarging of Bore
Same Pistons and Rings Used—All Work Guaranteed for Life of Car
Reshipped 24 hours after received. Tested and approved by most motor manufacturers.
Write for Pamphlet.

L. LAWRENCE & COMPANY
(Established 1862)
—PLANTS AT—
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Chicago, Ill.....1520 Michigan Avenue
New York.....546 West 45th Street
Cincinnati, O.....410 Richmond Street
Newark, N. J.....290 Halsey Street
Cleveland, O.....1810 Prospect Avenue

ATTENTION

Auto Owners, dealers and repair men. Highest grade plain ground mitre, or step joint piston rings for every make of motor 30c. to 40c. each. Piston pins in standard or any number of thousandths oversize for every model and make of motor, in stock, lowest prices. Light grey iron pistons standard and oversize for every make of motor, same price as heavy type. Leakless rings, the best rings today, no advance in price.
McCADDEN MACHINE WORKS, Inc.,
ST. CLOUD, MINNESOTA

CYLINDER REGRINDING PISTONS, RINGS and PINS

Quality work. Get our prices.
BUTLER MANUFACTURING CO.
ESTABLISHED 1897.
1121 EAST GEORGIA **INDIANAPOLIS**

Tire Repairing

TIRE SPECIALTY CO.
EXPERT TIRE REPAIRING
Guaranteed Work Moderate Price
757 Seventh Ave. 'Phone, 528 Circle. New York City

For Sale

FUR LINED OVERCOATS

Black wool kersey cloth, lined with selected muskrat skins, beautiful blended muskrat shawl collar, double breasted, length 50 and 52 inches. Sizes 36 to 44 ready for delivery. An exceptional opportunity to secure a handsome garment. Price

$39.50

Usually retailed at $75. Direct from Manufacturer. You save all middlemen profits, and take no risk.

Sent for Examination

Examine and try on before paying. Write today stating chest measure, height and weight. Enclose $1 for express charges only, and coat will be sent at once.

E. HART, Dept. B, 518 West 134th St., New York

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

FOR SALE—Gasoline tank and pump, 2" retreading moulds and cash register. Vanderpool Co., Springfield, O.

FOR SALE—Make money easy. While business is good. Vulcanize tires. Our book tells you how. $1.00. Vanderpool Co., Springfield, Ohio.

FOR SALE—Patent No. 1238050, issued August 21, 1917. A tool for making easy removal of tires from demountable rims. Contracts and expands rim into place. For particulars, address Chas. A. Peterson, Fields Landing, Calif.

LATHE FOR SALE—Pond 13-in. by 4½-ft. bed engine lathe, second hand, $100. Woodward Machinery Co., 514 Main St., Cincinnati, Ohio.

USED VULCANIZERS FOR SALE—Good as new; price low. You save the difference. W. W. Boob, 1944 Fairfax Ave., Cincinnati, Ohio.

FOR SALE—Garage, dwelling and one extra building lot in town of 300 population. Rich farming community to draw from. Have Ford agency, established six years; $5,500 takes all; stock at invoice; terms, one-half down. Reason for selling, want to go South. Address, R. O. Wones, Maplewood, Ohio.

MACHINERY FOR SALE—Lathe, 16-in. by 6-ft., Ames S. C. compound rest, full equipment, no chuck, overhauled, $200. Milling machine, Lincoln type, back geared, table 7 ft. by 30 in., vise, arbor and countershaft; price, $90. Send for photo. J. L. Lucas & Son, 3 Fox St., Bridgeport, Conn.

Patents

IMPROVEMENTS WANTED—Send for free bulletins and advice. Book, "Inventions—Patenting and Promoting," free. Lancaster and Allwine, 212 Ouray Bldg., Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

Welding

ACETYLENE WELDING
New Process—Brazing of Aluminum Crank and Gear Cases
GIVE US A TRIAL
DAVIS & SCHEGG CO., 2124 Broadway, New York

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Wanted

WANTED—Second-handed tire vulcanizer. State model and best cash price. Split Hickory Wheel Co., 1196 Sycamore St., Cincinnati, Ohio.

WANTED—a contract to design and build aeroplane motors embodying McCadden light grey iron pistons, fast cam shaft, removable sleeves, high pressure oiling system, super heater, etc. I have the ability and the plant. George McCadden, Box 582, Minneapolis, Minn.

Miscellaneous

COUPON Books for gasoline and supplies. Samples free. J. P. Forbes, Coshocton, Ohio.

IF YOU OWN A FORD CAR—Have some spare time and want to make money, write the Smith-Wilde Mfg. Co., 78 Clinton St., Newark, N. J. They can show you something.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Rectifiers

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

A Clever Window Display and Counter Stand.

We illustrate a new and very attractive window display and counter stand which has been brought out by the Atlas Auto Supply Co., 656-660 West Austin avenue, Chicago, Ill., for dealers in "Tire-Doh."

The window display size of this design stands 27 inches high by 42 inches wide and is beautifully lithographed in five colors. It shows on the left a badly torn inner tube, which tube is shown on the right after being repaired with Tire-Doh, inflated and ready for the road.

The copy is carefully prepared to show the reader the ease and speed with which Tire-Doh can be used to repair all kinds of tears, cuts, punctures, rips and holes in rubber goods, particularly inner tubes and casings.

Excellence of finish and durability of construction will make it possible for this display to stand up and do its duty



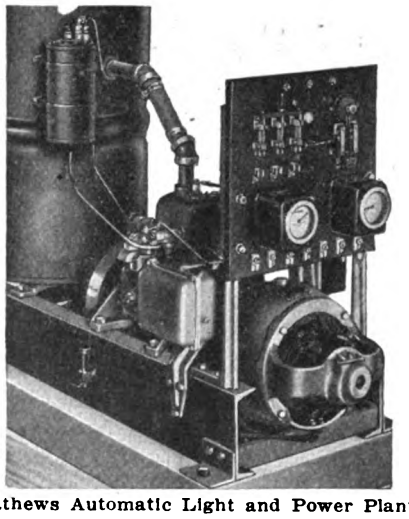
A Window Display and Counter Stand for Dealers.

as long as it is used wherever a Tire-Doh window is desired.

The counter size of this display, which is an exact reproduction of the large design for windows, will stand seven inches high by approximately 11 inches wide and in the center will have an opening cut out for the insertion of an individual can of junior size Tire-Doh outfit retailing for 50 cents. Dealers interested in obtaining one or both of these displays should write direct to the Atlas Auto Supply Co.

Matthews Automobile Light and Power Plant.

For several years, the Matthews Electric Light & Power Plants, both the standard and marine types, have been well known particularly on the Atlantic



Mathews Automatic Light and Power Plant.

coast, and now a most healthy growth has forced a factory development of a uniform type, and a rapid expansion into the hitherto undeveloped territory of the Middle West.

The Consolidated Utilities Corp., Chicago, Ill. (national distributors), announce that either type of plant fully automatic or semi-automatic is now available in either 1, 2 or 5 K. W. capacity. The automatic plant has more than four years successful operation. This plant not only stops automatically but is self-starting, whenever the batteries have been discharged 15 per cent. of their capacity or whenever the load, or current demand, is in excess of that which the battery should furnish.

It will readily be seen that a plant of this type will protect the battery against its two greatest enemies, overdischarged or remaining discharged. Moreover, it is a great blessing to the user, because he doesn't have to keep the batteries "on his mind."

The new sales campaign, which is broad and complete, provides real dealer co-operation and territory organization along intensive and aggressive lines, insuring to the large dealer his share in the enormous growth of the farm lighting business.

Laurel Motors Corp. to Build New Factory.

The Laurel Motors Corp., which has taken over the Laurel Motor Car Co., has purchased a factory site in Anderson, Ind., and will erect a modern plant for the manufacture of Laurel cars and trucks, and expect to be operating the new plant about January first. The Laurel Motor Car Co. has been manufacturing cars in Richmond, Ind., for the past two years and there has been a great demand for their car. The new plant will enable the company to have a large production and take care of agents and territory with whom contracts previously could not be made on account of insufficient facilities to turn out cars. The company will use a new 16-valve engine designed by Robert M. Roof of Anderson, Ind., whose 16-valve head for Ford cars has attracted wide attention. The new model for 1918 will have 116-inch wheel base and all the popular types of bodies will be furnished. Pending the completion of the new plant the Laurel will be produced in temporary quarters at Anderson. It is estimated that the production for 1918 will be from three thousand to five thousand cars. The price has not yet been publicly announced but it is reported the pleasure car will be in the $1,000 class.

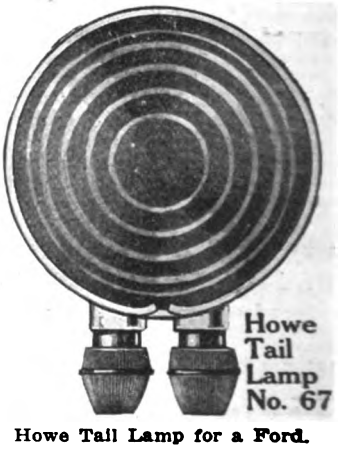
New District Representatives for Diamond T. Truck.

At the annual sales conference of the Diamond T Motor Car Co., the following men were appointed district representatives: Frank S. Hyman, formerly with the Packard Motor Car Co., will assist dealers in Michigan, Ohio and Kentucky. Headquarters will be in Cleveland, O. E. T. Strickland, formerly manager of the Kansas City branch of the U. S. Tire Co., will cover Kansas, Oklahoma, New Mexico and Texas. Headquarters will be in Kansas City, Mo. Louis E. Wagner, formerly with Baker Motor Vehicle Co., will be general representative for the territory including North Carolina, South Carolina, Florida, Georgia, Mississippi, Alabama, Louisiana and Tennessee. Headquarters will be in Atlanta, Ga. R. A. Breeden, formerly general representative for the Diamond T, will devote his exclusive attention to Northern Illinois, Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Colorado and Nebraska. He will make his headquarters in Minneapolis, Minn. Joseph S. Conroy will continue to act as district manager for the Chicago territory.

Howe Manufacturing Company Marketing Tail Lamps.

The Howe Mfg. Co., Chicago, Ill., makers of the well-known Howe spotlight, have announced to the trade a complete line of tail lamps. Their introductory announcement to the trade in a circular, contained this description:

"All Howe tail lamps are equipped with National Mazda 6-volt, 2 candle



Howe Tail Lamp for a Ford.

power bulbs, double contact unless otherwise specified. Each lamp is packed in high grade, individual, labelled carton. The lenses are genuine ruby semaphore. The finish is high grade black enamel."

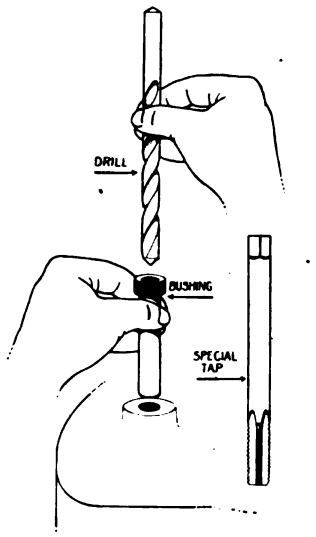
The tail lamp illustrated is made espe-

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cially for Ford cars and has 2 bulbs and 2 plugs. The one bulb is an 18-volt taking its current directly from magneto when the engine is running. The other bulb is 3-volt connected to two dry cells. When the engine is running, current is supplied by the magneto. When the engine is idle, a throw of the switch to the dry cells continues the light. The same care and quality goes into the production of Howe tail lamps as is used in the manufacture of Howe spotlights. Very attractive prices are being made, the circular says, due to the large volume of lamps produced by this concern.

The Handy Tap and Drill Set.

Every man who has overhauled a Ford car knows that drilling sheared-off bolts in the cylinder blocks is usually a ticklish and mean job, but with the Stevens tap and drill set illustrated herewith absolute accuracy is assured. Guessing as to the center of the bolt is eliminated by a special bushing which absolutely does the trick. This bushing fits snugly into the hole and unerringly guides the drill through the exact center of the



Showing Use of Stevens Tap and Drill Set.

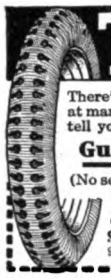
bolt. The tap is thus enabled to dislodge deftly every particle of the broken bolt thread, leaving the hole absolutely clear for a new bolt of the original size. This special bushing feature is included in every set and the tap and drill set is put up in a neat wooden box, at a retail list price of $1.00. This is a quick selling device for any dealer. Readers who are interested should write direct to Stevens & Co., 375 Broadway, New York City.

MECHANICAL DRAWING.

By Ervin Kenison, S. B., Instructor in Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 140 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price.....$1.00

Sent to any address postage prepaid, on receipt of price. Address

M. T. RICHARDSON CO., Publishers,
71-73 MURRAY STREET, NEW YORK



TIRES 1/3 LESS

There's a way to obtain high-grade tires at manufacturers' prices. Write and we'll tell you. Freshly made tires, every one

Guaranteed 6000 Miles

(No seconds). All sizes, non-skid or plain. Shipped prepaid on approval. This saving on guaranteed quality will open your eyes. State size tires used.

SERVICE AUTO EQUIPMENT CORPORATION
951 Westover Building, Kansas City, Missouri.

TES-TITE
PISTON RINGS

are made with an eye single to absolute technical precision. The highest—very highest in efficiency—but lowest in price for piston rings of their character.

Separate envelope for each ring with installation directions. Packed 12 in a box for the trade.

Write for literature.

TES-TITE PISTON RING CO., Inc., Freeport, N. Y.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF AUTOMOBILE DEALER AND REPAIRER, published monthly at New York, N. Y., for October 1st, 1917.

STATE of New York } ss.
COUNTY of New York }

Before me, a notary public in and for the State and county aforesaid, personally appeared Frank R. Whitten, who having been duly sworn according to law, deposes and says that he is the business manager of the Automobile Dealer and Repairer, and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

NAME OF—

Publishers—Motor Vehicle Publishing Co., 71-73 Murray St., New York City, N. Y.

Editor—M. T. Richardson, 71 Murray St., New York City, N. Y.

Managing Editor—M. T. Richardson, 71 Murray St., New York City, N. Y.

Business Managers—F. R. Whitten, 41 Pinehurst Ave., New York City, N. Y. M. T. Richardson, 71 Murray St., New York City, N. Y.

2. That the owners are:

Motor Vehicle Publishing Company, 71-73 Murray St., New York City, N. Y.

STOCKHOLDERS—M. T. Richardson, 71 Murray St., New York City, N. Y.
F. R. Whitten, 41 Pinehurst Ave., New York City, N. Y.
A. J. Richardson, Ridgewood, N. J.
Cornelius Doremus, 66 Broadway, New York City, N. Y.
Mrs. J. Howard Girardeau, Jr., Monticello, Fla.
Mrs. Guy Ulmer, Monticello, Fla.
Mrs. Harriet L. Johnston, New Rochelle, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear on the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

MOTOR VEHICLE PUBLISHING CO.,
Publishers,
Automobile Dealer and Repairer.
F. R. Whitten, Business Manager.

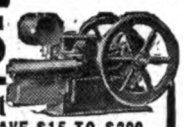
Sworn to and subscribed before me this 29th day of September, 1917.

Thos. H. McGoldrick,
Notary Public.

(SEAL)

(My commission expires Mar. 30, 1918.)

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Immediate Shipment

Direct from Factory—SAVE $15 TO $200—Simple in construction, strong and powerful, few working parts--easy to understand, easy to operate, easy to own. Buy practically on your own terms--Cash, Payments or No Money Down. 90-Day Trial--5 Year Guarantee. Write for latest prices.--ED. H. WITTE,

WITTE ENGINE WORKS
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2497 Empire Bldg. Pittsburgh, Pa.

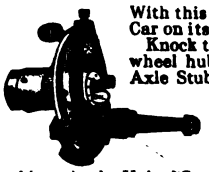


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COMBINATION
Water-Soap-Towel

All in one, ready for use. Every motorist should have one. At your dealers or direct, $1.00 prepaid. Refillers 50c., (tube of liquid and roll of paper towels,) 2c. a wash. Weight 29 oz. Size, 11x3¼".

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1714 Cherry Street PHILADELPHIA, PA.

EKERN'S EMERGENCY AXLE No. 3 FOR FORD CARS.



With this device you can place the Ford Car on its own wheels in two minutes. Knock the broken axle stub out of the wheel hub, place wheel on Emergency Axle Stub and hook the Device on the flange of the Axle Housing and the Ford can be pulled in at any speed desired with safety. Weight 8 lbs.

Sent Express Prepaid to any address in the United States for $4.90. Cash with order.

EKERN BROS. MFG. CO., Flandreau, SOUTH DAKOTA

AMERICA'S TESTED TIRES
GOODRICH
BLACK SAFETY TREADS
The B. F. Goodrich Rubber Company
The City of Goodrich, Akron, O.

"BRAINS IN THE REAR AXLE"
BAILEY
Non-Stall
DIFFERENTIAL
Bailey Non-Stall Differential Corp.
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"OTHERS"

The late General Booth's message to his Officers all over the world: "OTHERS"

There are numbers of poor folk in all our big cities who depend upon

The Salvation Army

for assistance during the long Winter months.

Will You Help Us

Help "Others" less fortunate than yourself?

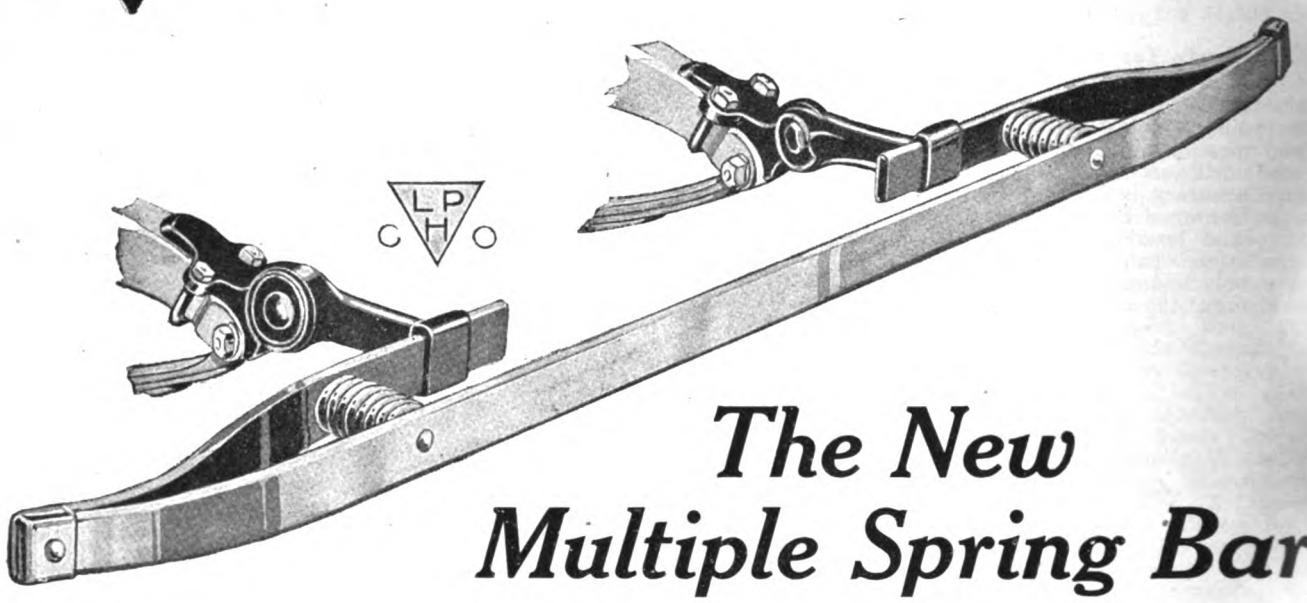


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The New Multiple Spring Bar

The latest and greatest improvement in bumper construction.

An absolutely new bar construction, comprising a heavy spring steel front bar joined to two supporting bars by means of flexible connections that eliminate breakage.

The final shock-absorbing qualities are attained through heavy buffer springs between the main and support bars.

The result is a bumper with no weak spots, but with the greatest resilience and shock-absorbing qualities ever attained in bumper construction.

We furnish this bar with the fittings shown in the illustration or with any of the Halladay fittings.

HERE IS A WINNER FOR LIVE DEALERS

The experienced car owner instantly recognizes its mechanical qualities and efficiency, and everyone appreciates its thorobred lines and beautiful finish

Get busy now and get the business of your vicinity; write your jobber or the nearest distributor.

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"Tug O' War"

DEALERS, have your customers make this test. Stick two Firestone Cementless Tube Patches together. Let your customer hold one. You hold the other. Then for the Tug o'War.

Throw your entire weight into it. Pull! Tell your customer to do his best. The patches will hold fast. You can't pull them apart.

You'll be surprised how this Tug o'War test will convince motorists. They know about these Cementless Tube Patches but they like to be "shown."

There's no better way than the Tug o'War test to prove the strength and gripping power of these patches.

At the time you make the test call the motorist's attention to the hand-buffed feather-edged finish. No puckering or creeping.

Tell your customers about all the Firestone Accessories. All you need do is to introduce them. Repeat business grows rapidly. Remember our selling co-operation is always at your service.

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Akron, Ohio — Branches and Dealers Everywhere



FIRESTONE LACE-ON BOOT
Fits any style or type of tire. Furnished with extra long lace. Hook-On style also.



FIRESTONE "CURE-CUT"
A soft, strong rubber gum for filling in tread cuts and snags.



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Strong and reliable, holds tire securely after cut or blow-out.

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IN THE

New York Show Number

OF THE

Automobile Dealer and Repairer

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You Too, Can Make Big Money.

We need immediately more men like Paul R. Fredricks, to manage Haywood Tire Repair Stations. "Just a year in the business and now doing $400 to $450 a week at a good round profit" tells the story of this ambitious young man's rapid rise to fortune. Scores of men like Fredricks have found their independence in the Tire Repair business, have opened Haywood shops and are making big money. The coupon below or a postcard with your name and address will tell you how to start. Send today.

Tire Repairing Revolutionized.

Motorists to Save Millions in Tire Expense.

The Haywood method of tire-repairing is different—**Scientific.** It strikes a new chord in tire economy. It is efficient—saves tires—increases mileage—**lasts.** It has required years of experience to develop it. Practical tests have proven it. Its superiority is acknowledged—accepted by those who know, as a **Triumph.**

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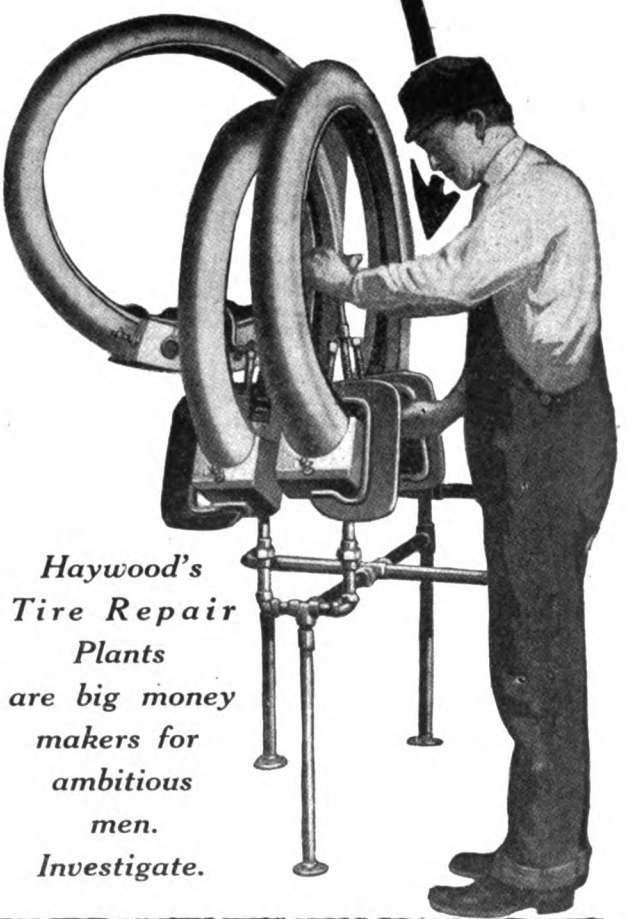
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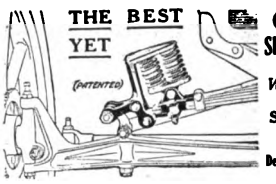
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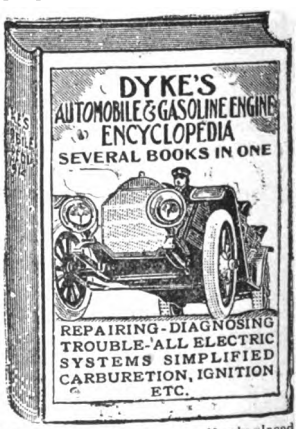
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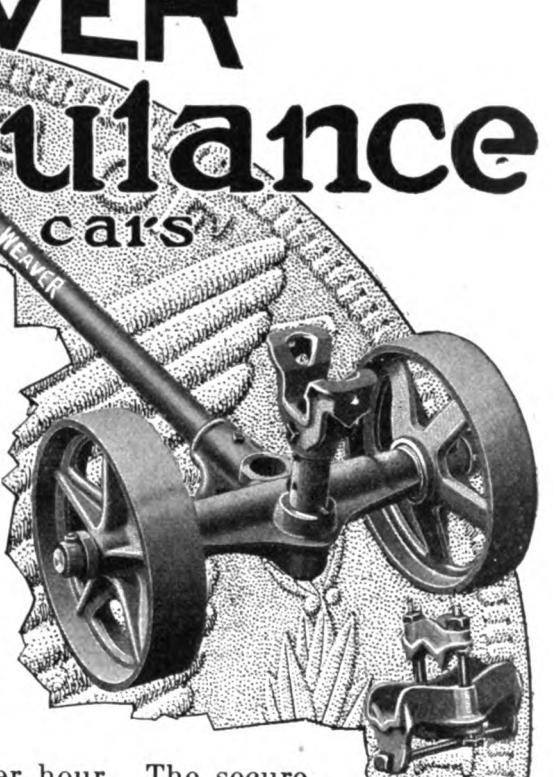
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AT "one dollar per mile", or whatever YOUR basis of charge may be for tow-in services, the Weaver Auto Ambulance will pay for itself in a few trips.

It enables one man to run out and tow in a crippled car in one-fifth the time it would ordinarily require two or three men to do the same work with the improvised methods usually employed.

The strong, rugged construction and the high, broad wheels equipped with roller bearings, make it possible to tow cars over country roads at a rate of 15 to 20 miles per hour. The secure clamping construction eliminates all chance of accident.

A "One-Man" Equipment

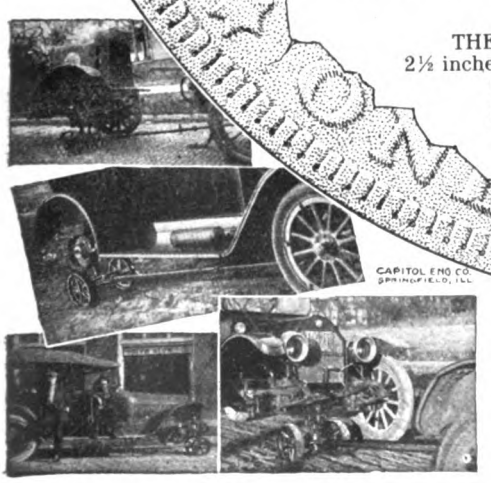
Though amply strong, this Ambulance is sufficiently compact and light to enable one man to handle it with ease. When under the front axle, the tongue does the guiding—so it is not necessary to have an operator in the rear car.

For Front or Rear Axle

The Weaver Ambulance is the product of a careful study of the conditions to be contended with in this kind of service. It will attach to either front or rear axle and has a wide range of adjustment to adapt it to any car.

Construction

THE TELESCOPING STEEL TONGUE is adjustable every 2½ inches from 6½ to 11 feet. The axle is 1¼ inches in diameter and extends entirely through the frame, giving ample support for the heaviest loads. The wheels are cast steel, 14 in. in diameter.





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One of our favorite demonstrations is to have a customer try to break a wheel with a ten pound sledge.

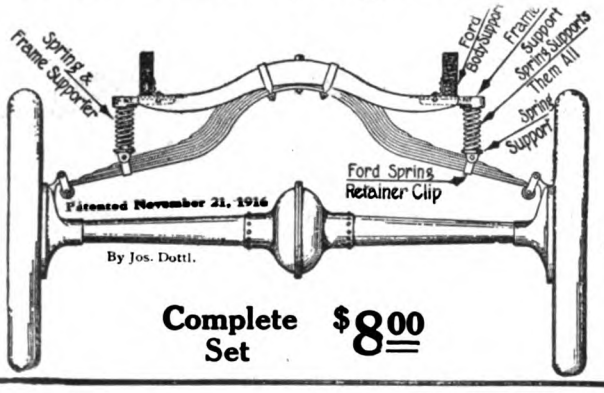
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An Economical, Effective and Valuable Device.

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Prevents striking and breaking housing, axle and Fenders, overcomes shearing of center bolt, sagging springs and tilting bodies. Supports frame, improves appearance and riding qualities. Saves the Tires. Acts as an Ideal Shock Absorber.

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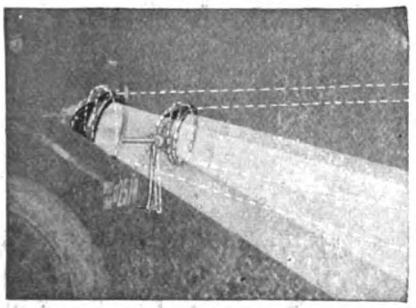
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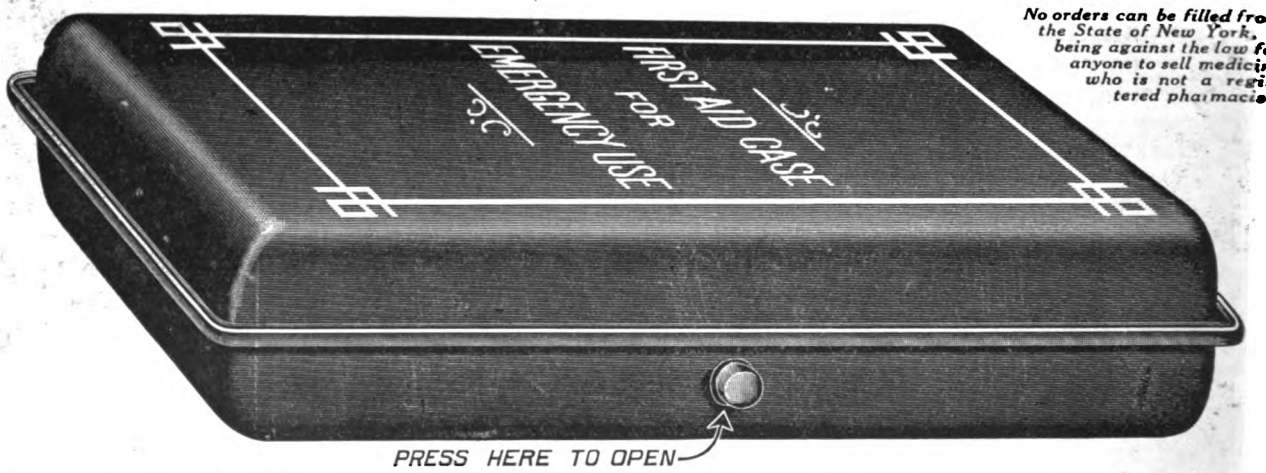
STEVENS & COMPANY, 375 Broadway, New York

STEVENS NEW YORK

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TO MEET WITH AN ACCIDENT ON THE ROAD.

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The contents have been carefully selected to supply the needs in an emergency, before the doctor comes. All gauze, bandages and cotton have been prepared in aseptic laboratories under the same rigid inspection as those supplied to the United States Army and Navy.

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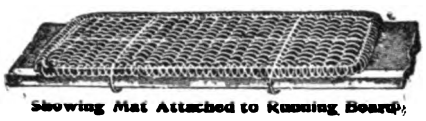
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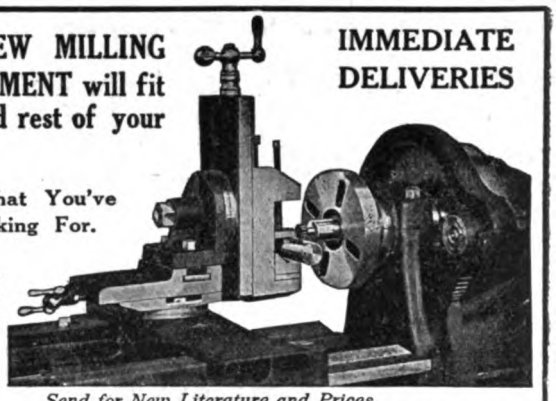
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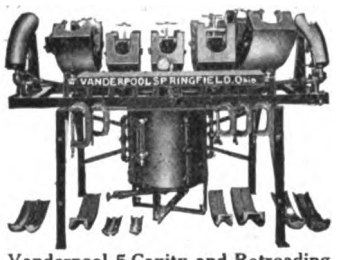
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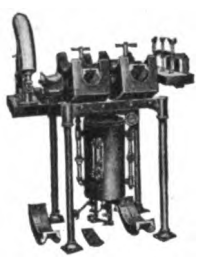
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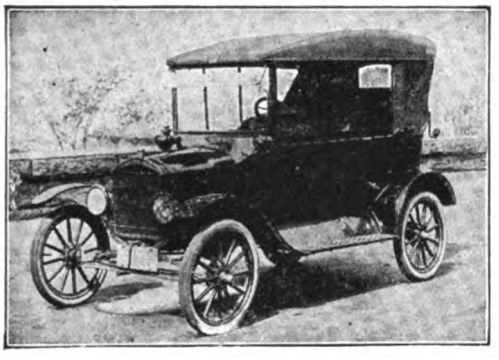
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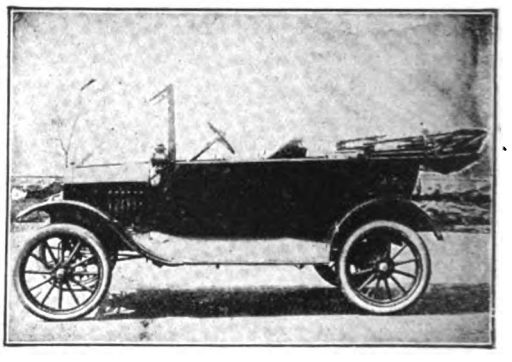
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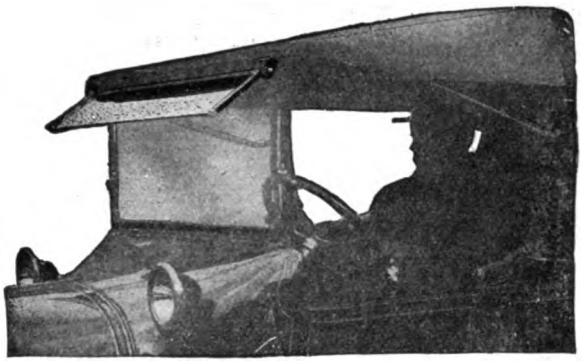
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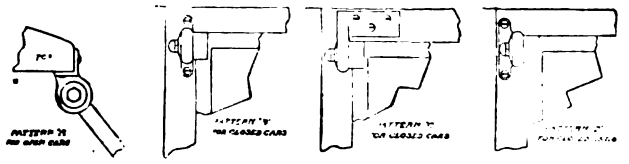
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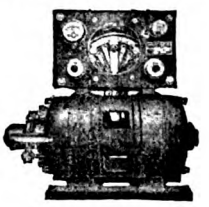
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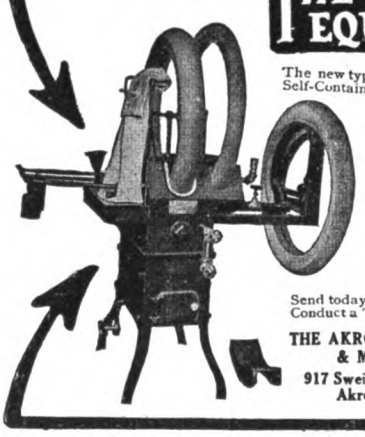
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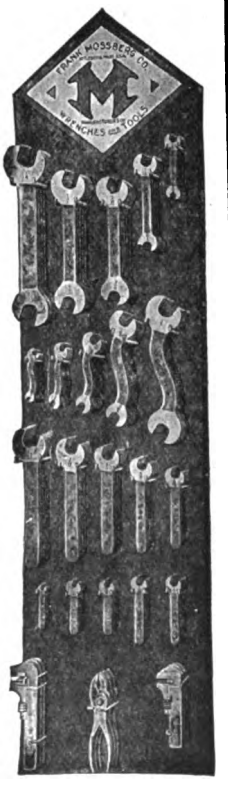


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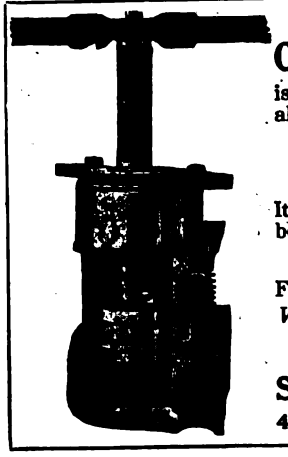
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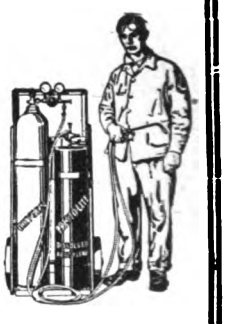
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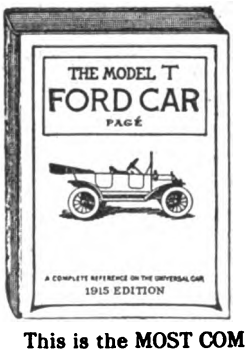
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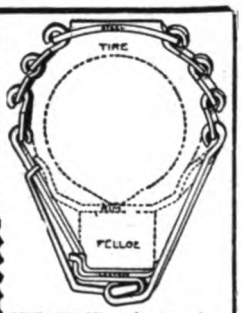
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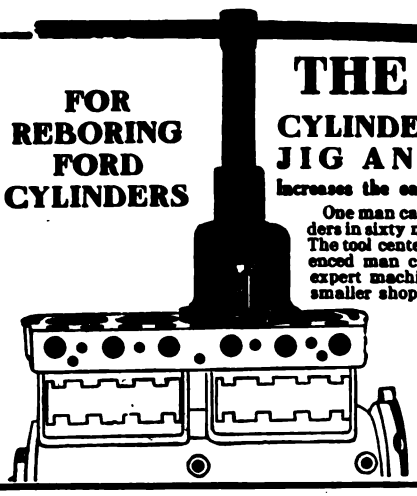






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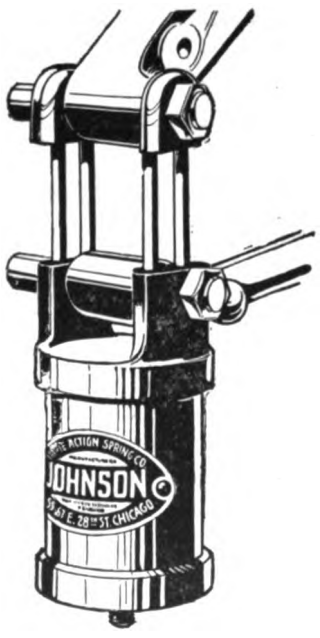
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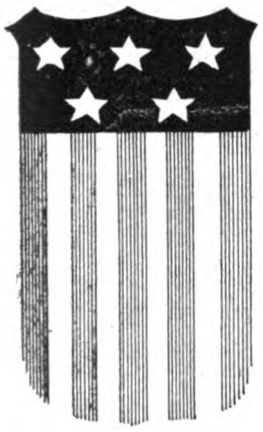
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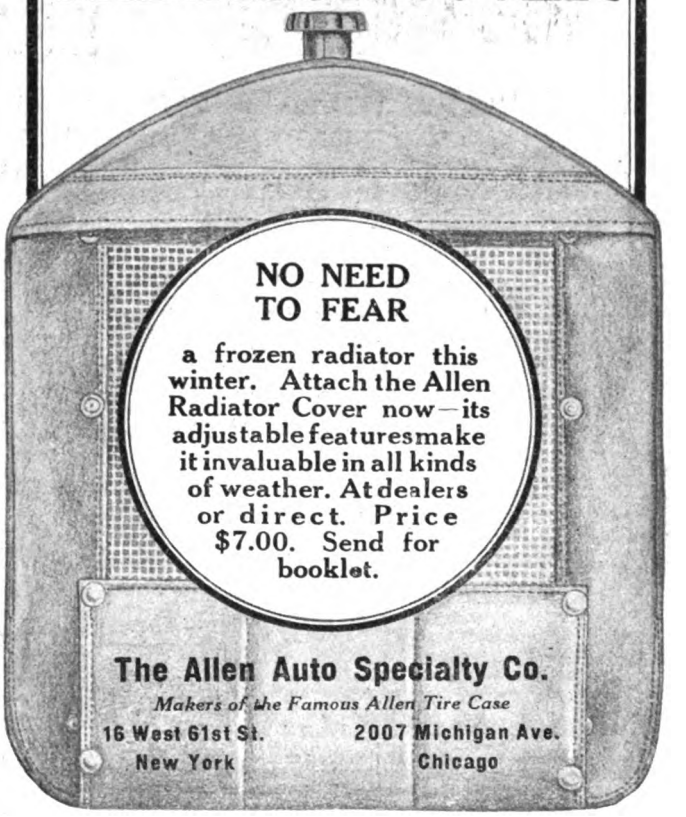
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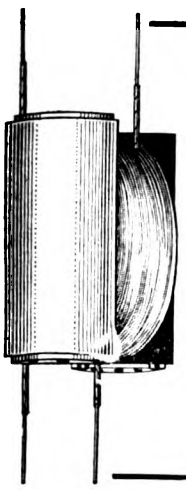
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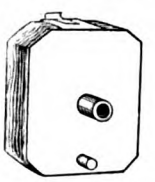
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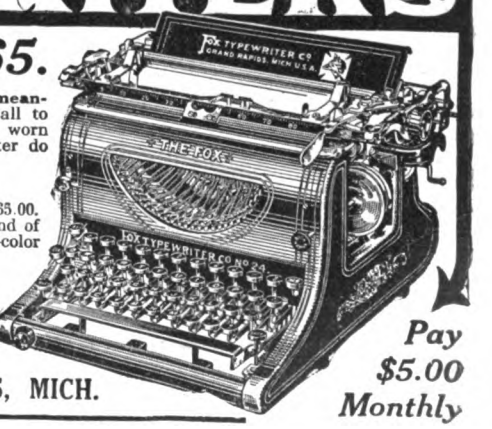
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MORE MILES PER TIRE
LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

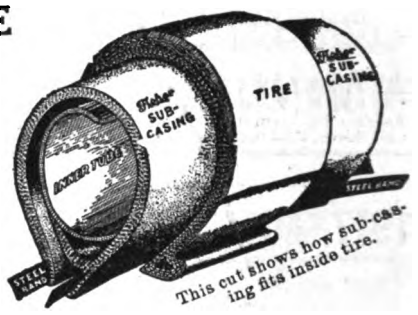
A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

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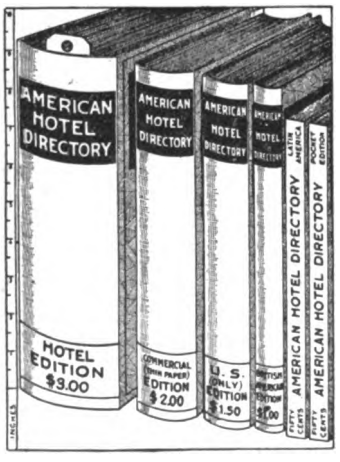
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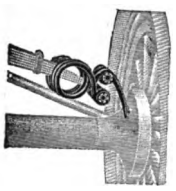
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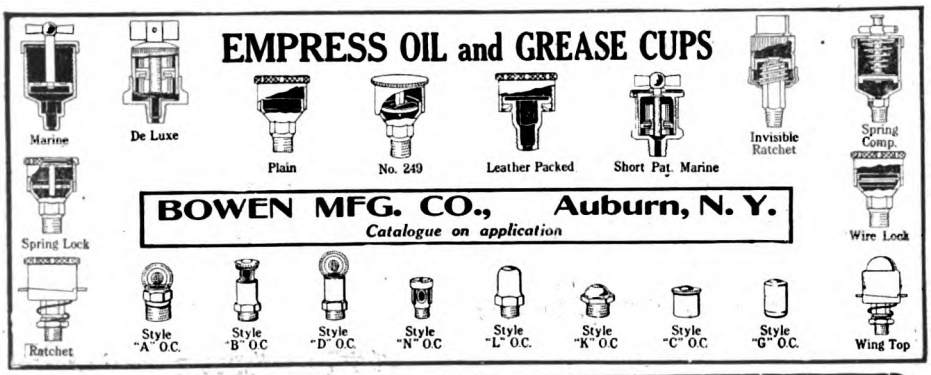


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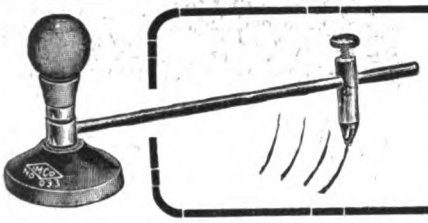
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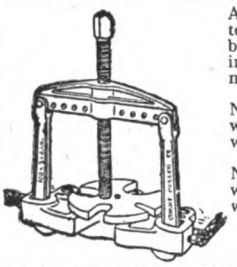
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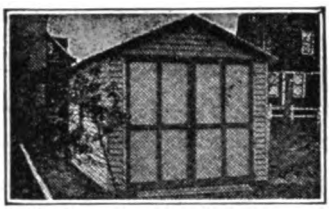


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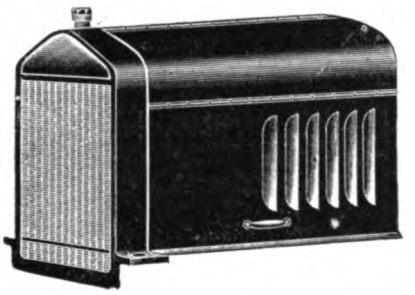
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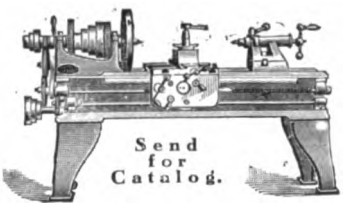
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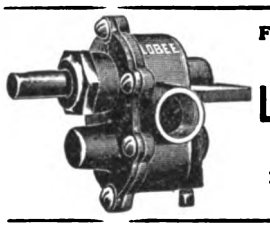
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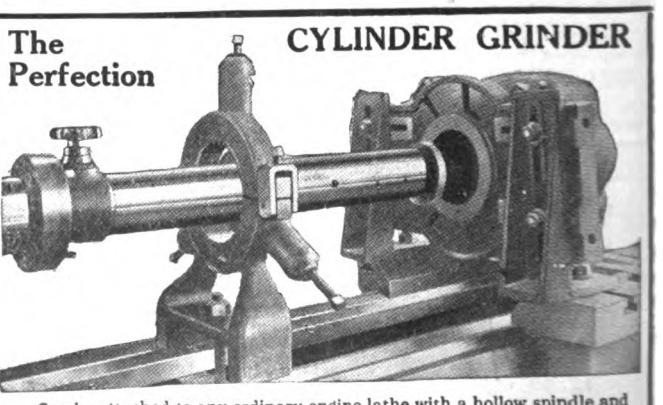
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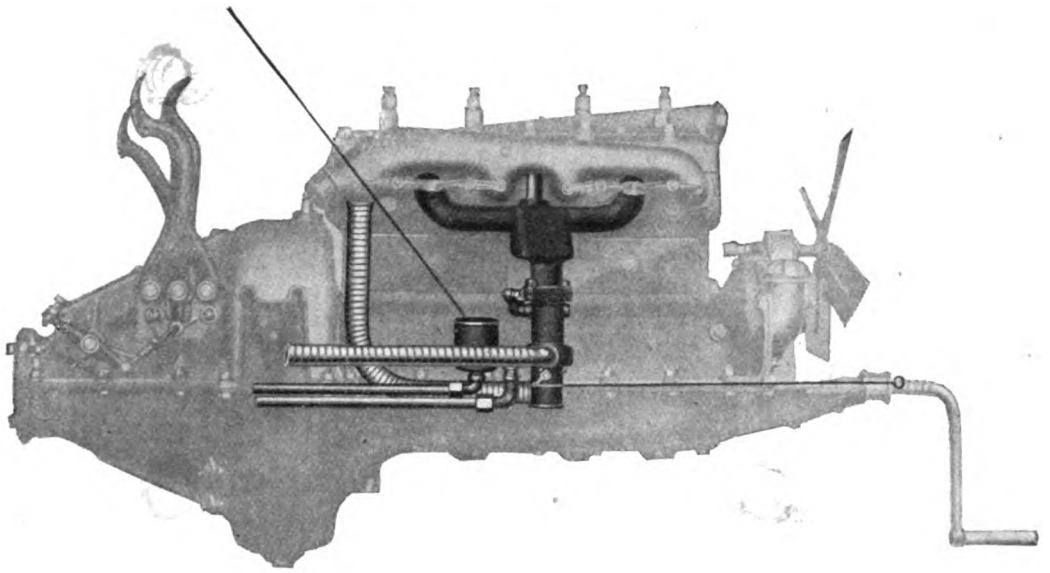


Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. **Descriptive literature on request.**

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Detroit *Kerosene* Equipment For Fords



Detroit Kerosene Equipment attached to Ford Engine showing the entire installation except the Gasoline tank located under floor board.

Use Kerosene

(Coal Oil)

One mile on Kerosene costs less than ½ cent.

One mile on Gasoline costs from 1¼ to 1½ cent.

Buy a Detroit Kerosene Equipment For Fords

Save 60%

Price of Equipment *(F. O. B. Detroit)* **$22**

30 Days Trial or MONEY BACK

Act Promptly

These are days of strict economy.

The Kerosene Equipment ready to be attached to Ford engine consists of:

1. The Detroit Kerosene Carburetor (patent pending) with only one float chamber (for kerosene); the three way valve admits the gasoline for starting.

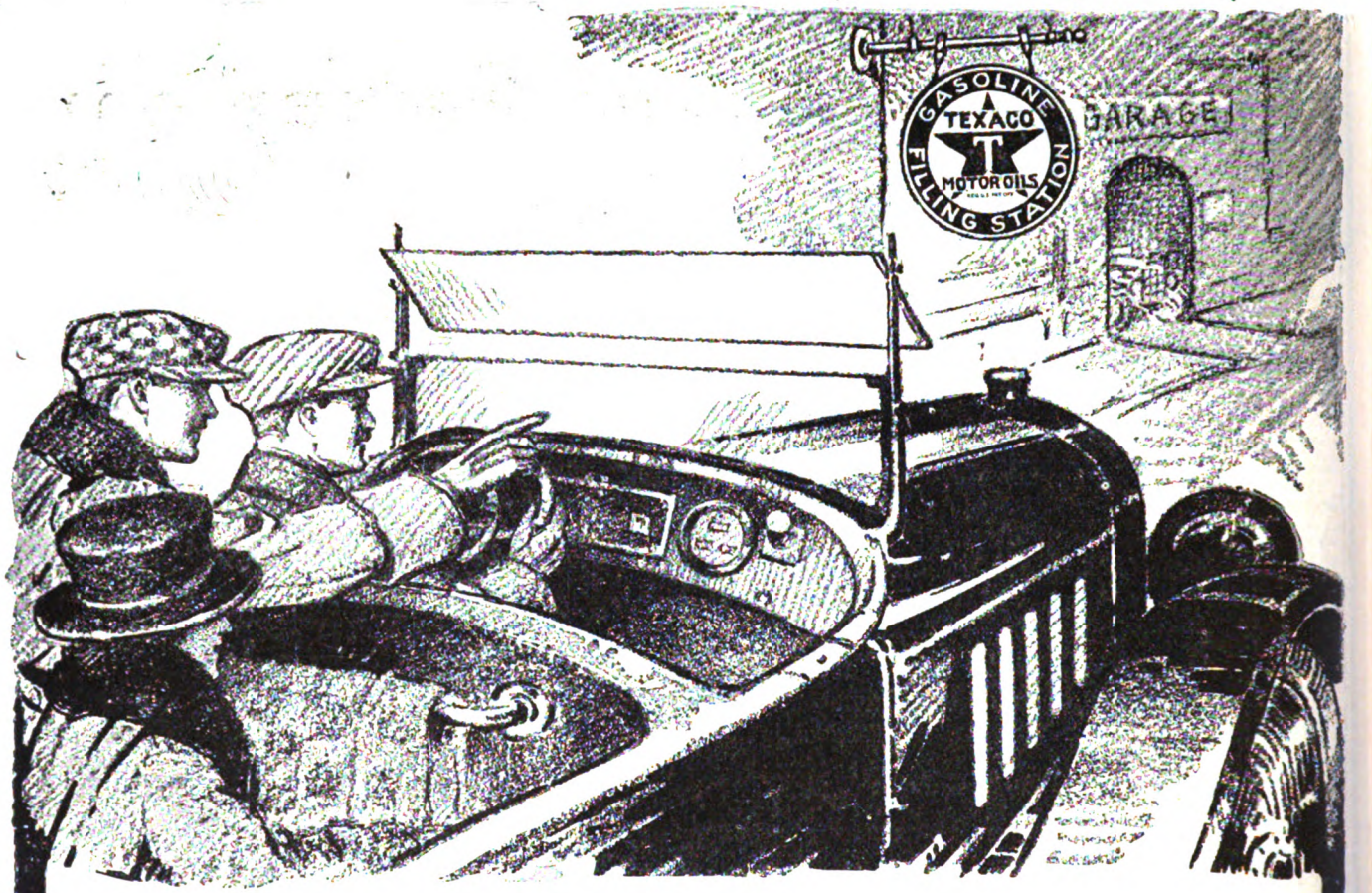
   Is non-adjustable—throttles down smoothly—idles without loading—increases mileage—is a positive fuel and money-saver—makes no condensation in cylinders and—reduces speed changing.
2. Intake Manifold with drying chamber.
3. Flexible tubings.
4. Gasoline tank, tube and couplings.

INSTALLATION

1. Drill a ⅞-inch hole into center of exhaust manifold.
2. Remove intake manifold.
3. Clamp on new manifold.

DETROIT KEROSENE CARBURETOR CO., Department 66, Kresge Building **Detroit, Mich.**

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IT is always a good sign when you see the Texaco Star in front of a garage or supply shop. It is a sign that you have found the proper place for a supply of gasoline or motor oil.

These two Texaco products have made driving a pleasure for thousands of motorists. Let them do the same for you.

TEXACO MOTOR OIL

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Texaco Motor Oil reduces friction to a minimum thereby enabling your motor to operate at its highest efficiency. It gives a perfect seal between piston and cylinder and allows no gasoline to leak into the crank case. Due to certain basic qualities it *cannot* deposit a hard carbon crust in the motor. If through the feeding of too much oil to the motor any carbon residue should be left it will be in the form of a soft, fine soot that can do no harm and is easily wiped off.

Texaco Motor Oil may be obtained at most good garages. The safest way, the best way, to buy is in one or five gallon cans.

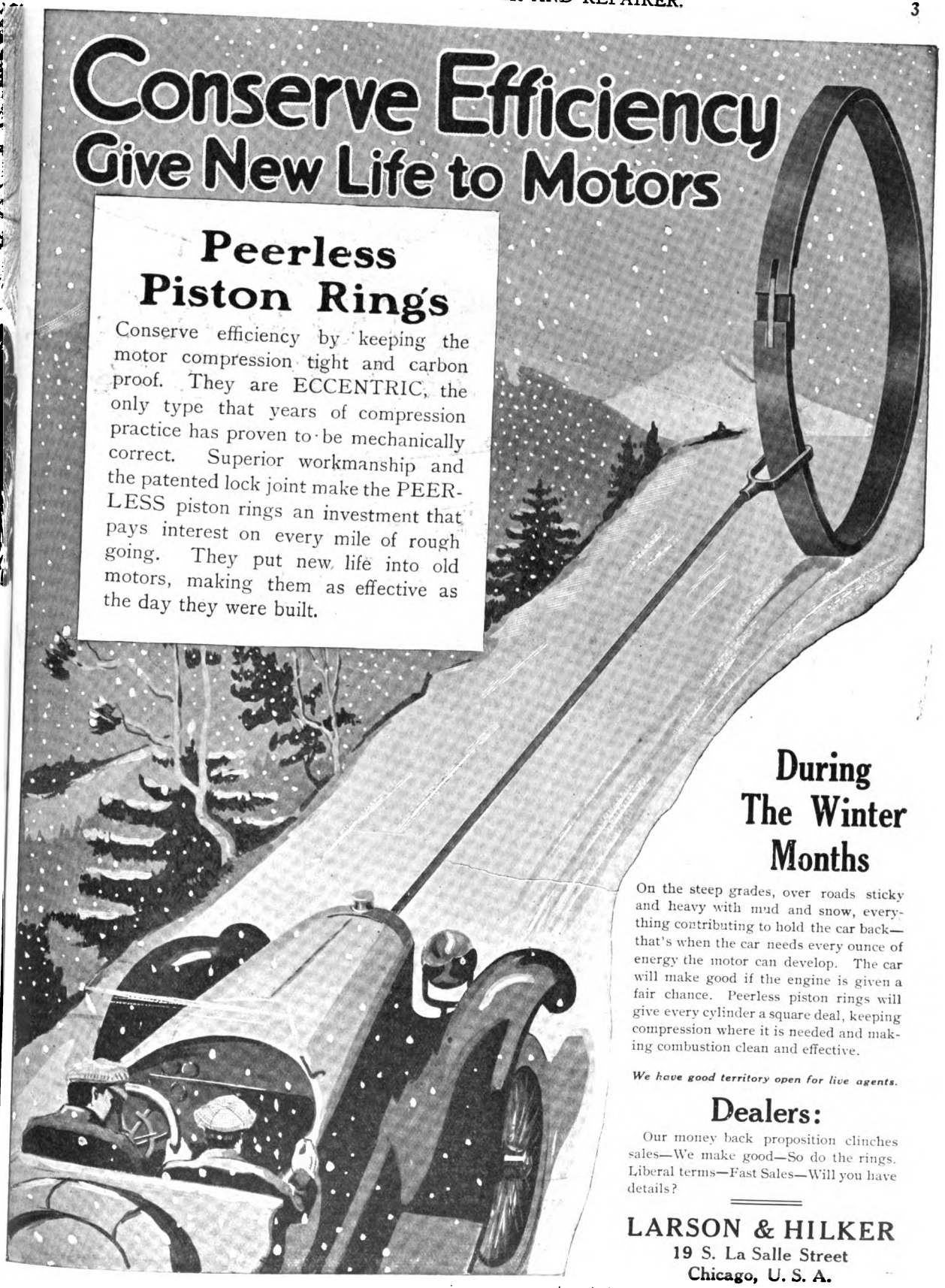
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Peerless Piston Rings

Conserve efficiency by keeping the motor compression tight and carbon proof. They are ECCENTRIC, the only type that years of compression practice has proven to be mechanically correct. Superior workmanship and the patented lock joint make the PEERLESS piston rings an investment that pays interest on every mile of rough going. They put new life into old motors, making them as effective as the day they were built.

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We have good territory open for live agents.

Dealers:

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Prest-O-Lite STORAGE BATTERY



Not only a better battery but

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Perfected Process Plates

QUICKER starts—longer life—greater staying power—the all-important standards of value to you in any storage battery—depend first of all on the plates, the real basis of the chemical action which creates electricity for starting, lighting and ignition.

In the great, modern Prest-O-Lite factories, experts have devised many new and efficient processes to insure you a better battery, and one of their greatest triumphs is the Perfected Process Plate—a distinct departure from previous plate-making practice—an established feature of all Prest-O-Lite Batteries.

Years of effort, research and expenditure stand back of this process.

The active, pasted material is seasoned by a new and different treatment which produces a super-hard center or "back-bone" of gradually increasing porosity as the surface is reached.

The super-hard center provides all the strength, stability and long life of the so-called "hard plate," but without the sacrifice of "pep" and power which is characteristic of all "hard plate" batteries.

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No other battery plates were ever made by this process.

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—and more than 800 specially appointed Prest-O-Lite Battery Service Stations in all parts of the country.

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What You Have Always Longed For Is At Last Accomplished

NEW YORK Vibrator-Les Coil IGNITION FOR FORDS



Uses One Powerful Transformer Coil—

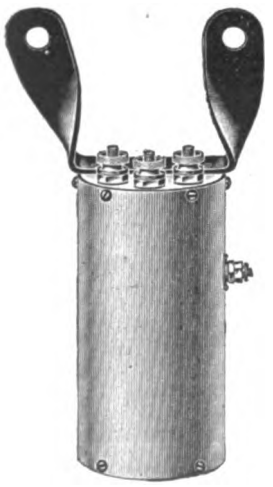
entirely devoid of Vibrators, which in connection with our new Distributor takes current from the regular Ford Magneto, giving you for the first time since the advent of the Ford car, an opportunity to equip with the same efficient, simplified single unit, non-vibrating Coil Ignition used on all modern, present day cars, with the still further advantage that no storage or dry cell battery is required.

The present bulky coil box is discarded and panel containing switch is fitted in its place—giving a "clean" dash, and much additional room.

We supply Coil, Distributor (containing our new circuit breaking mechanism) elevating gear bracket, wires, cables, and full instructions—no drilling or tapping is required to install.

Vibrator-Les Coil Ignition

enables car to be driven through dense traffic at a snail's pace, and instantly accelerates with a smoothness and power you never believed possible.



Entire absence of sticking contact points, vibrator adjustments, coil replacements and all ignition trouble, together with easy, certain starting, are but a few of its advantages.

Full details given in our booklet.

Price complete as described— $20.00

Sold with a money back guarantee



NEW YORK COIL COMPANY

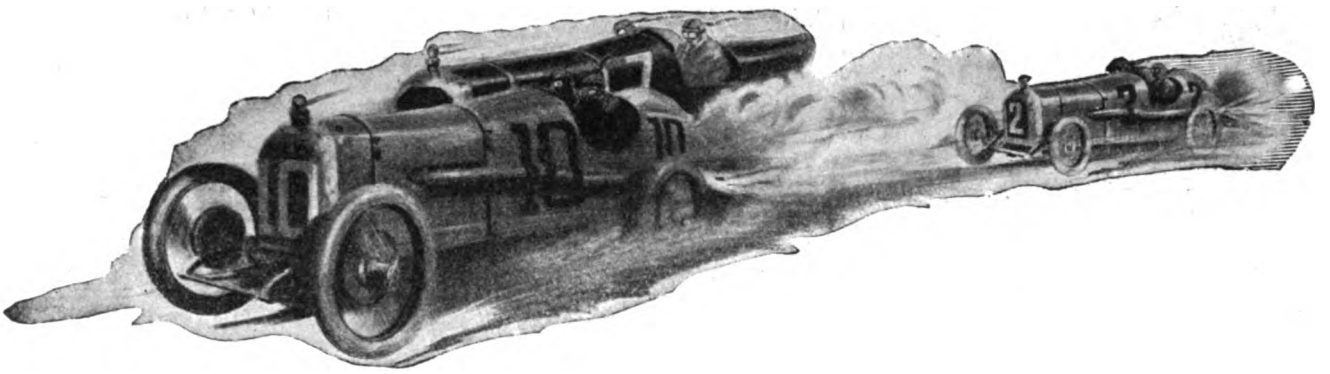
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Rajah Spark Plugs have always equipped the majority of winners in all American races.

For exactly the same reason, Rajah Plugs have always given the longest service in all American cars.

Rajah Spark Plugs sell well because they serve even better than they sell.

RAJAH *SPARK PLUGS*

RAJAH TERMINALS AND ADAPTERS

are furnished so that Rajah Plugs can be used on any car not equipped with the Rajah type of Clip Terminal. Any size exchanged if desired



Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.



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Adapter for Dodge, Ford, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.



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Adapter for Packard 4 and 6 cylinder.



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Adapter for Franklin.
Special type for Willys-Knight.



Rajah Priming Plug

Address RAJAH, *Bloomfield, N. J.*

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"I put My Car up for the Winter!"

"The Old, Old Story Oft Repeated—
Unsatisfactory lubrication—Oil would not flow at Zero—
Scored cylinders."
"It's different now—I have found an oil which 'Flows Freely at Zero'—gives perfect lubrication and leaves less carbon."
"I run her all year 'round on

SUPREME AUTO OIL

Sold everywhere you see the Sign of the Orange Disc.

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Power Reviving for Winter Driving

Living Up To an Opportunity

Never did winter business look better for garage and repair men. War times have kept many owners from trading in for new cars. They intend making their old ones do over the winter.

There's your opportunity to get those cars in for overhauling and re-equipment with accessories. They need most to have their old motors put in good shape to make up power shortage and cut down waste of fuel and oil with

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

You know them and why they lead the piston ring field as power producers. Their wonderful gas-tight quality that comes from equal-balanced tension, accurate fit and finish. Their strength and durability with minimum wear on cylinders.

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Standard or over-sizes—any width or diameter—for any make or model of motor. Over 300 jobbing and supply houses carry complete service stocks. Over 2,000 different sizes kept constantly in stock at the factory, ready for immediate shipment anywhere.

No other piston ring manufacturer gives such prompt and complete service. It means quick and satisfactory installations, and helps you handle the greatest number of jobs through your shop.

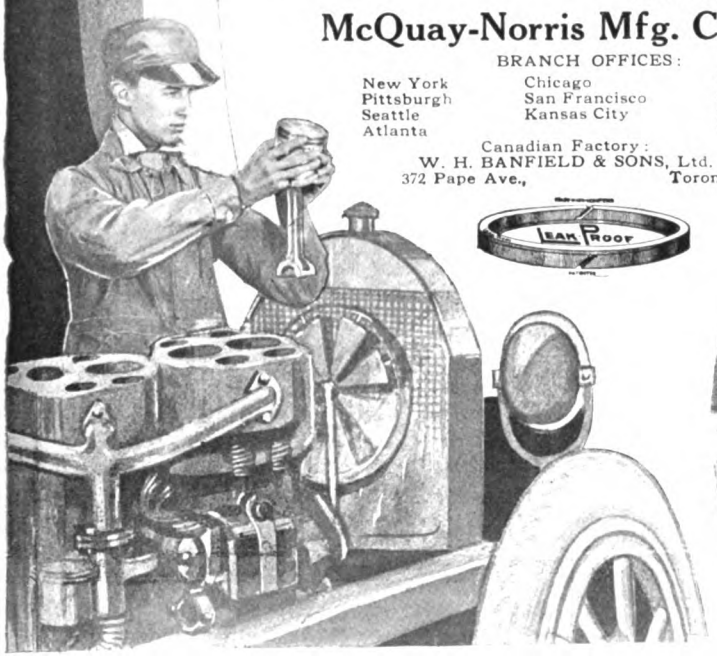
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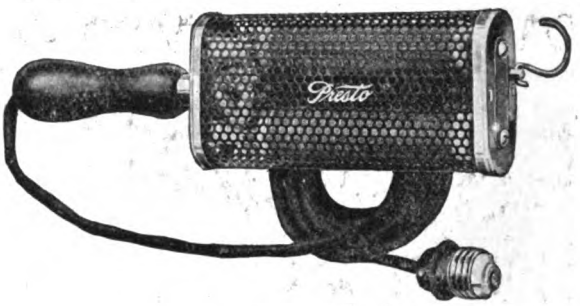




Send for this FREE book — "To Have and to Hold Power." It will tell you all about the Genuine McQuay-Norris LEAK-PROOF Piston Ring. Will save you and your customers a good deal of money, time and trouble. Write Dept. R.

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Dealers and Jobbers Handling the

Presto

BLUE RIBBON SELLERS

have built up a big, profitable business with this fast moving line. They turn cold weather into big, cash business. Hook up with this line and get your share of the big winter money.

THE PRESTO ELECTRIC HEATER delivers the heat where most needed, and eliminates starting difficulties in cold weather. Does away with expensive heating of the entire garage. Connects with nearest light socket. Consumes about 1 cent's worth of current per hour. New handle and hook enables you to hang it anywhere under the hood while hot.

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THE PRESTO ALWEATHER PROTECTOR and the PRESTO ELECTRIC HEATER are two of the hundred Presto Blue Ribbon sellers. The Presto Alweather Protector keeps out the cold draughts from your car by effectively closing all the foot pedal and lever slots.

Write Now for Dealers' Catalog of over 100 Real Live Blue Ribbon Sellers and Make Yours a Good and Profitable Business

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149 New Montgomery St., San Francisco, Calif.

PRESTO ELECTRIC HEATER : : $4.00
In Canada : : : : $6.00





The Alweather Protector goes under this plate as shown in the larger cut. It is made of rubber and steel. Price, $1.75

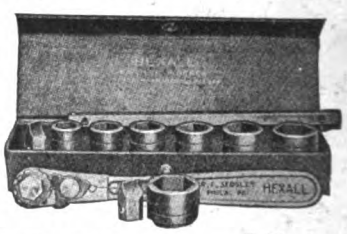
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Break Any Sedgley Wrench and We Repair It Without Charge

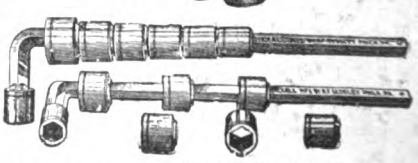
Sedgley Quality is Your Guarantee of Durability

Get Your Order In To-day

HEXALL WRENCHES SELL RAPIDLY and once in awhile a dealer gets caught short—but that's no way to do business—to tell a customer that "you carry them but you are just out of them"—or in other words, you're making money but you don't get it in your hand—making profits in your mind isn't tangible enough to keep your business on its feet very long. Get that delayed order in to us to-day—keep your stock up!



"HEXALL" No. 2 contains—7 in. Steel Forged, Ratchet Handle, 2 Screw Driver Bits, 7 inch Extension Bar, 7 Hexagon Sockets for nuts and bolts size $\frac{1}{4}$ to $\frac{9}{16}$ in. Packed in neat strong cloth case.



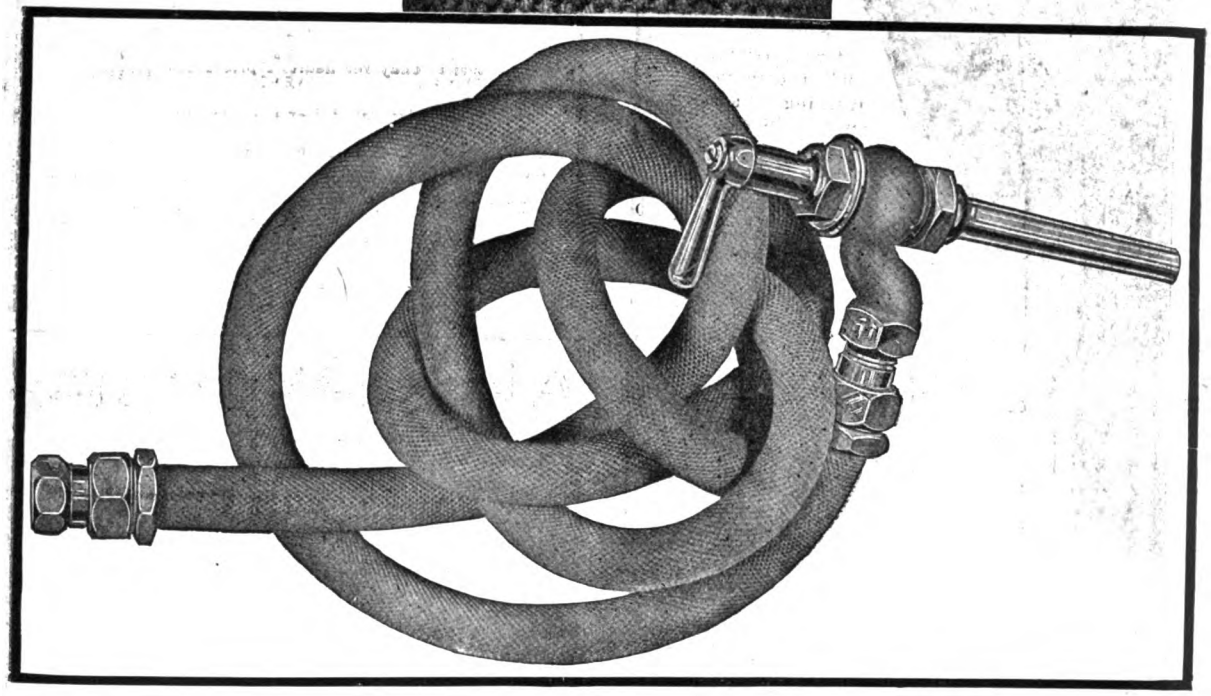
"HEXALL" No. 5. 10 inch Handle made from ½ inch Hexagon Steel, 7 Hexagon Sockets, with same range as No. 2 set. Sockets pack neatly on handle when not in use. Friction Ball prevents them from falling off. Can be used as an extension with wrench on short end.

Ask Your Jobber

R. F. SEDGLEY, Manufacturer, 2311-13 North 16th Street, PHILADELPHIA, PA., U. S. A.

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Welded---FLEXIBLE---Permanent

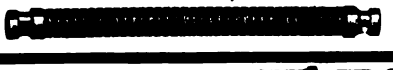
---and it's METAL lined!

The unequaled service qualities of "Triplexd" gasoline hose are due to its three part construction (Metal, Rubber and Loom-Woven Fabric) welded into a unit of strength and compactness thru vulcanization.

Because "Triplexd" can withstand weather, wear and hard usage—because it is strong, flexible and leakproof—48% of the gasoline pump mauufacturers have standardized it and over 60% of the oil companies have adopted it as the most permanent equipment obtainable.

Specify "Triplexd" when you order gasoline hose.

METAL HOSE & TUBING CO.
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— TRIPLEXD —

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You grip it just once to drive a screw



With an ordinary "driver" you must "grip and let go" the handle a couple of dozen times, or more, when driving or drawing a screw.

With this "Yankee" Ratchet Screw-driver No. 10 you grip the handle once—then just turn your wrist to and fro till the screw is home. Not only a great saving of time but a big saving of muscular effort. Prevents tiring and cramping of muscles of hand and forearm. The Ratchet movement between handle and blade takes all the hard work out of screw-driving and lets a man "speed up" mightily.

"YANKEE" Ratchet Screw-driver No. 10

Ratchet Shifter works lengthwise of blade, adjusts blades for right- and left-hand movement and rigid position. In "Yankee" Ratchet Screw-driver No 11 shifter moves crossways of tool.

PRICES

Eight lengths of blade

2 inch.....	$0.45	6 inch.....	$0.80
3 inch.....	.55	8 inch.....	.90
4 inch.....	.65	10 inch.....	1.05
5 inch.....	.70	12 inch.....	1.15

Your dealer can supply you

"YANKEE" TOOLS

Make Better Mechanics

Write for "'Yankee' Tool Book,' showing all the "Yankee" wood-and-metal-boring and screw-driving tools—FREE.

NORTH BROS. MFG. CO.
Philadelphia

BIG MONEY FOR LIVE DEALERS

Save your customers 35% to 50% on

TUXEDO TIRES

GUARANTEED FOR 3,500 MILES

¶ There is an enormous demand for low priced tires that will stand up under hard use.

¶ Much of this business now goes to mail-order houses and cut-rate supply concerns.

Sell Tuxedo Tires and Get This Business

¶ TUXEDO TIRES have stood the test. Thousands of them are in daily use, giving perfect satisfaction.

¶ We always have a complete stock, all sizes, plain and non-skid.

SOME OF OUR SPECIALS:

Size	Tire	Tube
30 x 3	$6.50	$2.40
30 x 3½	8.25	2.85
34 x 4	12.90	4.30

Write today for dealer's prices and terms.

¶ We sell only one dealer in a town—get ahead of the other fellow.

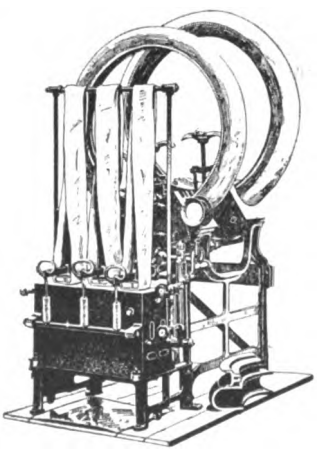
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304-K West 54th Street NEW YORK

Akron-Williams

TIRE REPAIR EQUIPMENT
ENDORSED BY ALL
LEADING TIRE COMPANIES

More than 60 of the foremost tire manufacturing companies use Akron-Williams equipment in their factories and recommend and sell them to their dealers all over the country.

The outfits we sell you are the same in every way—and enable you to do the best and most profitable work in the shortest time.



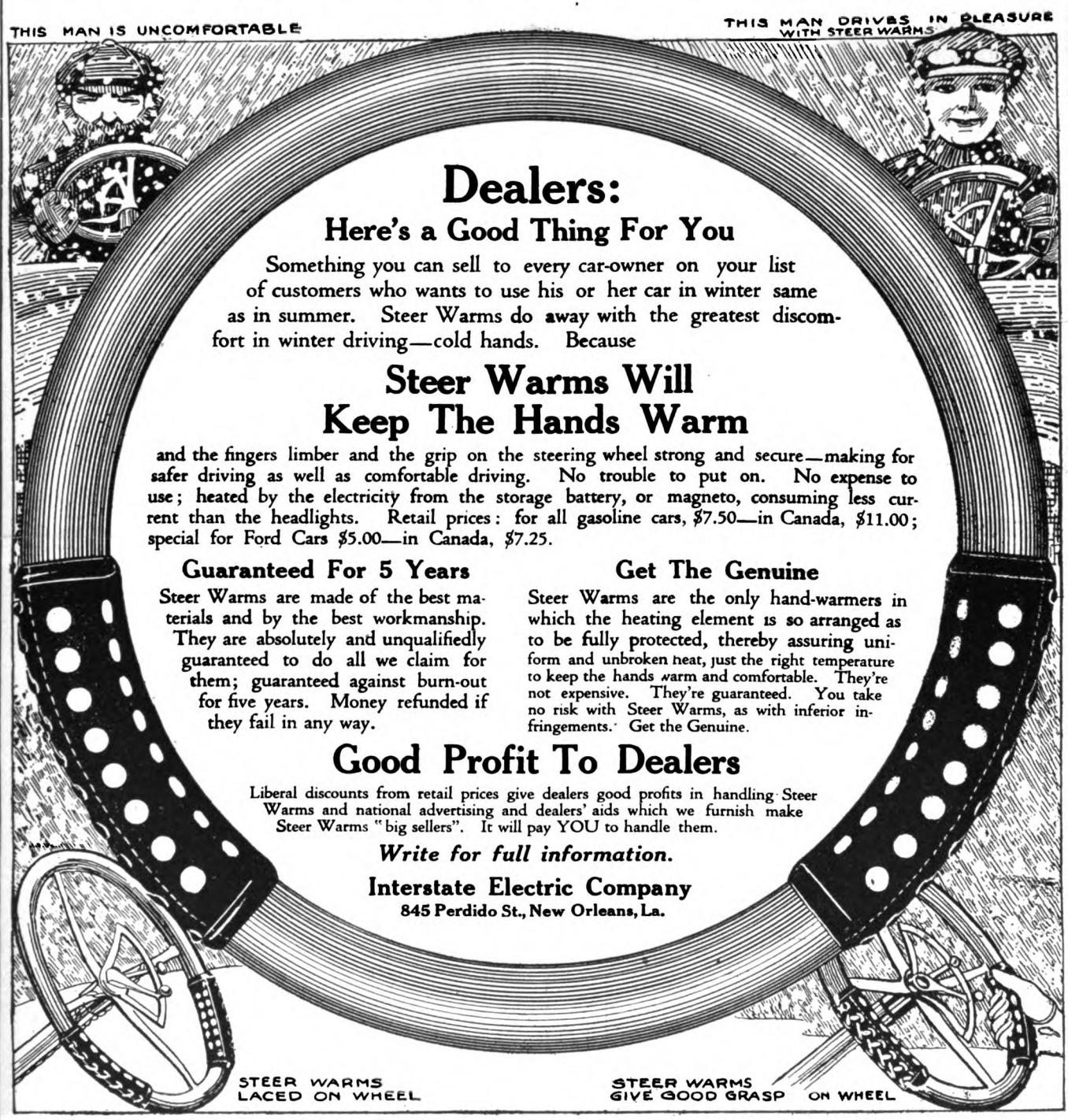
To do the best work, you must have the best equipment. Send for catalog on complete line — no outfit too large for us, no tools too small.

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Exclusive Distributors for California: THE WATERHOUSE & LESTER CO., San Francisco.

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Steer Warms
For Winter Driving



Dealers:
Here's a Good Thing For You

Something you can sell to every car-owner on your list of customers who wants to use his or her car in winter same as in summer. Steer Warms do away with the greatest discomfort in winter driving—cold hands. Because

Steer Warms Will Keep The Hands Warm

and the fingers limber and the grip on the steering wheel strong and secure—making for safer driving as well as comfortable driving. No trouble to put on. No expense to use; heated by the electricity from the storage battery, or magneto, consuming less current than the headlights. Retail prices: for all gasoline cars, $7.50—in Canada, $11.00; special for Ford Cars $5.00—in Canada, $7.25.

Guaranteed For 5 Years

Steer Warms are made of the best materials and by the best workmanship. They are absolutely and unqualifiedly guaranteed to do all we claim for them; guaranteed against burn-out for five years. Money refunded if they fail in any way.

Get The Genuine

Steer Warms are the only hand-warmers in which the heating element is so arranged as to be fully protected, thereby assuring uniform and unbroken heat, just the right temperature to keep the hands warm and comfortable. They're not expensive. They're guaranteed. You take no risk with Steer Warms, as with inferior infringements. Get the Genuine.

Good Profit To Dealers

Liberal discounts from retail prices give dealers good profits in handling Steer Warms and national advertising and dealers' aids which we furnish make Steer Warms "big sellers". It will pay YOU to handle them.

Write for full information.

Interstate Electric Company
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STEER WARMS GIVE GOOD GRASP ON WHEEL

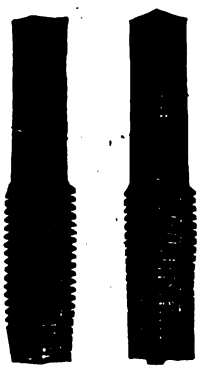
Warm Hands
In Coldest Weather

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Little Giant Screw Plate

THE COMPLETE LINE OF THREADING TOOLS



Hand Taps



Little Giant Die



G. T. D. Threading Machine

Whatever your requirements in the screw cutting line may be, we can meet them, as our line is the most complete in the world. Bear in mind that our service in the threading tool line is unexcelled.

Ask for a copy of our No. 37 General Catalog which contains besides the products listed below, many tables of valuable information for garage repairmen, etc.

Below is a partial list of products shown in the catalog:

Taps—All kinds, for hand and machine use, in all thread standards.

Dies—Several styles, for hand and machine use, in all thread standards.

Screw Plates—Many styles for bolts, nuts and pipe, with Automobile (S. A. E.), or U. S. S. threads, combination assortments with both U. S. S. and S. A. E. thread taps and dies.

Reamers — Hand and machine, bit brace and straight shanks, all types.



G. T. D. Burring Reamer

GTD

Greenfield Tap & Die Corp'n
Greenfield, Mass.

New York, 28 Warren Street
Chicago, 13 South Clinton Street
London, 149 Queen Victoria Street
Canadian Factory, Wells Brothers Company of Canada, Ltd., Galt, Ont.

Imperial Primer

A Profit-Line for Winter

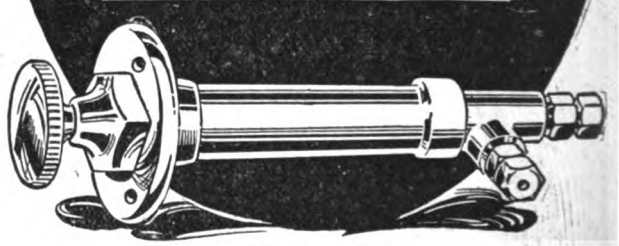
Motorists everywhere are looking up the live dealers and investing in the IMPERIAL PRIMER, the one device that Makes Cold Weather Starting Easy.

Easily and quickly installed on any make of car. Price $6.00 complete.

Full page advertisements in The Saturday Evening Post are helping you to make profitable sales.

Write today for our proposition.

IMPERIAL BRASS MFG. CO.
520 S. Racine Ave., CHICAGO, ILL.



There are no better accessories made





The same company that built the Au-To Air Compressor so good that no user has ever paid them for repairs is putting remarkable quality into "Oro" Bumpers and the whole line of



Oro
GOOD as GOLD

accessories. The "Oro" mark is a guarantee of those indestructible qualities which make buying worth while. It lets you know before you buy that the article will last.

Sold by all jobbers
Literature free *Write today*

THE AU-TO COMPRESSOR CO.
Dept. 62 WILMINGTON, OHIO

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"FIRST MONTH'S PROFITS PAID FOR THE PLANT"

THAT'S WHAT ONE MAN WRITES

No Experience Necessary—We Teach You How!

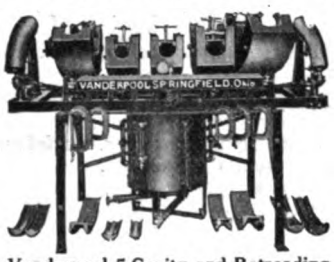
THE VANDERPOOL VULCANIZER

will get you your share of the big Winter and Spring tire repairing. Order a Vanderpool Vulcanizer today—**don't put it off—you lose money every day you delay.**

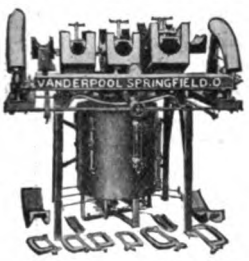
Get into this big profit-making business while work is plentiful—prices are good and everybody has more than they can do. Vanderpool Vulcanizers do the best—yes, the very best work, and that's the kind of work that satisfies customers and builds your success.

Operators of Vanderpool Vulcanizers are selling these machines for us right along—all the time. Ask for our list of users in the U. S. A., Canada, Cuba and South America. Write for price list today and send this "ad" in with your letter. (A.D.&R.)

RETREADS, DOUBLE TREADS, SECTION REPAIRS, INSIDE AND OUTSIDE, CURES AND REPAIRS TUBES



Vanderpool 5-Cavity and Retreading Molds with Bead Molds



Vanderpool 3-Cavity



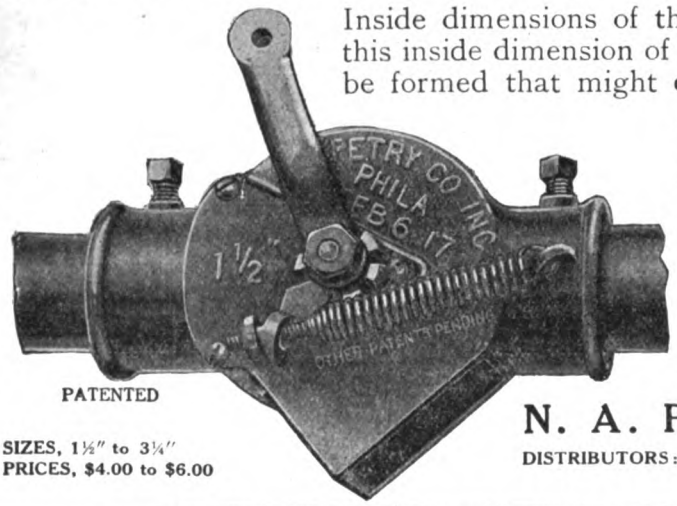
Vanderpool 2-Cavity

Start in Right Now—Don't Put it off a Minute Longer—Send for Catalog

VANDERPOOL COMPANY - SPRINGFIELD, OHIO

No Back Pressure With the Petry

Inside dimensions of the cut-out at every point are larger than this inside dimension of the exhaust pipe, and no air pockets can be formed that might cause back pressure.



PATENTED

SIZES, 1½" to 3¼"
PRICES, $4.00 to $6.00

The Petry Cut-Out is quickly and easily installed, having eight points of adjustment—and once applied, its position is permanent.

Gas-tight joints. Adjustable spring cannot anneal being well away from all heat. No fluttering of valve. No strain on exhaust pipe. Gases are discharged through a flaring opening which intensifies sound, facilitating tuning up of motor.

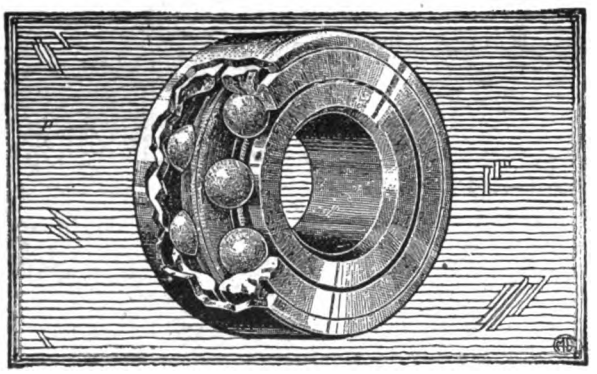
Easy to install and operate—no complicated parts to get out of order. A size perfectly suited to every car.

N. A. PETRY CO., Inc., 1313 Race Street PHILADELPHIA

DISTRIBUTORS: Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Hughson & Merton, Inc., San Francisco, Cal., Portland, Ore.

PETRY CUT OUT

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Performance Unfailing!

IN aeroplanes, torpedoes, "tanks" and ambulances New Departure Ball Bearings have a proper place, because success (with human life in the balance) depends upon facile and unfailing operation at critical moments.

New Departures have earned the reputation of being fit and worthy of the trust which is placed in them, in all operations of supreme importance.

The world has no patience with ineffective and unreliable mechanism in this Great War.

New Departure Ball Bearings will help any machine to give efficient and absolutely reliable performance.

The New Departure Mfg. Co., Bristol, Conn.
Conrad Patent Licensee

NEW DEPARTURE BALL BEARINGS



PEDEX

The Adjustable Pedal Extension

eliminates the driver's clumsy cushion and gives the correct leverage to insure greater control, safety, comfort and convenience.

PEDEX clamps on backs of pedals leaving them free for use when desired.

Retails at $5 Per Set

When ordering name *make, model* and *year* of your car.

DEALERS—Write for our interesting trade offer.

SLOCUM, AVRAM & SLOCUM LABORATORIES, Inc.
American Car Accessories—Dept. B
531 WEST 21st ST. NEW YORK, N. Y.

Make Extra Profits by Oxy-Acetylene Welding

Savings made please your patrons and pay good substantial profits.

PREST-O-LITE
Dissolved Acetylene
(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high-grade welding apparatus for $75.00 (Canada $100.00). The average user will also need gas cylinders at an additional cost, and about $10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.



Send for details of Prest-O-Lite Service for Oxy-Acetylene Welding.

THE PREST-O-LITE CO., Inc.
The World's Largest Makers of Dissolved Acetylene
U. S. Main Office & Factory, 820 Speedway, Indianapolis
Canadian General Office, Dept. X, Toronto, Ont.



The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. **Try them and prove it.**

Dealers Wanted. *Write for prices and discounts.*

Manufactured by AMERICAN PISTON RING CO., 3-5 East German Street
BALTIMORE, MD.

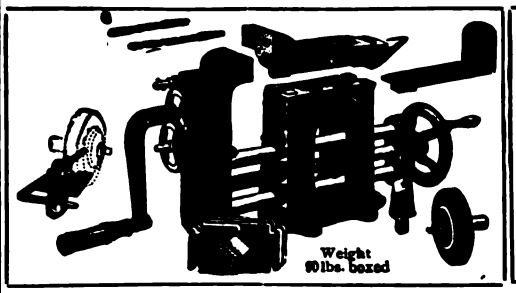
N. A. PETRY CO., Inc.
1309 Race St., Philadelphia, Pa.
Eastern Representative, North and South, East of Denver.

A. H. COATES
444 Market St., San Francisco, Cal.
Western Rep., North and South, West of Denver.

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Stewart Handy Worker

A Big, Strong, Everlasting Combination of Tools



A Workshop In Itself

Price Complete

$14

(Worth $25)

A wonderful repair outfit for use in public or private garage. Six tools in one. If bought separately would cost $25 at the very least. Outfit includes strong practical anvil; powerful vise up to 4½ inches; a sure-grip steel pipe vise, takes up to 1½ inch pipe; corundum grinding wheel 5 inches by 1 inch; a two-speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing handle grip. It operates grinding wheel, buffing wheel and many other similar tools.

Special Offer

Send for one of these outfits, remitting $2 with your order, pay balance on arrival. If not entirely satisfied in every way, return it and money will be cheerfully refunded.

Descriptive booklet gladly mailed on request

Chicago Flexible Shaft Company

Department M, 12th ST. and CENTRAL AVE., CHICAGO



Knocking Gears and Knocking Customers

become a thing of the past when cars are lubricated with

DIXON'S GRAPHITE Automobile LUBRICANTS

Write to us for Dixon's Dealer's Deal No. 184G.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

D X N TRADE MARK ESTABLISHED 1827 D X N TRADE MARK



The HANDY TERMINAL

25¢ each

Eliminates *All* Terminal Troubles—

No burned fingers—no lost nuts in drip pan—no loose connections

Most ignition troubles can be traced directly to loose connections caused by vibration and jar. The Handy *can't* work loose—the greater the vibration the tighter the jaws of the Handy grip—the better the electrical contact.

The jaws of the Handy are threaded on the inside and engage the threads of the Spark Plug center bolt. One motion raises the ring, compresses the steel spring, releases the terminal and lifts it from the spark plug. There are no nuts to tighten or loosen or fish out of the drip pan. No tools are required. Can be attached or detached in ***one second.***

The method of fastening the magneto cable insures a permanent connection. The ferrule is fitted to the cable and the stripped wire firmly held by a copper clip, making a non-soldered connection that can't work loose.

The Handy is the last word in convenience and efficiency. Made in 3 sizes to fit ***every*** make of spark plug, for pleasure cars, motorcycles, trucks, motor boats, airplanes, etc.

DEALERS

Because the Handy Terminal eliminates ALL terminal troubles and is a great time and trouble saver it is a great seller. National advertising campaign now running—attractive dealer helps. A great winter seller. Write for attractive dealer's proposition. If your jobber can't supply you with the Handy, send us his name and we will see that your requirements are filled promptly. Get your share of this business now Write Today.

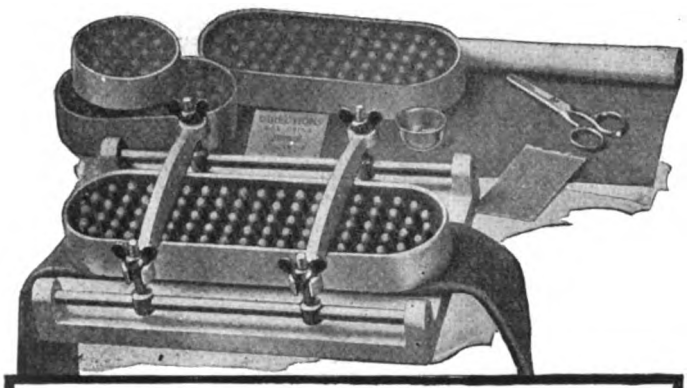
THE FRANCIS-RAND CO.

Manufacturers of

HANDY PRODUCTS

412 Erie Building, Cleveland, U. S. A.

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12 inch Tube Repairs

Can Be Quickly and Easily Made with the

ADAMSON

TYPE "S"

VULCANIZER

This vulcanizer enables the repairman to give his customers a perfect repair at low cost and net him a handsome profit for his time. It enables the private garage owner to cut his repair bills to the bone.

The Type "S," like all Adamson Vulcanizers, is entirely automatic and anyone can operate it. There is no waiting to get up steam. No slow, expensive electricity. It's a gasoline vulcanizer — the most convenient and practical vulcanizer made. There are thousands in daily use.

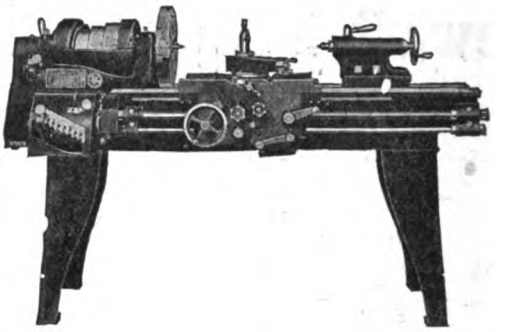
It absolutely will not injure tubes as will many vulcanizers — the temperature being automatically and positively regulated. Its scientific design insures a quick, permanent repair ***always.*** Even a 12 inch repair can be made in fifteen to twenty minutes— that's speed.

There is money for repairmen and garage owners who use an ADAMSON Type "S." More tubes will be repaired next year than ever before because today they cost more. The Type "S" costs but $12, complete as shown here, and soon pays for itself. It will last a lifetime.

There is a type of ADAMSON Vulcanizer for tube and tire repairs of every kind. Priced from $1 to $12. If you don't know the ADAMSON dealer, write us.

THE ADAMSON MANUFACTURING CO.,
EAST PALESTINE, OHIO.

DEALERS—No other manufacturer can offer you a complete line. Tie to ADAMSON — Adamson dealers have sold over one million ADAMSON Vulcanizers, and they all made good. If your jobber can't supply you, write for details, prices, etc.



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

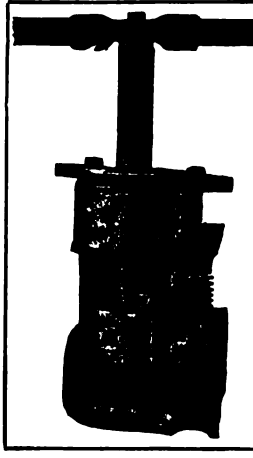
Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices

THE MONARCH MACHINE TOOL CO.
SIDNEY, OHIO



THE STORM & O'HAIR

Cylinder Reboring Machine

is adjustable and will rebore practically all makes of

Automobile, Aeroplane, Motor Cycle, Light Marine, Tractor and Stationary Motors

It is simple, speedy and accurate and can be used by anyone familiar with tools.

Indispensable in any repair shop.

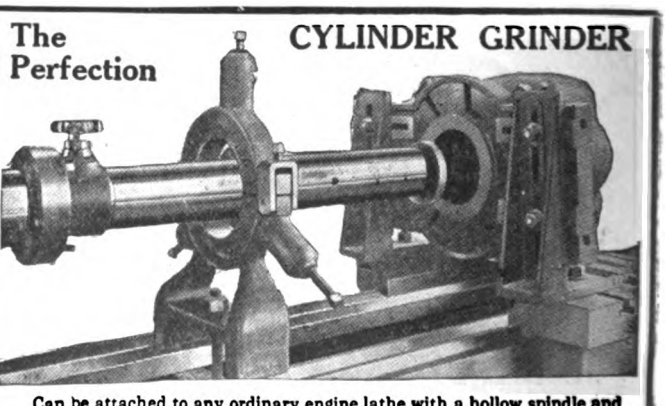
FOR SALE BY LEADING JOBBERS

We furnish oversize pistons for all makes of Motors.

For further information address

Storm & O'Hair Company
426-27 W St. Thompson, Iowa

The Perfection CYLINDER GRINDER



Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. **Descriptive literature on request.**

WOOD & SAFFORD MACHINE WORKS, GREAT FALLS, MONTANA

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WILLIAMS'

SILVERBEAM SEARCHLIGHTS SELL

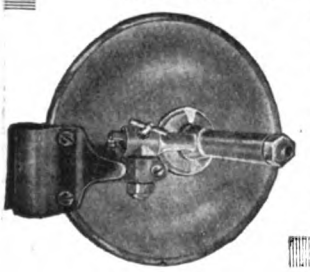
More readily than lower priced lamps when side by side on the dealer's counter, because they are

HANDSOME. Designed on beautiful lines, in harmony with the refined fittings demanded in the modern motor car.

WELL MADE. Superior workmanship showing at every point. Anti-rattling, heavy plating, baked enamel, connections complete.

PORTABLE. Readily detached to serve as trouble lamp—ten feet of cord gives easy access to every part of car.

LAW COMPLYING. The Williams locking device bracket guards against infraction of laws regulating elevation ahead.



SILVERBEAM

$9.00. Baked enamel and nickel, in black or colors. Convex lens. 6 in. reflector.

With 7 in. reflector, $10.00

Proven by three years Satisfactory Service.

LIBERAL DEALER DISCOUNTS

At All Jobbers, or Write

WILLIAMS MFG. CO.

308 N. Flower Santa Ana, Cal.

Guaranteed for 10,000 Miles



EVERY Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser.

"Absolutely Puncture Proof"

Brictson Tires are puncture proof, and proof against blowouts, skidding, rut wear, rim cuts, and can't be damaged by oil or gasoline. Wonderful resiliency, easy riding and economy commend them to every car owner.

The Big One-fourth Retread Feature

Should the tread surface wear out after 10,000 miles of service you can get a new retread for one-fourth the original cost of the tire, instead of buying a new tire, and you keep the remaining three-fourths in your pocket. With ordinary service the Brictson Tire should run enough beyond the 10,000 miles to require one or two extra retreads. The more retreads you use the cheaper your service.

FREE TRIAL OFFER

To convince you the Brictson Tire will give satisfaction TRY THEM ON YOUR CAR AT OUR EXPENSE. Write today for this Free Trial Offer, a copy of our guarantee and full information about Brictson Tires.

BRICTSON MFG. COMPANY

10-15 to 24 Woodman of World Bldg.

Dept. 1127 OMAHA, NEBRASKA

Brictson Pneumatic Tires

It Sells—

MELLIN'S REVERSIBLE GEAR SHIFT EXTENSION

Here is a little accessory at $1.25 to $2.00 that sells itself to women drivers and to every motorist who is made aware of the inconvenience of *reaching* for the gear-shift lever instead of having it brought in easy reach of the hand.



It's So Easy Now

No More Reaching for the Gear-shift Lever

Screws onto the shift-lever at adjustable length. Reversible. Attached in a minute. Enables driver, with a single arm movement, to shift gears easily, rapidly and without changing position or moving body.



The Old Way

Tiresome and Inconvenient

A TRIED AND PROVEN SELLER

20,000 IN USE

Price, $1.50

Excepting for the following cars: Hudson Super-six, Chalmers, Hupmobile, Oldsmobile and all types having a solid ball, $2.00. Dodge Model 75-90 or Overland, $1.25.

AT YOUR JOBBER'S, OR WRITE

M & H NOVELTY CO.

857 East 24th Street Los Angeles

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O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

$1/4^{20}$, $5/16^{18}$, $3/8^{16}$, $7/16^{14}$, $1/2^{13}$, $5/8^{11}$, $3/4^{10}$,
U. S. Standard

$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $7/16^{20}$, $1/2^{20}$, $5/8^{18}$, $3/4^{16}$,
S. A. E. Standard

LIST PRICE — $20.00

This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies. This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

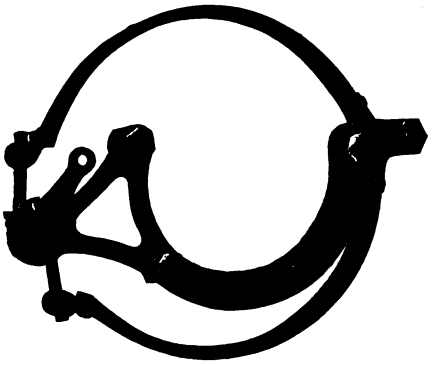
F. E. Wells & Son Company Division

Greenfield Tap and Die Corporation
Greenfield, Massachusetts

HOLDFORD BRAKES

SAFETY FIRST

PRACTICAL



POSITIVE

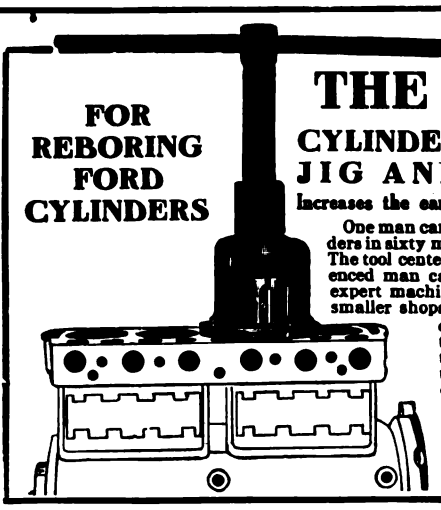
ASSURES YOUR SAFETY

HOLDFORD BRAKES are high-grade external contracting brakes for Ford cars which can be easily and quickly installed to act from the hand lever as emergency brakes, or from the foot pedal as service brakes. Designed in accordance with the best engineering practice; the band and brace are of steel, the toggle crank and bracket are dropped forgings and the lining J-M non-burn. Do not drag when released, no readjustment for wear is necessary and oiling is easy.

HOLDFORD BRAKES save wear and tear and will be attached by the wise owner on his pleasure car, delivery car or truck. They will positively stop a Ford with locked wheels on *any grade, at any speed, with any load.* Not necessary to remove old brakes.

When Ordering State Whether for Hand or Foot.

THE G. H. DYER COMPANY, Cambridge, Mass.



FOR REBORING FORD CYLINDERS

THE DAVIS

CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.



BRAENDER TIRES

are made right
and sold right

Live Dealers will find BRAENDER "The Tyre to Tie To"

We Give You a Proposition Competitive in Price and Quality.
Write Sales Department for the Proposition.

Trade Mark

BRAENDER RUBBER & TIRE CO., Rutherford, N. J.

NEW YORK PHILADELPHIA CHICAGO

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FORD FRONT END STABILIZER

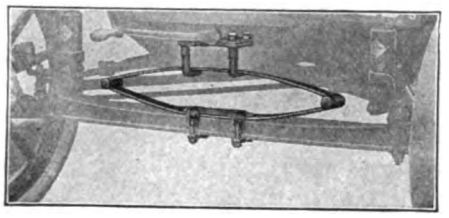
Also Serves as a Re-Bound Check and Easy-Steerer. *Absolutely Necessary.*

Can Be Put On By Anyone in 20 Minutes.

NO HOLES TO DRILL - NO MECHANIC NEEDED.

LOOK! THIS IS IT

PUT IT ON YOUR TRUCK OR PLEASURE CAR.



ONLY $4.00

Just as Necessary as the Engine

With the Ford Front End Stabilizer you can drive your car or truck at high speed and eliminate the danger in the car lurching from side to side when riding the ruts, rough spots and sand.

SPECIAL OFFER

I will send it to you freight prepaid on receipt of remittance. You must pay charges if sent by express or C. O. D.

Standard Discounts to Jobbers and Dealers.

DAN. S. HICKEY, Jr.,
40 Iffley Road, BOSTON, MASS.

20th Century's No. 6



Self-Vulcanizing Patch

Note carefully from above illustration the construction of this Patch—how the Semi-Cured Rubber is vulcanized on to the Fabric, which gives an absolute GUARANTEE against leakage, while the RED RAW Rubber Guarantees a perfect Job of Vulcanizing on to the Tube.

GUARANTEED SATISFACTION
or Money REFUNDED

Made in 3 sizes
- 2¼x16— 36 Square Inches .....$ .50
- 4 x15— 60 Square Inches .....$ .75
- 6 x18—108 Square Inches $1.50

If you want a Patch, call for "20th CENTURY"
We make all kinds of Patches, all Sizes and Prices.

If your JOBBER or Dealer has not got them, write to us direct.

20th CENTURY TIRE PROTECTOR CO.
MIDLOTHIAN, TEXAS.



"NORMA" BALL BEARINGS

(Patented)

Failure of a bearing in a magneto is equivalent in effect to failure of the power plant. Failure of a bearing in a lighting generator is in effect a failure of the lighting system. Either will surely mean dissatisfaction — either may mean disaster and loss.

The proved speed-and-service qualities of "NORMA" Ball Bearings have resulted in their adoption as standards by practically all makers of high-grade magnetos and lighting generators — those used on cars and trucks of the better class.

Be Sure—See that Your Electrical Accessories are "NORMA" Equipped

THE NORMA COMPANY OF AMERICA
1790 BROADWAY NEW YORK

Ball, Roller, Thrust and Combination Bearings.



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Quick Service on Gordon "Jack Frost" Radiator and Engine Robes



Divided Curtain style supplied for all cars.



One-piece Curtain style supplied for Ford cars.

THE owner of a car in need of a Robe wants it quick—SERVICE gets his order. You can get a Gordon Robe shipped from the factory within 3 days after your order arrives.

The Gordon "Jack Frost" line includes Robes for every American Automobile and it is the line that gives COMPLETE SATISFACTION to the car owner in fit, appearance, wear, and convenience, and to the dealer in profits. The "Gordon" name is known to motorists with whom quality counts—you need not coin "just-as-good-as" arguments when you feature the "Gordon" line. Your sales are quick and easy and GORDON SERVICE will keep you smiling and your customers coming back.

Made by the same organization as the famous

GORDON Seat Covers TAILORED TO FIT

with the "Sectional Overlap Lazyback."

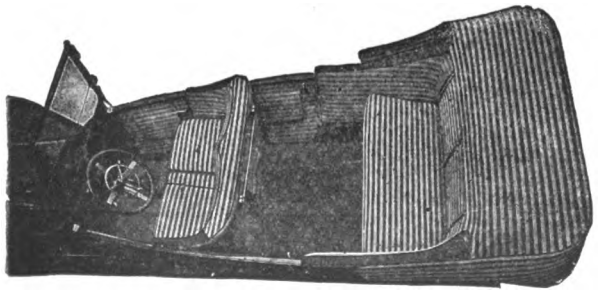
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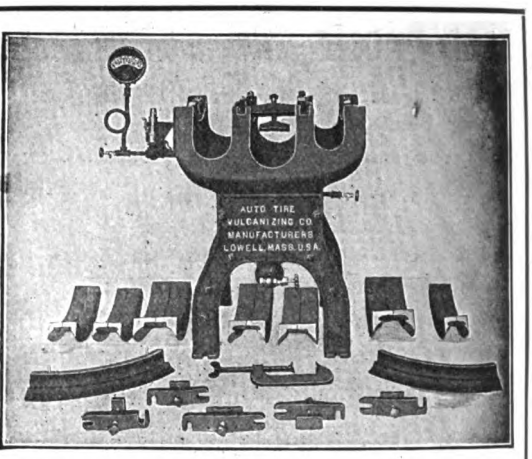
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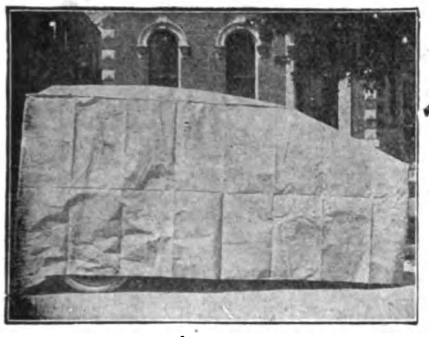
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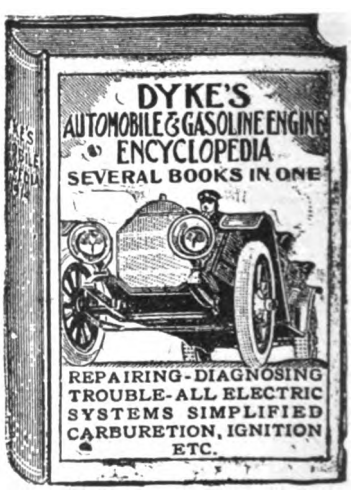
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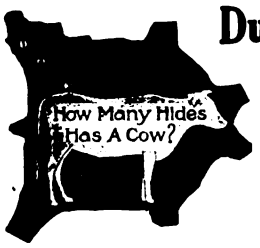
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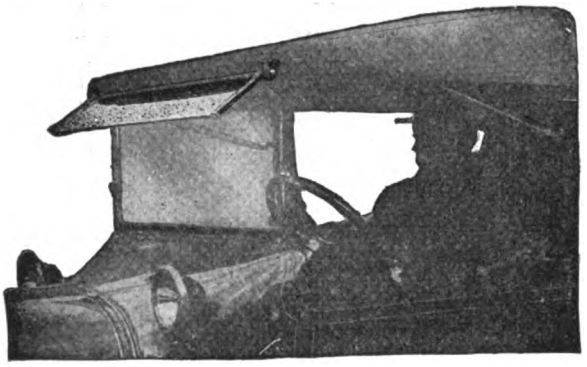
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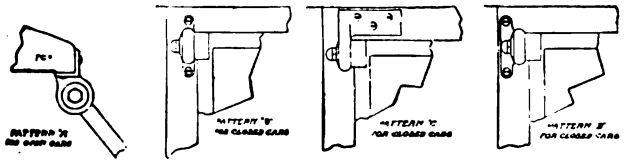
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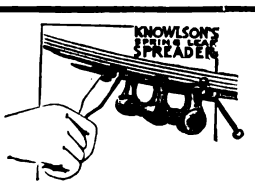
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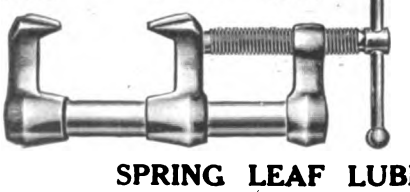


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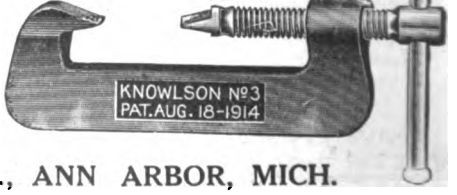
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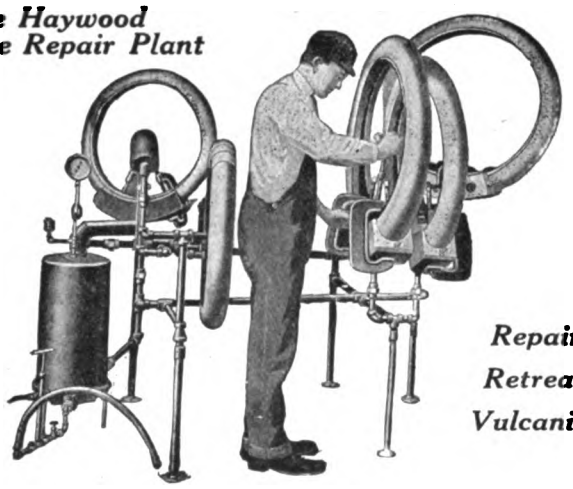
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G	2½	1½	12	11½
H	2¾	1¾	12	12¾
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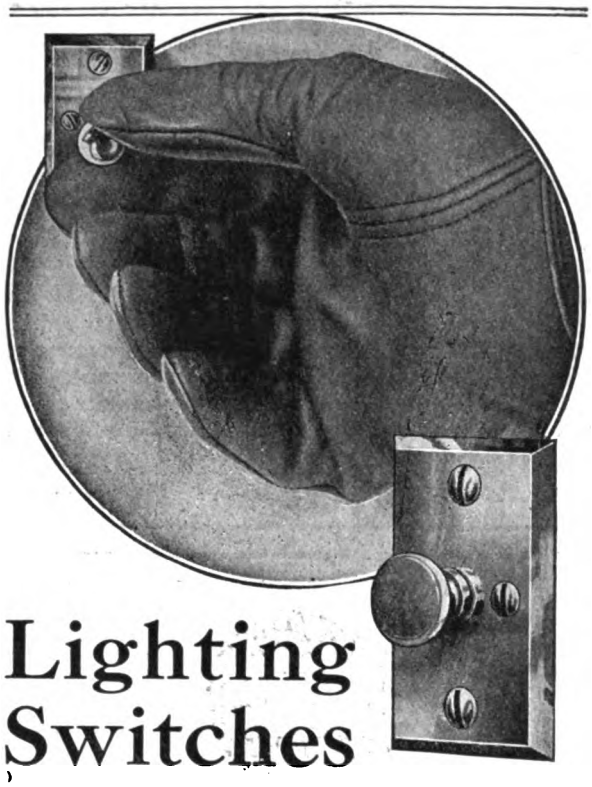
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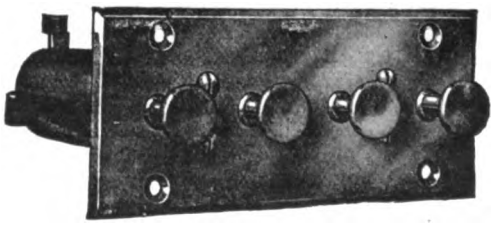
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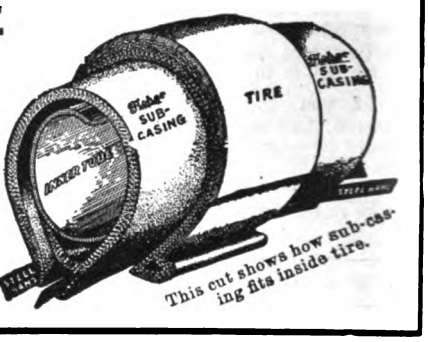
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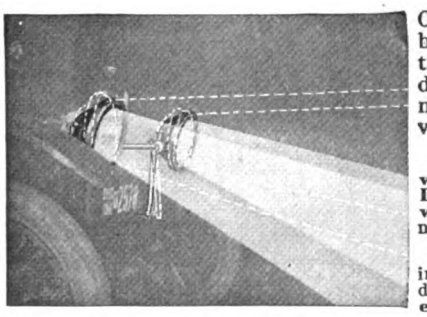
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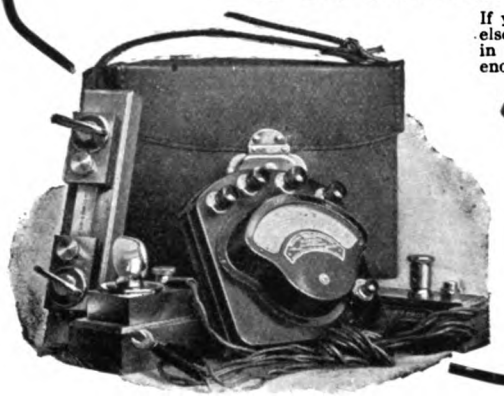
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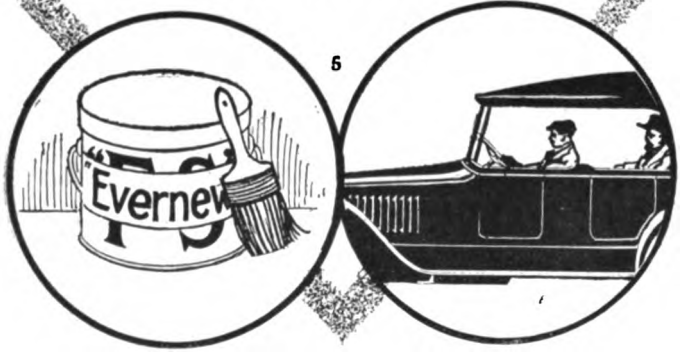
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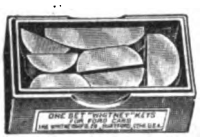


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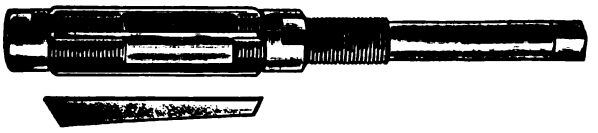
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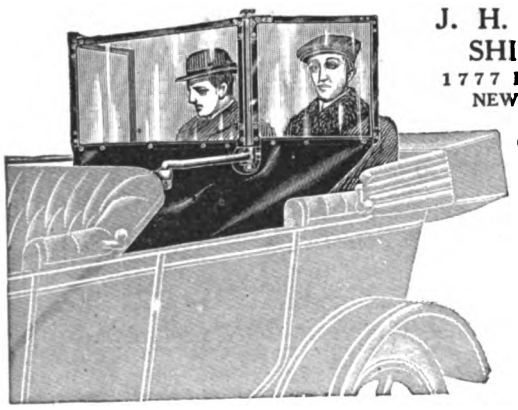
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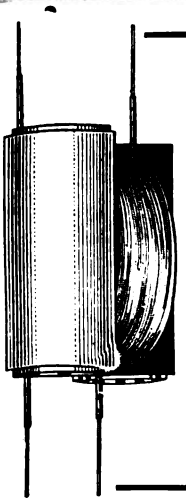
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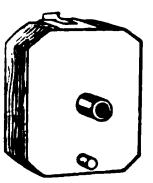
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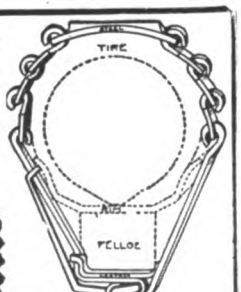
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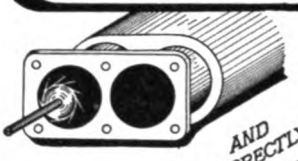
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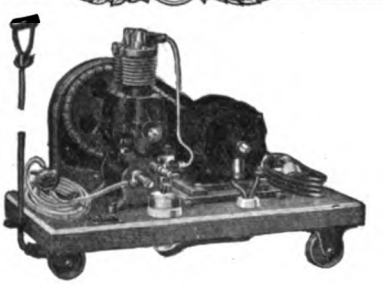
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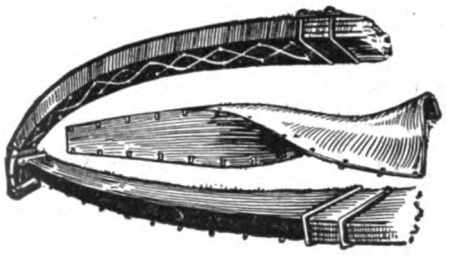
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Running Down Elusive Starting, Lighting and Charging Troubles of the Motor Car.

Practical Methods for Solving Electrical Problems Inherent with the Dynamo, Motor and Battery, and in a Minimum of Time.

BY CHARLES LEIGHTY.

In this day of efficiency, when we are all trying to do the most with the least waste of time and energy, it is surprising how little has been done toward getting at the seat of automobile electrical troubles in a minimum of time.

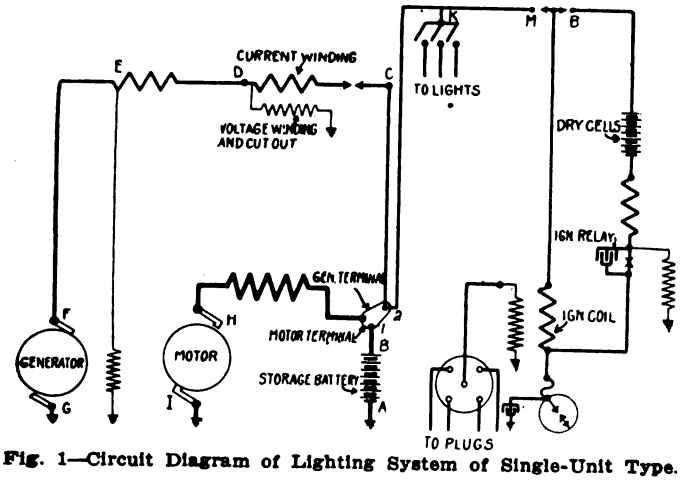


Fig. 1—Circuit Diagram of Lighting System of Single-Unit Type.

I believe it is pretty firmly established that mechanics are anxious to learn how to "shoot" troubles in a workmanlike manner. They read everything written on the subject that is available, still it is more than evident that they go principally by guesswork when called upon to locate and repair electrical troubles.

Difficult to Grasp.

Mind you, I do not say this disparagingly. We all realize how little chance the average man has had to become really proficient. I have been called into scores of shops in the last year or two, and have had a chance to observe just to what extent the average mechanic has been able to grasp this subject. I am convinced that the main reason why men fall down on this work is the fact that it is very seldom put up to them in proper shape to be understandable.

Oh, yes, there has been a great deal written on the subject, and there is hardly a mechanic anywhere but that has purchased one or more books dealing with starting and lighting systems. Our trade papers devote space to it. Still these men have to blunder in their work. Supposing we used the same methods in locating gas engine troubles that we do in locating electrical troubles. How long would we have customers? I know of lots of repair shops whose owners claim that their chief mechanics can listen to a man's car for a moment and "tell right away where the trouble is."

Applying Knowledge.

We all know that there is no man that is able to do this every time, but there are lots of experts who can do wonders along that line, and it seems like they simply have to listen a minute or two and then lay their hands on the trouble. But you men who are gas engine experts know that you don't do it by a sixth sense. It isn't so mysterious after all. All you do is to apply knowledge and reasoning to the problem.

You must know gas engines. But that isn't all; you must know how to reason, how to apply your knowledge.

For example: A man drives up and says, "My engine jerks when I drive slow." You know right away that it misses on low speed. You also know that it may be due to a weak magneto, to leaky valves, to leaks past the rings, to improper carburetor adjustment. If the car has a battery system of ignition you can eliminate the weak magneto theory at once. At any rate you wouldn't remove the magneto, take it apart, and test the magnets first thing. No, sir. If you did, and if the trouble was not in the magneto, you would have all your pains for nothing. You would try out your compression first, would you? You would use reason.

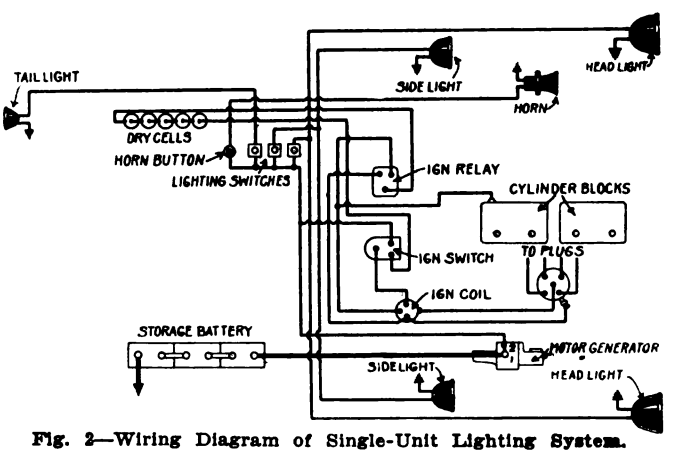


Fig. 2—Wiring Diagram of Single-Unit Lighting System.

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Knowledge of Principles.

Now in locating electrical troubles we have to use the same practical methods. We must first know the principles upon which electrical systems work. Then we must know the particular system we are dealing with. But that's not all. We must know how to apply our knowledge, how to reason.

How are we to know these different electrical systems? There are two ways of conveying this knowledge. One is by a written description, the other is by means of circuit diagrams. A circuit diagram is to the electrician what a blue print is to a carpenter. It furnishes details.

Don't confuse a wiring diagram with a circuit diagram. A wiring diagram simply shows the relative positions of the various parts and shows where the different wires connect. It shows that a certain wire leads from one point to another point, but it gives no idea, generally, what part that particular wire plays in the general scheme. It doesn't give any idea of what the effect would be if that wire was missing.

The Dayton Engineering Laboratories Co. publishes a Delco Service Manual: This contains both circuit and wiring diagrams for all the earlier model Delco equipped cars, and for the later cars many of the diagrams are combined circuit and wiring diagrams. I expect many of you have secured this mighty valuable book. It is well worth a price, but so far has been issued free of charge. Now this manual contains all the information an electrician needs in doing any Delco work. Of course, it would not be clear to a man who had no idea of electrical circuits.

Value of Diagrams.

I am going to take one of the Delco equipped cars and use it is an example of how readily the majority of the troubles may be located with the help of the diagrams contained in this manual. We will take, for an example, the 1914 model B-24-25 Buick. For the benefit of those who have no manual, Figs. 1 and 2 may be referred to. Fig. 1 is the circuit diagram and Fig. 2 is the wiring diagram. For the further benefit of those to whom the diagrams are not quite clear a brief description of this system and how it works will be required.

This is what is known as a single-unit system. This means that one instrument answers for both a generator and a motor. There is only one armature core, but this core has two windings on it. One is of coarse wire, each coil consisting of few turns terminating at the motor commutator which is made up of a few wide segments of copper. Directly in front of the motor commutator is a commutator of smaller segments to which the generator winding leads are attached. The commutator that is smaller in diameter is the generator commutator.

Winding of Field.

The field consists of three windings. One is a few turns of very heavy "bar" or "ribbon" wire. This is the motor field. It is a series field. It is so connected as to be in series with the armature and storage battery. No current can flow from the battery through the motor armature without at the same time flowing through this series field.

Then we have the shunt field winding. This is the principal generator field winding. It consists of many turns of fine wire connected in shunt or parallel with the generator armature. It is so arranged that any current sent through the generator armature will divide, part of it flowing through the shunt field. Then we have the reverse series field, which is a few turns of coarse wire in series with the generator armature circuit. It is not as heavy wire as the motor windings, however. Another peculiarity about this winding is that the current that flows through it encircles the field core in the opposite direction to that which flows in the shunt field winding.

Automatic Cut-Out Relay.

This motor generator is provided with an automatic cut-out relay very much like the ordinary two-unit system is provided with, except that this cut-out is inside the generator and performs an extra function that will be explained later. This cut-out can be seen by removing the top cover the motor generator.

It is provided with two terminals. One (marked "C" in the circuit diagram) leads directly to the generator terminals. The other (marked "D") leads to one end of the reverse series winding of the generator. One terminal of the battery is grounded. The other is connected to the motor terminal by means of a large wire. The motor terminal and generator terminal are really one. They are joined together. Two terminals are used merely for convenience in connecting the wires.

A wire leads from the generator terminal to the lighting switch and to the "M" side of the ignition switch. The lighting switch is a gang of three single-pole switches. One terminal of each switch is connected to the light or lights—that particular switch is designed to control. The other three terminals are joined together, making a common terminal to which the wire from the generator terminal is connected. While the ignition circuits are shown, still we will disregard them in this article and take up only the lighting, charging and starting circuits.

Starting.

We will consider the starting circuits first and point out what happens when we start the engine. First we get all "set" the same as if we were going to crank by hand. Then we push down this starting handle. This operation moves a rod endwise through the motor-generator. This rod closes the cut-out points when it has traveled a short way. At the same time it moves the starting pinion close to the flywheel, ready to mesh with the teeth cut in the flywheel.

When these cut-out points close it creates a circuit between the battery and the generator, causing it to turn slowly as a motor. This revolves the pinion and permits it to mesh with the flywheel teeth. This, then, permits the starting handle to be pushed further down. Further movement of the rod that this handle controls allows the upper motor brush to drop down onto the motor commutator.

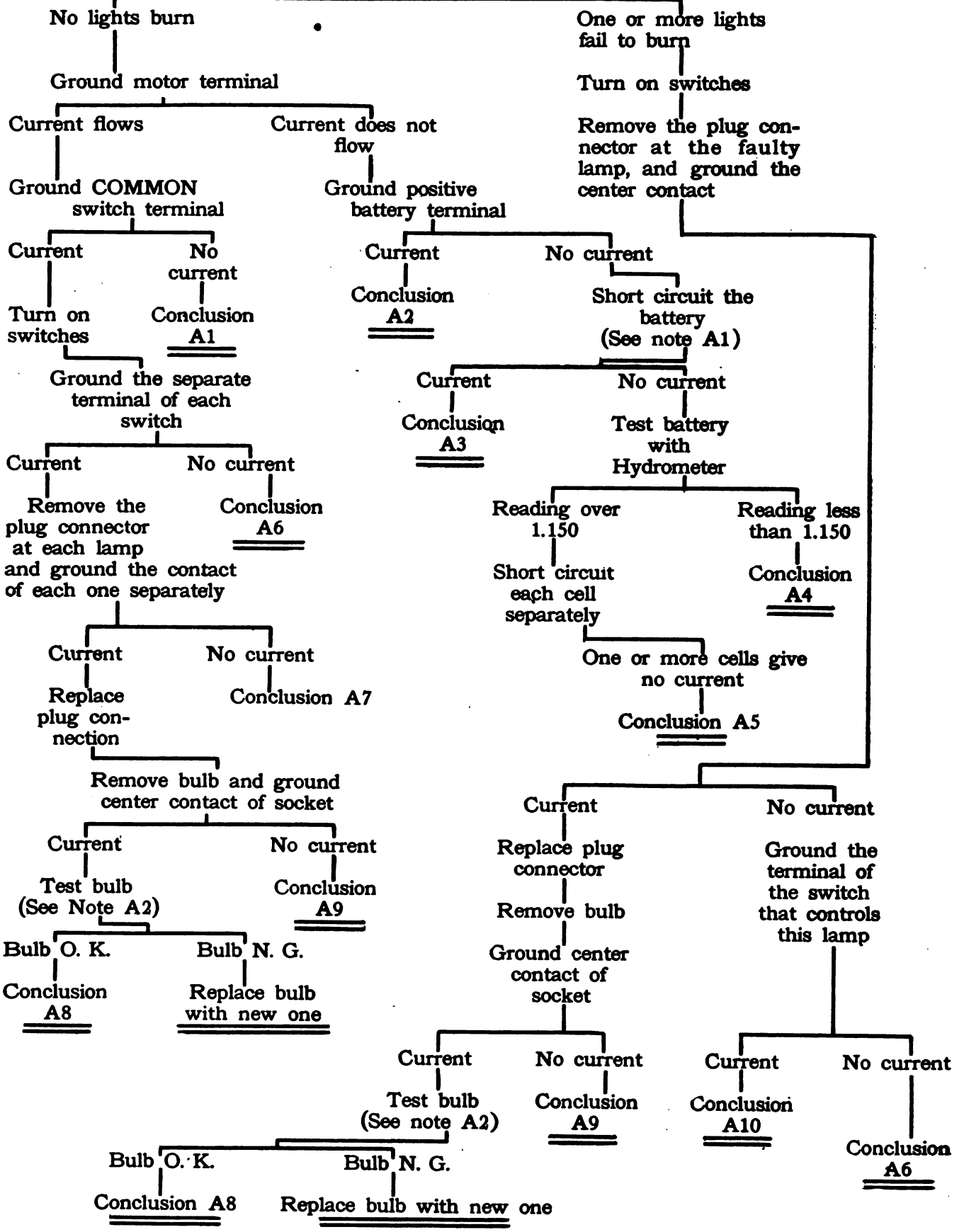
Path of the Current.

This brush acts as a starting switch, closing the starting motor circuit. Current then flows from the battery to the motor terminal, thence through the series winding and motor armature to "ground." From there to the other terminal of the battery. This starts the engine. When the engine takes up

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Chart "A"

LIGHTING TROUBLES



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its cycle we release the starting handle. This raises the motor brush and stops the motor. At the same time the armature is revolved by means of the overrunning clutch. As soon as the armature begins to revolve it begins generating voltage, which forces a slight current through the shunt field winding and also through the voltage winding of the cut-out.

When the speed becomes great enough to generate enough voltage to charge the battery (about 7.5 volts) the magnetism of the cut-out causes the cut-out points to close. Then the charging current flows from the generator through the reverse series winding, thence through the current winding of the cut-out, through the cut-out from there to the battery, and completes the circuit through the frame of the car.

Regulating Charging.

As the speed of the generator becomes greater the voltage rises. This has a tendency to increase the charging rate. But this increased current flowing through the reverse-series field winding weakens the generator field magnetism, which compensates for the speed increase and thus the charging rate is regulated.

The current flowing through the current winding of the cut-out assists in holding the points closed against the action of the spring. But should the engine slow down, the voltage of the generator might not be great enough to charge the battery. In this case the battery will start to discharge through the generator armature. This then causes current to flow in the reverse direction through the current

Chart "B"

GENERATOR DOES NOT CHARGE THE BATTERY

- Remove top of generator case to expose the cut-out.
- Short across the terminals of the cut-out with screw driver, pliers, or piece of wire
- Generator should motor (See note B3)
  - **Generator motors**
    - Trouble is in the cut-out (See note B1)
  - **Generator does not motor**
    - Use an ammeter to connect the two cut-out terminals together
      - Remove cover from brushes at front end of generator
        - **Ammeter shows flow of current of more than 10 amperes**
          - Raise top generator brush, so it does not touch the commutator
            - **Ammeter still shows large flow of current**
              - This indicates that there is a "ground" in the generator or the cut-out
              - Conclusion B3
            - **Ammeter shows small flow of current**
              - Trouble is in the cut-out. (See note B2)
        - **Ammeter shows flow of current of less than 2 amperes**
          - Ground the top generator brush
            - **Ammeter still shows small flow of current**
              - Conclusion B1
            - **Ammeter shows large flow of current**
              - Ground commutator
                - **Ammeter still shows small flow of current**
                  - Conclusion B2
                - **Ammeter shows large flow of current**
                  - Lower brush is not touching commutator. Put in new one.

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winding of the cut-out. This demagnetizes the cut-out, allowing the points to open, thus disconnecting the battery from the generator circuit.

Lighting.

When the engine is idle the battery furnishes current for the lights. When any one of the switches is closed, current flows from the battery to the motor terminal; thence to the common terminal of the switch; through the switch to the lamp, and from the lamp to ground. The circuit is completed through ground back to the battery. If the engine is running, and the battery is charging, current flows from the generator to the generator terminal.

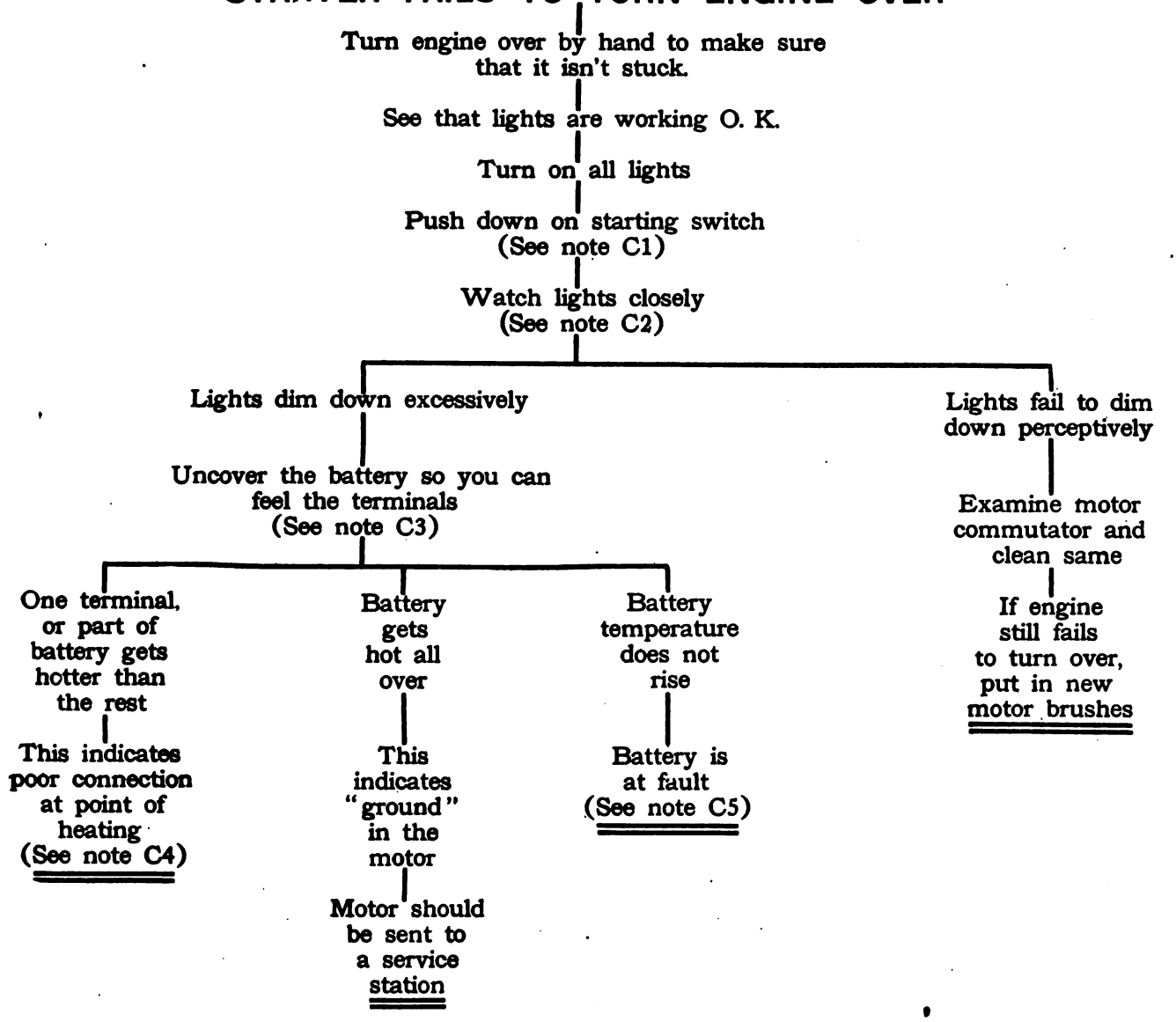
of the engine increases, the voltage will increase, and will soon cause the lamps to burn out. Then if the engine continues to run with the battery disconnected the excessive voltage will force excessive current through the shunt field winding and through the voltage winding of the cut-out. This will cause them to eventually get extremely hot and do damage. This is why we must take precautions to either remove a generator brush, or short circuit the generator if the battery is removed and the engine is run.

Lighting Troubles.

Now let us assume that a car comes into your

Chart "C"

STARTER FAILS TO TURN ENGINE OVER



here it divides. Part flows through the lamp circuit, and part through the battery.

If the battery should be disconnected it is plain see that the current would have only one path. would flow only through the lamp circuit. The mps are incapable of using as much energy as is sed in charging the battery. Therefore there would ot be the ordinary flow of current through the erse series winding. On this account there would no means of voltage regulation, and as the speed

shop and the lights refuse to burn. There are several things, any one or more of which might cause the lights to fail. For example: the lamps might be all burned out, the contacts at the lamps might be poor, the circuit might be open between the switch and the lamps, the switches might fail to function, the circuit might be open between the switch and the generator terminal, or between the battery and motor terminal; the contacts might be poor on at the battery terminals, the battery might be discharged,

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one or more cells might be dry, there might be a short circuit somewhere.

This is about all that is ever said in most of the articles I have read on the subject of lighting troubles. A list of possible troubles are given and the man is left with nothing to guide him in choosing the most likely troubles first. For instance, it would be foolish to remove all the lamp bulbs and test them individually to see if they are burned out, until you know for certain whether the current has a chance to get to them.

Result of Poor Contacts.

Let us suppose a case where the ground wire of the battery is making poor contact at the battery on account of corrosion of the terminal. The lights do not burn. The first and easiest thing to do is to ground the motor terminal. In this case there would be no flow of current. This would immediately confine your search to a comparatively small part of the circuit. Then ground the positive terminal of the battery. You still get no current. Now you know at once that the trouble is in the battery itself, or in the ground connection.

Now short circuit the battery. You do get current. Then this leaves no other place for the trouble except at the ground connection, and I wish to remark right here that sometimes a connection looks like it is all that it should be and still will not carry current.

Chart A contains the steps that I would take in locating any lighting troubles. I believe they are in the most logical sequence and following them will lead one to the trouble in a minimum of time. Charts B and C show how to locate charging and starting troubles. Any electrical system could be handled in much the same way.

Conclusions.

A1.
This shows that there is a broken wire between the common switch terminal and the motor terminal, or there is a poor connection at either of these terminals.

A2.
Open circuit between the battery and the motor terminal. May be due to broken wire or poor connection at either terminal. Most likely to be on account of corrosion at the battery terminal.

A3.
Open circuit between the battery and the ground connection. May be due to broken wire or poor connection.

A4.
Battery is discharged. Charge same, and see that it is in good condition before replacing.

A5.
Battery is at fault. Remove it and have it inspected by an expert battery man, or replace with new one.

A6.
Switch is at fault on account of faulty mechanism or dirty contact inside the switch. Best method is to replace switch with new one.

A7.
Open circuit between lamp and switch. May be due to broken wire or poor contact at switch.

A8.
Poor connection between socket and bulb. This can sometimes be remedied by dropping a little solder on the contact inside the socket.

A9.
The wire that leads from the lamp body connector to the reflector socket may be broken or there is poor contact at the connector. This can sometimes be remedied by dropping solder on the contact to make it longer, as in A8.

A10.
There is a broken wire or poor connection between this lamp and its particular switch.

B1.
In this case there might be an open circuit in the reverse series winding, or the wire that connects to the top generator brush may not be making contact. Clean this contact and replace. Then if it still acts the same way, the generator should be sent to a service station.

B2.
The top generator brush is not making contact with the commutator. Clean the commutator, then if this fault still shows, replace the top brush with a new one.

B3.
Remove the two wires from the cut-out terminals. Join these two wires together with the ammeter. If the ammeter then shows small current flow, the trouble is in the cut-out. If the ammeter then shows large current flow the trouble is in the generator itself and same should be sent to a service station.

A1.
Take a short piece of heavy wire. Touch one battery terminal with one end of this wire. Then touch the other end of the wire to the other battery terminal. Make this second contact very quickly.

A2.
Remove the bulb. Touch the center contact of the bulb to one terminal of a good battery. Then touch the metal shell with a wire that has been connected to the other battery terminal. If the bulb is O. K. it will light.

B1.
The cut-out is used to make automatic connection between the battery and the generator when the generator is generating enough voltage to charge the battery, and to break this connection as quickly as the generator voltage falls below the voltage of the battery. This prevents discharging of the battery through the generator. In its operation the points of the cut-out close to make this connection. Sometimes they fail to close on account of improper adjustment. Again, failure to function may be due to an open circuit in the voltage winding of the cut-out. If you are unable to locate the reason for its failure, send it to any good electrician for repairs or adjustment.

B2.
This indicates that there is a ground circuit in the cut-out Should be replaced with a new one unless the fault is located.

B3.
When we say that the generator should motor, we mean that the generator should turn over slowly. In other words it acts as a motor, but it will not attain anywhere near as great a speed as the motor itself. When it is motoring there will be a clicking sound heard at the front end of the generator, caused by the overrunning clutch.

C1.
In pushing down the starting switch the generator will motor as explained in note B3, when the switch has moved only a part of its travel. This is to enable the gear to mesh with the teeth of the flywheel before the motor circuit closes.

C2.
When everything is working O. K. there will be a slight dimming of the lamps when the starting switch is closed. This is on account of the large flow of current through the motor, and the consequent "drop" of voltage across the battery. This dimming will be slight, however; not to exceed ¼ decrease in brightness.

C3.
If the battery is of the bolted connection type, there may be poor connections at the terminals of any of the three cells. This may not be sufficent to stop the flow of current to the lights, and still may not be able to carry the large current required to operate the starter.

C4.
This shows poor connection, as explained in note C3.

C5.
Test the battery with a hydrometer. It is very likely that it needs to be charged. While being charged it should also be tested for any other possible faults by a battery expert.

NEW SIX-HOUR RECORD.

De Palma in Packard Travels 616 Miles, Creating Many New Marks.

A new world's record for six hours was established by Ralph de Palma at Sheepshead Bay, N. Y., on November 16, when the Italian covered 616 miles in a Packard Twelve. His actual distance was 633.12 miles, as De Palma drove above the mark set on the track by A. A. A. The former record was held by Resta, Chassagne and Guinness, who drove a Sunbeam at Brooklands, England, 566 miles and 589 yards on October 1, 1913.

De Palma averaged officially 102.8 miles for the 616 miles and 105.52 miles for the 633.12 miles. At no time during the race against time did his average fall below 101 miles. The best average was 110 miles in the first hour. The speed, exclusive of stops of 15 minutes and 20 seconds, was 111 miles per hour. The car now holds all records from 10 miles up to 600, regardless of class or free-for-all classifications for cars under 300 cubic inches. The time for each hour was as follows:

	New Records.		Former Records. Distance.		
Hr.	M.P.H.	Distance.	Miles.	Yd.	M.P.H.
1	110	110	107	672	107.85
2	109.5	219	195	189	97.55
3	106.9	320.9	287	856	95.83
4	107.2	426.8	380	628	95.09
5	104.4	522	473	464	94.65
6	102.8	616	566	589	94.39

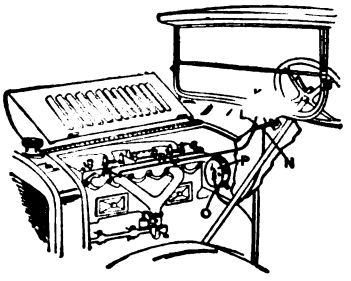
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Why the Gasoline Engine Requires Coaxing Before It Will Start In Cold Weather.

A Non-Technical Explanation of the Factors Responsible and Various Suggestions for Overcoming the Trouble.

BY C. P. SHATTUCK, M. E.

The time is fast approaching when the motorist, particularly the owner of an old car, one that must be cranked by hand, will experience considerable difficulty in starting the engine. It is safe to say that it will be even more difficult to start the old car than it was a year ago, for it must be borne in



Priming the Engine from the Dash Makes for Easy Starting.—The Imperial, Made by the Imperial Brass Mfg. Co., Is Adaptable to All Cars.

mind that the fuel now being supplied is not growing any more volatile as the demand increases. The average new owner is prone to blame the fuel, but a careful analysis of the average case will generally reveal a number of factors which contribute to difficulty in starting. By this is meant that there may be reasons other than failure of the fuel to vaporize which are responsible for hard starting of the engine.

Problems of Carburetion.

Not only is the owner confronted with trouble in cold weather, but the manufacturer has his problems. It is demanded of him that he supply a carburetor that will make starting easy in low temperatures, provide flexibility at all ranges, obtain plenty of "pep" when accelerated and, last but not least, the device must be very economical of fuel. And the last named is being given serious consideration in these days of the high cost of fuel.

Now, the designer of a carburetor aims to supply a device that will suitably proportion the fuel to the air and to properly vaporize the fuel. In all practical carbureting devices the liquid fuel is brought into the presence of the air with which it is to combine by means of pressure depression exerted upon the discharge end of a tube or passage so constructed and located as to cause the fuel to be carried off by a moving column of air.

Effect of Temperature.

The proportioning of the fuel and the air is subject to irregularities as a result of temperature change, not always seasonal changes, but of the engine itself. The last named changes are greatest, especially with low atmospheric temperatures, and as a result irregularities in mixture proportioning are greater in the winter than in the summer. Changes in the temperature, whether it be the air entering the carburetor, or of the engine proper, tend to alter the mixture proportions. There are other factors involved but these, being technical, will not interest the reader.

Frequent Changes Necessary.

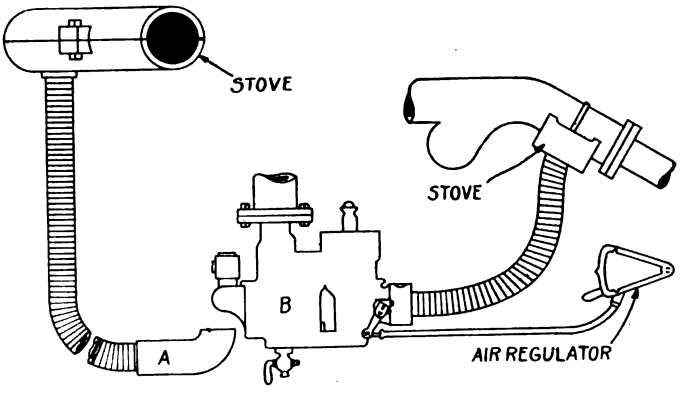
The older types of carburetor generally require more or less changing in the adjustment of the fuel and air supply, and a mixture making for easy starting is generally excessively rich at operating speeds, as is frequently noted by the exhaust of old engines in cold weather. The exhaust is accompanied by a pungent, acrid odor and black smoke. With such carburetors operative efficiency is sacrificed for easy starting, and many owners prefer the latter to the former.

Where Engine Is at Fault.

Owners of old types of engines must not expect to obtain easy starting even if a new type of carburetor be fitted, for there is another factor to be considered—the intake pipe or manifold. If it be long and has many tortuous curves, starting is bound to be difficult. The elimination of the intake manifold, the casting of the cylinder bloc with inlet passages and increased use of heat have been brought about by the low grade of fuel. Such construction, coupled with the rapid rotation of the crankshaft by the motor starter, has eliminated starting troubles to a great extent but not wholly, as will be pointed out.

Mixture Not a True Gas.

When the mixture leaves the carburetor it is not a true gas, it consisting chiefly of liquid particles carried in mechanical suspension in the moving air current. A definite velocity is needed to maintain this suspension, and the moment the speed of the



Advantage Should Be Taken of the Heat of the Exhaust.—The Design at B Shows Control of Air and A Illustrates a Stove.

moving air current is decreased below a certain velocity the larger particles of fuel are deposited on the walls of the intake pipes and the mixture no longer contains that amount of gasoline that was metered into it by the carburetor.

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Whenever a moving fluid comes in contact with foreign surfaces the velocity of the surface stratum is markedly diminished by the friction of the contact, termed "skin friction," an amount dependent upon the condition of the smoothness of the frictional surface. That portion of the air column which comes in contact with the walls of the manifold frequently falls below the critical velocity, even though the interior of the column be maintained well above it. This wetting of the surfaces is commonly, but erroneously attributed to "condensation." Condensation implies a change of state from a gas to a liquid. As the gasoline has never been a gas, during the process under consideration, the term condensation is a misnomer.



Starting on a Cold Morning Is Made Easy by the Use of Heat.—The Presto Electric Heater, Made by the Metal Specialties Co., Raises the Temperature of the Fuel.

Surface Evaporation.

The liquid film, wetting the walls of the manifold, is subjected to the attraction of the moving air column, with the resulting evaporation of the liquid. This evaporation takes place only from the surface of the fuel and is a slow process with low grades of gasoline. The processes of deposition and evaporation are noted when starting some engines on a cold morning. After running a short time the rate of evaporation, assisted by the rise of the temperature beneath the hood, equalizes with the rate of deposition and the engine runs smoothly and without that "surging."

Curves Decrease Efficiency.

The tendency of the liquid to seek the outer periphery of all curves in the induction pipes is another factor affecting the proper distribution of a mist-laden mixture. No matter how finely the fuel may be comminuted, so long as it remains a liquid its specific gravity is greater than that of the air and, being thrown violently against the outside of the curve by centrifugal force, its velocity is lessened by the impact. The result is a tendency to impoverish the mixture. With the tortuous passages of some manifolds, it is probable that nearly all of the unevaporated fuel is deposited before reaching the cylinders, and it is not uncommon to note with poorly designed manifolds an actual dripping from around the throttle shaft and from the primary inlet to the carburetor, after one has become exhausted by the ineffectual cranking of a cold engine.

While these defects in manifold design have been eliminated to a great extent in the modern engine, it can be readily seen that some of the starting troubles experienced are due to inefficient manifolds. It is important that each cylinder receive an equal quantity, as well as a mixture possessing the same chemical and physical characteristics. Some older types of motors preclude this. Add to these complications those present with the early forms of carburetors and it is no wonder that trouble is experienced in obtaining a mixture that will afford easy starting and operative efficiency.

When Owner Is at Fault.

Difficult starting is frequently the fault of the owner. Dealing with those cars not equipped with motor starters and dynamos and which rely upon the dry cell or storage battery for a source of current supply, it may be said that many owners do not take into consideration the fact that batteries that will start the engine easily in warm weather will fail in the winter. Cold has a certain effect upon electricity derived from chemical action, and because of this fact the dry cell and the storage battery require careful attention. Dry cells reading below 10 amperes should be discarded and all new installed. Storage batteries should be maintained according to the directions of the maker, even the cells charged by the generator of the lighting system.

Parts Causing Trouble.

The timer and distributor may be responsible for difficult starting, especially if dirty, for certain foreign elements set up a considerable resistance to the passage of the primary current, resulting in a weak spark. Worn rollers and metal segments and loose bearings prevent a good contact, and similarly if the points of the vibrating coil be fused or dirty, they impose a resistance in the circuit, affecting the intensity of the spark at the plug. Dirty and oil-soaked wires in both the primary and secondary circuits decrease the efficiency of the spark, for it should be borne in mind that the intensified electricity will always take the path of the least resistance.

Avoidable Troubles.

Failure to start the motor on the magneto—the true high-tension type—in cold weather is frequently due to too large a gap of the contact points or the points may be pitted or dirty. The contact points will wear after considerable service and the space between them when fully separated should be measured with the gauge accompanying the magneto. In the inspection of the components of the ignition system, the motorist, as a rule, overlooks the spark plugs. Many owners do not take into consideration that certain types of plugs have electrodes that are affected by the intensified current; that the gap is increased by the burning action of



Keeping the Radiator Well Covered Is an Aid in Starting a Cold Engine.—The H-M Cover, Made by the H-M Mfg. Co., Indianapolis, Ind., Is Controlled from the Seat.

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the current. This increase is so slow that it is not noticeable until the motor is hard to start in cold weather.

Natural wear of the spark control linkage and the driving mechanism of the ignition apparatus will contribute to hard starting. Invariably the motorist who starts his engine becomes accustomed to placing the lever on the quadrant in a certain location; in fact, it becomes a habit. With the wear of the linkage, etc., the spark occurs later, and if the engine be started on the magneto some do not take into consideration the fact that it is not always possible to attain the same rate of speed when rotating the crankshaft in cold weather as in the summer. Consequently the spark should be further advanced.

When Mixture Is at Fault.

Poor contacts at the switches are factors making for trouble in starting, and worn pins retaining the throttle valve of the carburetor admit extra air which dilutes the mixture at cranking speeds. Worn valve stems or guides will admit extra air, as will imperfect gaskets between the cylinders and flanges of the intake manifold. Frequently dilution of the mixture is caused by leakage of air between the carburetor and manifold. The amount of air drawn in may be small, but if the fuel supply must be increased to compensate for the extra air, the mixture will be unduly rich at operative speeds, which will breed engine troubles.

When one or more of the above-named conditions exist it is not reasonable to expect the engine to respond to ordinary treatment. One does not desire to expend large sums in correcting faulty design, but starting can be greatly improved by an inspection of the components mentioned to note if faults exist. One must not expect that the installation of a motor starter on an old engine will wholly overcome starting troubles. Under certain conditions the motor starter must have assistance. It will rotate the crankshaft but it will not vaporize fuel of low volatility nor correct ignition or mechanical troubles. Even if the car be equipped with a motor starter, in extreme cold weather and particularly when the car has been standing a long time, it is advisable to enrich the mixture or prime the cylinders or both. The writer has noted instances where the motorist exhausted the battery in endeavoring to start without priming, etc. If the engine does not respond, do not continue to waste current, but prime the cylinders.

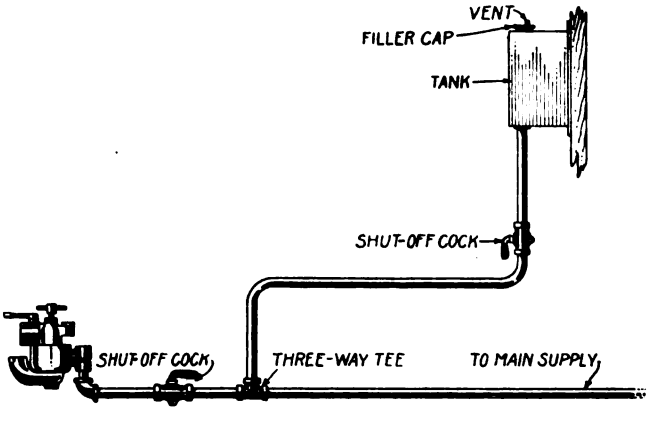
The motorist who garages his car in a heated building and who does not expose the engine to low temperatures for any great length of time when it is not running, does not as a rule experience trouble in starting. But the automobilist whose garage is not heated must employ means to coax the engine into life. There are thousands of owners storing their cars in unheated buildings, especially in the suburban and country districts, and whose means do not warrant the installation of heating apparatus. Under such conditions the mixture must be enriched, either by temporarily restricting the air supply or increasing the amount of fuel or both. And it should be borne in mind that during cold weather the air supply should be cut down slightly or the fuel supply increased. The amount and method will depend upon the carburetor.

Flooding Isn't Priming.

The simplest form of priming is to displace the spark plugs and pour about a tablespoonful of gasoline into the combustion chamber; that is, if the engine be not provided with priming cocks. Spark plugs having priming features are marketed and will save time and effort. A few words on the difference between priming and flooding will be of value to the novice and to some experienced motorists. Priming means injecting a rational amount of fuel into the cylinders. Flooding is the addition of more gasoline or other inflammable fluid for the same purpose. The latter condition makes starting more difficult and sometimes impossible. When on an extreme cold day the cylinders have been primed and the engine fails to respond, it is useless to pour more gasoline into the cylinder until the first quantity has been removed. Open the primary cocks and with the ignition switch on, crank the engine. Then close the priming cocks and the engine will generally start. Enriching the mixture does not mean supplying so much fuel that it will not ignite.

Suggestions for Starting.

Some cars cannot be started easily by priming and among the practical methods are: covering the air intake of the carburetor and pouring boiling hot



An Auxiliary Fuel Tank for Storing a Highly Volatile Fluid Will Greatly Aid in Starting the Cold Engine.—Control Is by a Shut-Off Valve in Main Line.

water over it and the intake manifold; utilizing a cloth bag about two or three feet long, filling it with sand and placing in the oven of the stove until thoroughly heated, then wrap the bag around the intake pipe and carburetor; using warm water to refill the radiator when the water has been drawn off, and moistening the electrodes of the spark plugs with gasoline.

While the experienced motorist is familiar with the advantages of thoroughly blanketing the radiator when the car is to be left on the street, etc., the novice will find that by using two robes and covering the hood also, that the heat will be retained for a considerably longer period, for it should be remembered that the heat from the engine rises.

The present grade of fuel has greatly stimulated the efforts of inventors and as a result there are many practical devices marketed which greatly reduce the efforts attendant upon starting a cold engine. These range from a spark plug with a priming attachment to the electrical heating device which raises the temperature of the fuel in the carburetor as well as that of the intake pipe or manifold.

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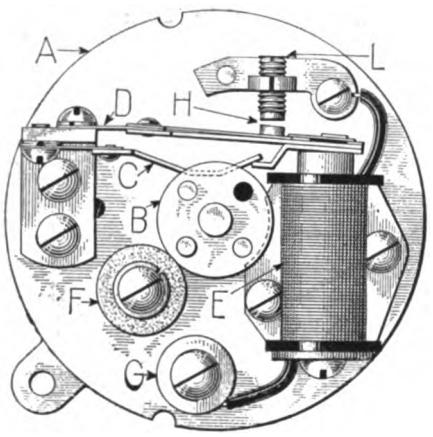
ELIMINATES USUAL COIL.

New Ignition System for Ford Makes Use of Non-Vibrating Coil and Novel Breaker.

One of the disadvantages of the Ford system of ignition is that it includes the magnetic type of vibrator, or the vibrating coil, a system that does not obtain that essential factor, synchronization, and particularly after the coil points, etc., have been in service for some time. The use of the non-vibrating type of coil or transformer with the Ford car has not been practical heretofore because the current obtained from the flywheel magneto or generator is alternating and because there are 16 positions in each revolution where no current is being generated. It is because of these zero positions that a vibrating type of coil is necessary. The Ford system also requires the use of a timer or commutator affording a rather long period of contact or closing of the primary circuit.

The Vibrator-Les System.

An ignition system eliminating the vibrating type of coil and conventional timer has been brought out by the New York Coil Co., New York City, and



Showing the Ingenious Method Employed in Obtaining Rapid Break in Primary Circuit and How Sticking of Contact Points Is Prevented.—The Normal Position of Points Is Also Illustrated.

one of its many advantages is that a rapid and positive interruption of the primary current is obtained without sacrificing the possibility of thoroughly saturating the primary windings of the coil. The coil is of the non-vibrating type, is specially wound to obtain thorough saturation of the primary circuit, and eliminates the regular Ford dash unit which is replaced by a neat panel containing a two-point switch. The new coil is retained by means of a special bracket which is attached or bolted to the studs of the intake manifold.

Interruption Is Positive.

The device obtaining the break or interruption of the primary circuit, and which is mounted on an elevating gear bracket, is shown in an accompanying illustration. It is a simple apparatus, one that is practically foolproof, and a construction that should require no attention other than an occasional adjustment of the contact points, the wear of which should be negligible. The operation of the breaker is novel, as it combines magnetic and mechanical action, one checking the other, and the possibility of the points fusing or sticking is eliminated. This is an advantage, particularly when the engine is started by manual cranking.

How Breaker Is Made.

The Rhoades breaker includes an armature, D, carrying a contact point, H. Directly under the



The Usual Dash Coil Is Replaced by a Neat Switch Panel.

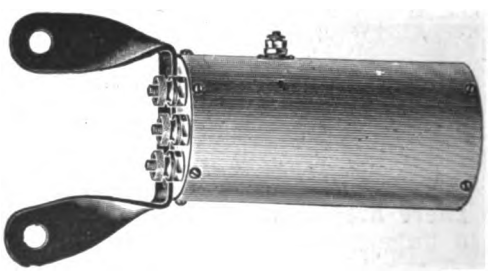
armature is a magnet, E, connected in series with the primary of the non-vibrating coil. The member C is supported at one end by a stiff spring so arranged as to normally exert a downward pressure to keep the contact points separated. The part C also engages a hooked section of the armature, further assuring normal separation of the contact points.

Breaking the Circuit.

The closing of the circuit or engagement of the contact points is obtained when one of the four steel pins of the rotating member B contacts with the member C. This raises the member C and allows the armature D with its point to contact with the fixed point L, which is in the form of a screw. This screw is carried in a support and the former is slotted so that it is a simple matter to make any required adjustments.

The circuit is completed through the magnet E when the contact points meet, and the magnet is so energized and the circuit so rapidly established and broken that a shower of sparks is obtained from the secondary of the coil. This action continues during the time the pin makes mechanical contact with the member C. After the pin separates the armature assumes the position shown in the illustration, thus breaking the primary circuit and preventing fusing or sticking of the points as previously explained.

The Vibrator-Les system comes complete with all



The Non-Vibrating Coil Is Attached to the Studs of the Intake Manifold by a Special Bracket.

wires, cables with terminals, also a tube for supporting the high-tension leads. The material and workmanship are first class in every respect and the system has been thoroughly tested under all conditions of service.

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Where a Big Fertile Field, a Profitable Market, Is Awaiting Development.

Manufacturer of Accessories and Equipment Neglecting the Small Town and Cross Roads Garage.—How This Trade Can Be Reached.

BY FRANK FARRINGTON.

There has been a good deal said about the development of foreign markets and the makers of automobile supplies have looked longingly toward the South American field where there is an increasing demand for the automobile products of the United States. It is worth while to work for the growth of trade in the other countries of the world, but at the present rate it will be some time before the whole of the home market has been intensively cultivated. There is not yet a full realization of what the rural and small town market for automobile goods means or what are the possibilities of its consumption of accessories and repair supplies.

The other day I took an inner tube into a garage that I know does a business in sales and repairs, amounting to not less than $50,000 a year, and I wanted a tube vulcanized. They did not have any kind of a vulcanizing outfit and could not even vulcanize a tube. At another time I took a casing to another small town garage doing at least as much business as the former and they had nothing with which to vulcanize a shoe though they could vulcanize a tube.

Garages Lack Equipment.

My experience has been that the small town or the crossroads garage does not have the equipment or near the equipment possessed by the city garage doing a similar amount of business. This is not that the small town garage does not need that equipment. It does need it more than the city garage because the latter is within easy reach of places where any kind of work can be done while the rural garage must be more dependent upon its own resources. It is not that the motorists in the rural districts do not need and want the repairs that are needed in the city, because there is no difference in that respect. The same things happen to cars in the country that happen to those owned in the city.

Sends Work Outside.

When I take a car to a small town garage to be overhauled there is a good chance that they will have to have some of the work done outside. They will have to send the radiator away or they will have to ship some other part to a specialist in repairs of a certain kind. They will have to take one part to the plumber and another to the carriage shop and still another to the blacksmith. This cannot be entirely obviated, but if the local garage had the equipment it could do many of the things it now has done in the city. This would mean a better price to the customer and a better profit to the garage and better satisfaction all around.

Is Outgrowth of Small Shop.

One reason, perhaps it is the big reason, why the small town garage does not have the equipment for special jobs and the more complicated work is that such a garage is usually the outgrowth of a small shop or the gradual development of a one-man shop, and the boss has never studied into the matter of available equipment.

The manufacturers of the tools and machinery that ought to be in these garages have not gone after sales there. They have regarded the city garage as the best prospect and they have worked the big town field and left the small town field to take care of itself, not realizing its possibilities.

There are so many automobiles in the cities and we see them congregated there in such great numbers that it is natural to think of the city as the place where the bulk of the automobile repair business must be done. But if we take the number of automobiles per capita we find the country districts holding their own and counties containing no large towns enumerating their one car for every 25, 30 or 35 inhabitants, right along with the city per capita enumeration.

Value of Publicity.

It costs more money for the manufacturer to reach the small towns than to cover the cities where the garages are many and close together, but if it is undesirable to send salesmen to these smaller towns, and in winter it may not be feasible to cover such territory traveling in a car, then there is the trade paper and it has been my observation that the small town garage man is likely to be a better trade paper reader than the city chap. He has more time. He takes the periodical home with him. His employees get hold of it and read it.

Appeals to the small town garage keeper through the advertising pages of the trade paper will go straight home but if they are to pull they ought to be prepared with the smaller town in mind. As a matter of fact they need to be supervised by a man who knows the small town field.

Where Mail Order Fails.

There is no need of telling any automobile supply man about the prosperity of the farmers. Everybody realizes that the farmers of the country are making and are going to make more money in the next few years than they have ever made in their lives. In canvassing a farming section recently selling Liberty Bonds I found the farmers provided with money beyond the ordinary expectations. It was not uncommon to canvass whole districts or valleys back into the hills and sell every farmer on the road. This means that the farmers have the money to buy more and more cars and they cannot get repairing done by mail order houses. They must patronize the nearest garage in the village.

Farmers Are Prosperous.

You find farmers to-day buying cars as they would buy a team of horses, not as a luxury, but as a part

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of their regular farm equipment, necessary in taking the family to town. The old buggy or surrey has been abandoned in favor of the car—and you know you can buy a serviceable car for less than a good pair of horses costs. The business done by the small town garage in the way of repairs and accessories has been in the past too much limited by the demand. There has not been enough urgent insistence by the manufacturer on the garage man advertising his accessories to the rural trade.

Makers Have Neglected Field.

The maker of toilet specialties, food products or wearing apparel, supplies his retail customers with advertising matter to be sent to the consumers in his territory. He urges the dealer to use this matter and there is every effort to make co-operation along this line profitable. How many makers of automobile accessories are working along this line? How many makers of machinery and tools and equipment are urging their garage customers to advertise to the trade the possession of such facilities for handling business? The repair business, in particular, has been left too much to go where it happened. Few garages are after the trade in a way that can be called urgent.

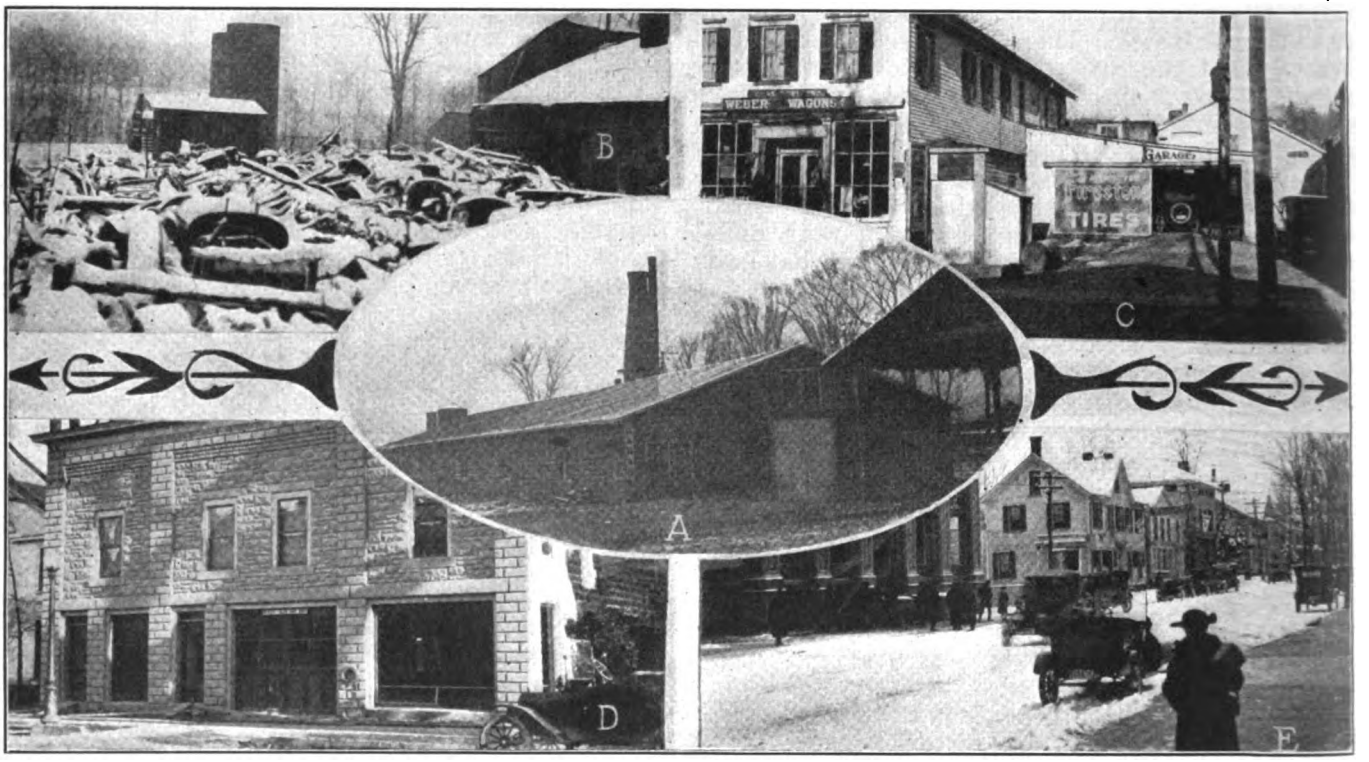
When the big car from the city rolls past the farmer's door the farmer sees it equipped with conveniences that interest him. Very likely he thinks of them as part of the regular equipment of a better car than he can afford, or a make he does not know about. As a matter of fact, in all likelihood most of the accessories are such as the farmer could get and use on his own car if he only knew it. The city owner has access to supply stores where all these things are kept. They are displayed where he sees them and he buys. The farmer too would buy and be glad to if he had the goods shown to him where he could be told their advantages. He would buy if he were only told in advertisements.

Are Good Buyers.

Country motorists are just as anxious to add to their cars the little touches in the way of equipment that mean style, but they are not in touch with such things. It is the same with the country motorist that it is with the woman in the small town who wants to dress well and stylishly. She has not the facilities for getting the things she needs and the motorist is deprived of the same privilege.

When the makers of these additional accessories and of the equipment the garage needs in order to be able to do the best work with the most speed and satisfaction begin to push their lines more intensively in the country districts and in the small towns they will begin to get sales from that part of the trade, and quite naturally those who discover the possibilities of the country first will be the ones first to reap the harvest.

If the country people buy cheaper cars that means all the more opportunity to sell them accessories. because their cars are not equipped with all the needed conveniences when they get them. If they buy cheaper cars it is not necessarily an indication that they cannot afford the bigger, better cars. It is often the case that the farmer lives where a light, cheap car is the only kind he can use satisfactorily owing to road conditions. The farmer living back on a narrow hill road has no use for a big, heavy car. It would be a white elephant on his hands. He must have something that will not easily get stuck in the mud, something that will go into the barn space he has available, something he can roll easily by hand. This man with plenty of money.



Developing the Small Town Garage—A, the Structure Replacing the Wooden Building, B, Destroyed by Fire; C, Type of Garage Frequently Found in Small Towns and the Development of the Vehicle and Implement Business; D, Type of Garage Springing Up in Every Small Town; E, the Farmers Use Their Cars Throughout the Year.

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though he must use a cheap car, does not need to stint himself when it comes to accessories and conveniences for taking care of his car.

It calls for a big advertising campaign to reach the country folks direct, but it is easy to reach the garage men and through them to reach the users in their territory. If there is any more direct way of reaching these garage proprietors economically than through the automobile press, I do not know what it is.

SHOP HINTS.

In turning and shaping metal on the lathe, planer or shaper there are certain speeds which must not be exceeded or the tool will be injured. In taking a roughing cut on the lathe on wrought iron the speed must be lower than when a finishing cut is being made, because of the fibrous nature of the metal, but with the other metals the speed can be the same with roughing as finishing.

In the case of brass the feed is the same at all speeds, and whether a roughing or finishing cut is being made, though with cast iron the speed should be slower in making finishing cuts. With wrought iron and steel, the feed is faster on the finishing cuts than on roughing cuts. As the diameter of the work turned is increased, the number of revolutions is reduced in proportion. Cutting speeds and feeds are as follows:

Diameter of work in inches	Roughing cuts: Speed in revolutions per minute	Roughing cuts: Feed	Finishing cuts: Speed in revolutions per minute	Finishing cuts: Feed
Brass.				
1 and less	380	25	380	25
1 to 2	318	25	318	25
2 to 4	255	25	255	25
4 to 6	229	25	229	25
6 to 12	191	25	191	25
Iron, Cast.				
1 and less	121	20	121	20
1 to 2	112	20	112	16
2 to 4	96	20	96	10
4 to 6	80	16	80	6
6 to 12	63	14	63	6
12 to 20	63	10	63	4
Iron, Wrought.				
1 and less	112	25	121	30
1 to 2	80	20	96	30
2 to 4	80	20	80	25
4 to 6	72	20	72	25
6 to 12	63	15	72	20
12 to 20	57	12	58	16
Steel.				
1 and less	63	25	63	30
1 to 2	57	25	57	30
2 to 3	57	25	48	30
3 to 6	48	20	48	30

Why Annealing.

The reason for annealing steel and other metals is to soften them for one purpose or another. This consists of heating and cooling very slowly as compared with quenching, which produces hardness. Cylinder castings of iron are treated by this process to remove internal strains set up between thick and thin parts. Many notably hard steels are annealed to permit of easy machining, while in parts subjected to shocks which must, however, sustain other loads, the hardening is necessary in order to bring out the best qualities of the material. This requires careful working for physical properties, then equally skillful annealing to remove all internal strains.

Rust Preventative.

To prevent rust, dissolve one ounce of camphor in one pound of melted lard, remove the scum, mix as much black lead with lard and camphor, as it will give it an iron color, clean the machinery or part well, smear with the mixture, and after 20 hours rub off, clean and polish with soft cloth.

Weights of Water and Fuel.

The weight of a gallon of water, pure, at 62 degrees Fahrenheit, the standard figure, is 8.3356 pounds. The usual number taken is 8.33, since all water is not pure, nor can it always be had at that temperature. In round figures, gasoline weighs about 7 pounds, and kerosene 7.9. This makes the former 16 and the latter 5 per cent lighter than water.

Bevel Gear Dimensions.

In giving the dimensions for bevel gears, always mention the pitch or diameter of pitch circle, the number of teeth in both pinion and gears, the width of face, the diameter of shaft hole, the size of keyway or set screw, the backing for both gear and pinion, the size of the hub on both, and location of one pitch line on the length of its shaft. If mitre gears are used, mention this fact.

Cleaning Brass Castings.

A pickle for brass castings can be made by taking three parts sulphuric acid and two parts nitric acid. Mix and add to this mixture one pint of common salt and stir until it dissolves. Use an earthern vessel and then dip articles deep. Remove at once and rinse in clear water. This will clean and brighten the castings.

Layout Work.

To whiten a surface for laying out work, mix whiting with gasoline to the consistency of thin paint and cover the work to be marked. The gasoline will soon evaporate, leaving a white surface on which lines can be easily scribed.

To Harden Reamers.

To harden reamers heat slowly and evenly to a bright cherry red. Quench quickly and immediately immerse in a bath of linseed oil, holding reamers vertically, and draw the temper to a straw color, as for a tap or a die.

Determining Size of Carburetor.

The size of a carburetor is determined by the area of the valve opening and not by the cylinder displacement, as the former more accurately indicates the capacity of the engine. Too large a carburetor, one with too much passage area, will not cause an engine to deliver more energy than would a carburetor having a passage equal in area to that of the valve opening. The use of too large a carburetor not only wastes fuel, but the output of the engine will not approach its maximum. With too small a carburetor the engine will not develop its rated output, as the necessary supply of mixture cannot be obtained at high speeds. In changing one make of carburetor for another, or replacing the old with a new type, these factors should be taken into consideration.

NEW BOOKS RECEIVED.

Acknowledgment is made of the following books and house publications:

Delco Doings. House organ published by Dayton Engineering Laboratories Co., Dayton, Ohio.

Safeguarding America Against Fire. Bulletin published by National Board of Fire Underwriters.

Concrete Highways Magazine. Devoted to concrete roads, etc. Published by Portland Cement Association.

Harry Newman's Pep. Published by Harry Newman-Stratton Co., Chicago, Ill.

Chalmers Monogram. House organ, Chalmers Motor Co., Detroit, Mich.

Auto Suggestions. House organ, Northwestern Chemical Co., Marietta, Ohio.

Auto School News. Published by the Michigan State Auto School, Detroit, Mich.

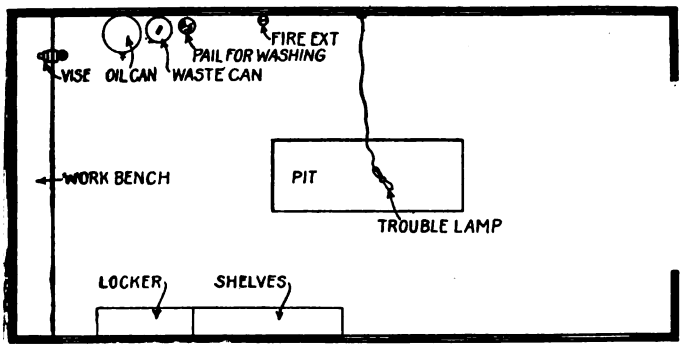
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Selecting Tools, Supplies and Equipment for the Private Garage.

Advice for the New Owner Desiring to Undertake the Maintenance of His Machine.—How to Arrange the Garage to Obtain Best Results.

BY CLIFTON EGERT.

When the new owner, the purchaser of his first automobile, asks the agent what will be needed for the new machine, the answer invariably will be, "Oh, just keep her filled with oil, water and gas, and be sure you use plenty of oil for a while." This



A Suggested Arrangement of a Garage for One Machine and the Equipment Essential for Its Operation.

reply is a stock expression with many dealers, but others will be encountered who will take the pains to explain to the novice what is required to obtain good service from the car, and some will even go to the trouble of suggesting a list of practical supplies and equipment, particularly if the new owner intends to erect a small garage on his premises.

Cataloging the Motorist.

The new owner, as well as his older and more experienced fellow motorist, may be divided into classes. There is the man who keeps his machine at a public garage, relying upon its mechanics to do all necessary adjustments and repairs. This motorist will be content with the tools, etc., accompanying the car. As this story is intended to deal with the owner who looks after his own machine, wholly or in part, the public garage motorist will be eliminated.

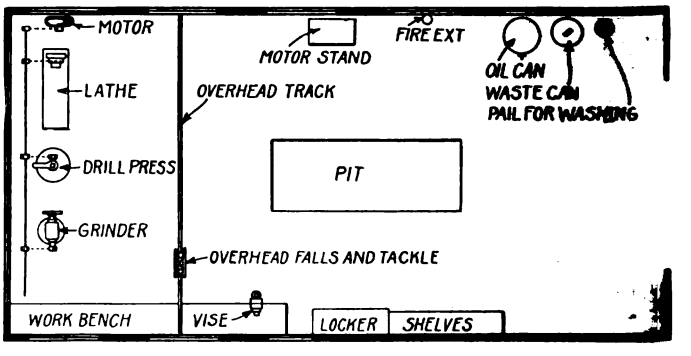
When the new owner, the man making his initial investment in a gasoline propelled vehicle and who desires to give his new machine that little attention it requires to keep it in first-class running condition, decides he will utilize a piece of the ground on which his house stands to build a garage, he generally makes a mistake common to the novice. And that is to build too small a structure. In other words, the novice is prone to plan a building for the car without giving any consideration to himself.

Why Room Is Important.

The writer knows of many instances where the new owner built a structure which, when completed, permitted the owner to just squeeze in between the running board of the car and the side of the building. The increased cost of making the garage at least two feet wider deterred these owners from obtaining a garage with sufficient room to work around the machine in comfort. There is another disadvantage of the too small a building and that is when an overhaul of the machine is attempted it means that some of the bulkier components cannot be handled in the building. Speaking from experience, the writer advises that when the plans for the new structure are being made that the mistakes of the economical new owners be avoided.

Standard Equipment.

Reverting back to the new owners, there is the class which at first is content with what is termed ordinary equipment, material necessary for the operation of the car. The dealer was partially right when he told his customer he would need oil, gas and water, but he failed to state that the new owner would require other material and equipment. Had the dealer the best interests of his client at heart he would have informed him that inasmuch as the operation of the car depended upon the source of the current supply the storage battery must be cared for. Now, caring for the battery does not mean renewing the supply of distilled water, but an intelligent use of a hydrometer. The second article required for the upkeep of the car is a grease and oil gun or a combination instrument. This, utilized according to the lubricating chart, will save repair bills, for friction is the one thing to be avoided. To renew the supply of water in the radiator one should purchase a funnel. Avoid the cheap tin affairs, as these rust. A combination oil funnel and measure is exceedingly useful, particularly where the ordinary measure cannot be used



Illustrating Equipment Including Machinery Enabling Owner to Complete a Thorough Overhaul of the Car.

to reach the filling member. While an ordinary measure can be used, there is always more or less opportunity for spilling or dripping the oil over the engine.

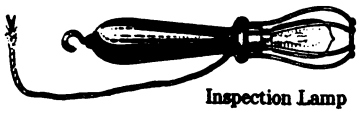
Necessary Garage Material.

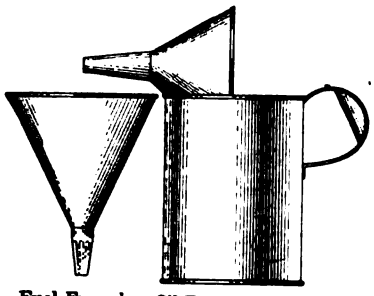
Those utilizing an anti-freezing solution including alcohol ought to invest in a freezometer, an in-

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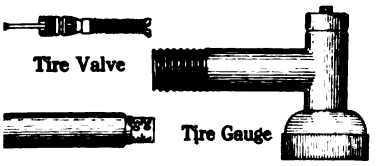

Hydrometer


Oil and Grease Gun


Inspection Lamp

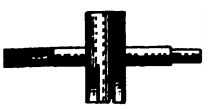

Fuel Funnel Oil Funnel and Measure

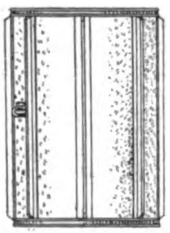

Freezometer

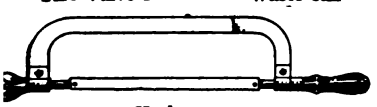

Tire Valve Tire Gauge

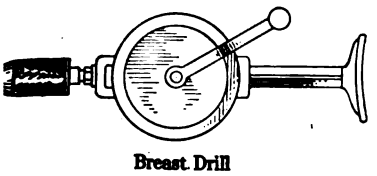

Vulcanizer

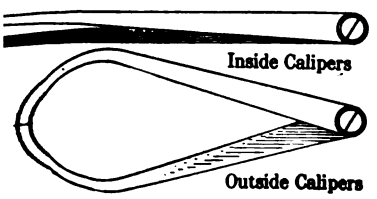

Water Funnel


Tire Valve Tool


Waste Can


Hacksaw


Breast Drill


Inside Calipers Outside Calipers

strument for indicating the strength of the solution. It is very important that the proper strength be maintained, particularly if the car be kept in a cold garage. If one buys gasoline in quantity or even in five-gallon lots, a fuel funnel with a strainer or one permitting of the use of a chamois will avoid the possibility of foreign elements reaching the needle valve and spraying nozzle of the carburetor. Economical results will be obtained from the tires only when they are kept properly inflated, so add a tire gauge to the list. Cuts will occur in the casings, and these should be cleaned and vulcanized as well as punctured inner tubes mended. A very efficient and inexpensive vulcanizer can be purchased, and it is a good investment. Include a tire valve tool for renovating damaged valve stems, and at the same time buy a few of the tire valves; that is, the part that screws into the valve.

Fitting Up the Garage.

There is certain equipment that should be found in every private garage. One of the first investments to be made is in some type of a fire extinguisher if the car be not equipped with one. Incipient blazes are likely and with an extinguisher they can be checked. If waste is used or old rags, for that matter, the oil and grease soaked members should not be thrown on the floor or left around the building. Such rags have been the cause of more than one mysterious fire and which has been blamed to faulty electric wiring. Keep all such rags and waste in a can, one having a cover. It is all very well to say you will burn these old rags, but they are frequently forgotten. Invest in a trouble or inspection lamp, one having a good grade of cord and a sturdy cage with a hook. This lamp can be plugged in as needed.

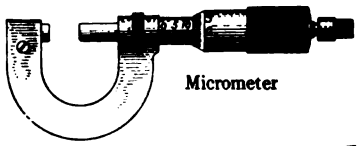
Work Bench, Lockers, Etc.

The new owner may think he will not do any adjustments or repairs about the car, consequently he may feel as though he will not care to go to the trouble of building a work bench and buying a vise, but the first time he has to struggle with some part requiring to be firmly held he will regret he didn't buy that vise. It is better to invest in a good vise, one having at least three-inch jaws and opening four or five inches, than to buy a cheap one. Shelves and lockers are decidedly useful, the former for storing small supplies and material and the lockers for preventing use of nice tools by others than those intended. The equipment described will serve the purpose of the owner who does not care to undertake repairs or the overhauling of the car.

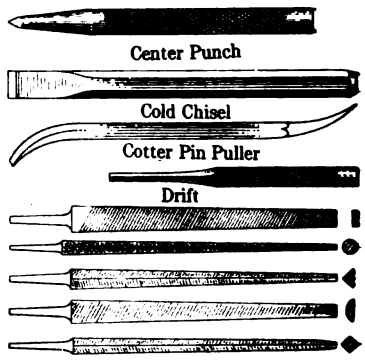
Adding to the Equipment.

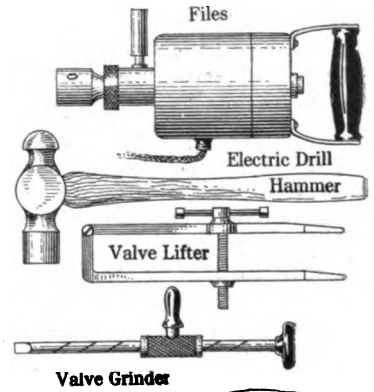
As the new owner becomes more familiar with the components of the car and acquires knowledge by that old reliable teacher, experience, he will augment his tools, etc., with new and useful members. Among the first will be the valve-lifting tool, a device for compressing the valve springs while the retaining member is displaced, for the valves have to be removed to be reground. In selecting the valve lifter pick out one that is best adapted to your car, although universal lifters are made. The dealer who sold you the car or his head repairman will advise you as to the tool best suited to your valves.

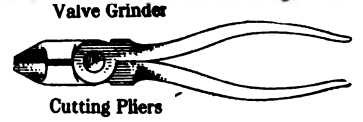
A valve-grinding tool is not absolutely essential,

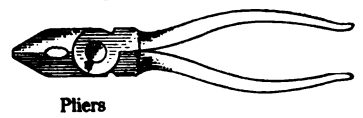

Micrometer


Piston Ring Tool
Carbon Scraper
Bearing Scraper

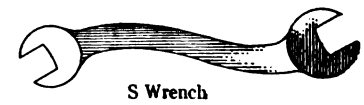

Center Punch
Cold Chisel
Cotter Pin Puller
Drift
Files

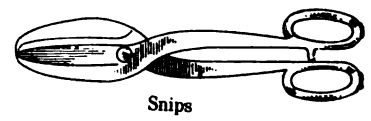

Electric Drill
Hammer
Valve Lifter
Valve Grinder


Cutting Pliers


Pliers


Socket Wrench


S Wrench


Snips

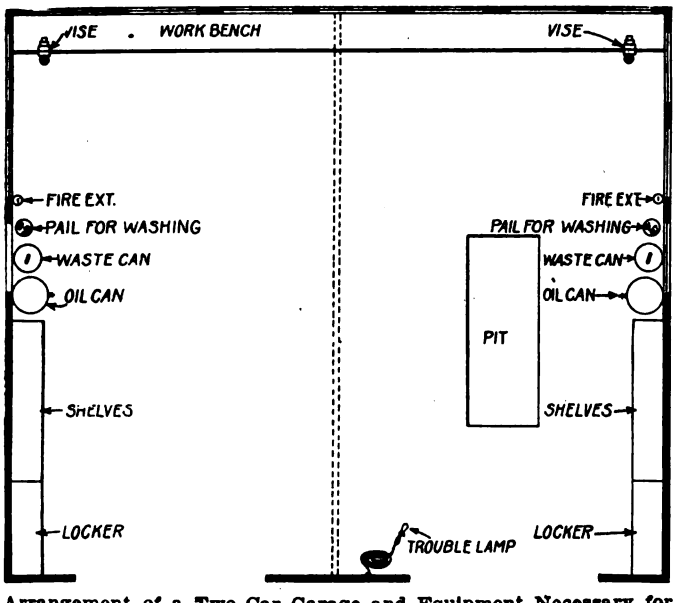

Offset Screw Driver


Tap


Stillson.

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as a screwdriver can be used if the valve heads are slotted. If not, a tool will be required, also some abrasive. The next investment is very likely to be



Arrangement of a Two-Car Garage and Equipment Necessary for Upkeep of Machines.—The Dotted Lines Represent a Removable Partition.

carbon-scraping tools, and these are not expensive. About this time the new owner will discover that he requires a good hammer and he will want a machinist's hammer. Select one weighing about 1½ pounds, although a pound hammer will do. As one continues to do more and more adjustment work the more will special wrenches appeal.

Fixed spanners or S wrenches are indispensable when dealing with standard nuts and bolts, as these tools can be worked from vertical to horizontal. The socket or box wrench outfit, where the openings fit all sides of the nut or bolt, is a valuable addition to the tool equipment. Generally these outfits include a universal member, extension and some form of wrench proper permitting of moving in places not accessible with the ordinary wrenches. The equipment often includes a socket for removing spark plugs, etc.

Useful Wrenches.

While the plier equipment is most important, and should include a pair of cutting members, the wrench outfit requires careful consideration. In addition to the S wrenches and those coming with the car, one will need for overhauling work an all steel about 12 or 14 inches long, a Stillson or pipe wrench and a small bicycle wrench. The adjustable end wrench is useful in places where the straight handled member cannot be applied. If the purse will stand it buy two Stillsons, one about six inches long and the other eight or ten.

In selecting the screwdrivers do not invest in cheap tools, for it is poor economy. Screwdrivers are called upon to do hard work and three will answer all practical purposes. One should be about 10 inches long, a metal forging with two wooden pieces forming the handle. The second should have an all wood handle for testing ignition, while the third can be a small affair for handling very small screws.

Files, Chisels, Etc.

In selecting files pick only those of the best quality. The list for all kinds of work should include an eight or ten-inch round bastard; flat, half round and square mill files of the same length, a small rat-tail and a three-cornered saw file. A file for cleaning contact points of the timer-distributor or magneto can be included. Chisels are inexpensive and are known as cutting, cape, diamond nose and round nose. They are steel forged, hardened and ground, so a keen cutting edge is available. Of those named the cold, cape and diamond are best adapted to automobile work. A center punch and drift or closed punches are useful, as is the cotter pin puller.

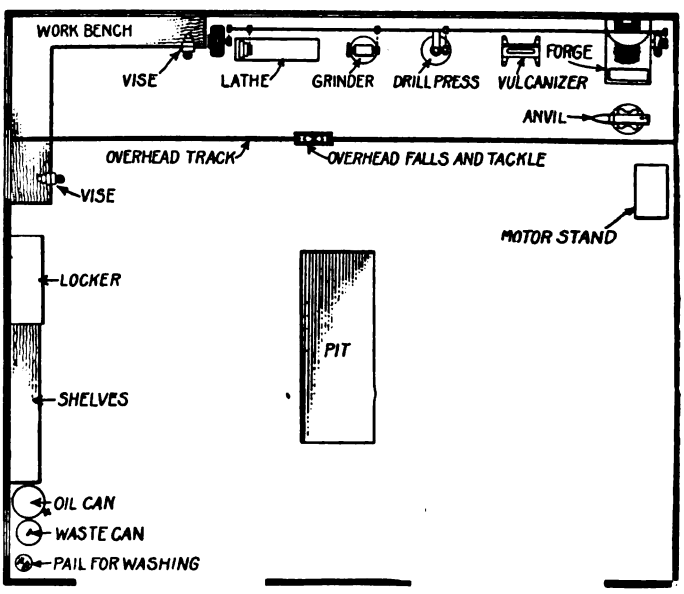
The hacksaw, an adjustable one, with both fine and coarse blades, is essential if metal is to be cut. An offset screwdriver, bearing scraper and piston ring tool can be utilized to an advantage where the power plant receives a thorough overhaul.

Supplies and Small Material.

A well-equipped garage will include in its equipment a soldering iron and flux and a torch. The last-named come in two forms, a pressure and an automatic. With the mass of wiring and connections about the chassis there is more or less use for a torch and soldering outfit. The older the car the larger will be the amount and variety of small material required. This will include a roll of friction tape, soft copper and iron wire, assorted cotter pins, lock washers, taper pins, nuts and bolts and cap screws. In addition there will be packing, both for water and exhaust joints, candle wicking, graphite, hard and hand soap and other small material of service in keeping the old types of machines in running condition.

Machinery and Power Tools.

As time goes on and the novice becomes a full-fledged repairman he will have a craving for power tools, tools that save hard muscle and bone labor. In recent years the power-driven tool for automobile work has been highly perfected, thanks to the fact that electricity can be obtained about everywhere. A useful tool is the combination drill and grinder, a tool that can be moved about the garage



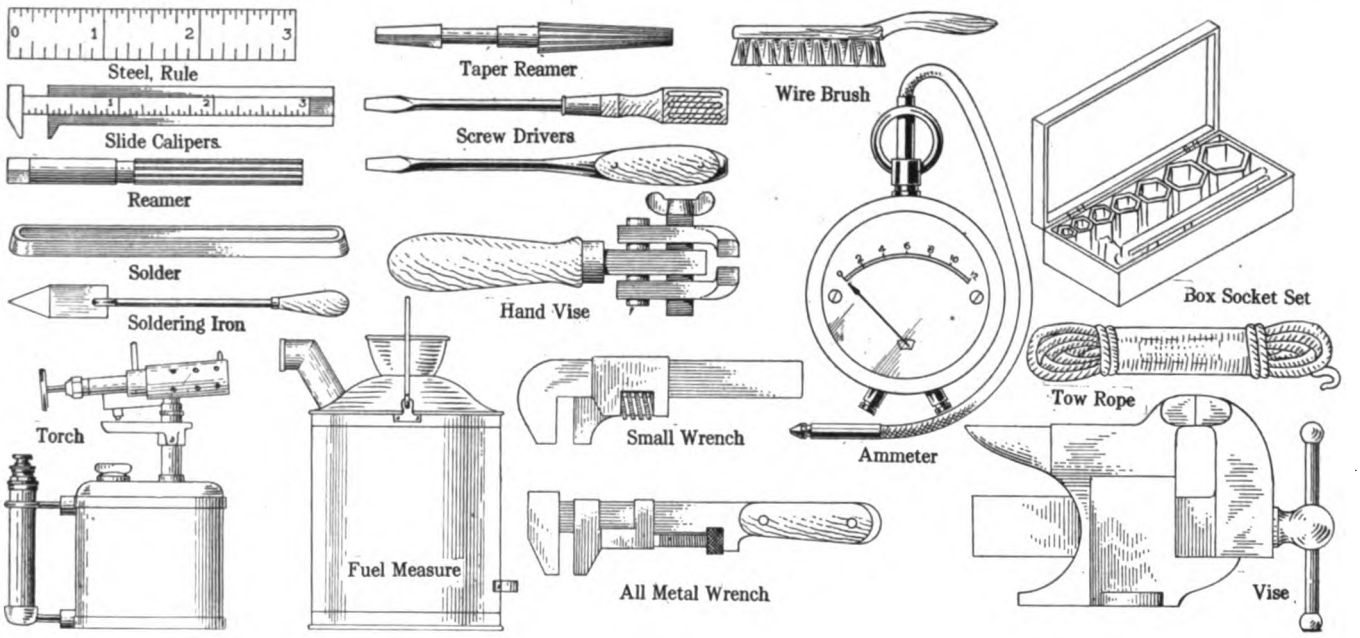
A Suggested Equipment of a Garage for Two Vehicles.—It Affords the Mechanically Inclined Owner Every Facility for Completing Repairs, etc.

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for drilling holes, etc., and can be clamped in the vise, and an emery wheel fitted for grinding work. When one cannot afford the electric drill he must be content with the breast drill. With either one will want a set of drills, and drills may be bought one or two at the time and as required. Mention should be made of the wheel puller, a most useful tool, particularly if a wheel refuses to leave the axle or a flywheel or gear proves stubborn. The adjustable type is to be preferred; that is, a puller that can be used for all around work.

Measuring Tools.

Measuring tools will be required as one becomes more proficient in the art of repairing the car. A pair of outside and inside calipers will not be expensive, but for really fine work and where it is done on the lathe, etc., the micrometer will be necessary. This enables one to make very fine measurements and handle accurate work. A steel rule is not costly and is superior to the wooden member. Slide calipers can be added, and mention must be made of the need of reamers, both the hand and taper, and the machinists' hand tap and dies. Gauges, thread,



drill tap and steel wire can be added from time to time. To give a complete list of the power driven equipment for the private garage and which would answer equally as well for the repair shop, would but bore the reader. A sufficient number of tools, etc., have been described to give the owner an idea of the equipment.

Laying Out the Equipment.

The arrangement of the equipment which is capable of doing any and all work requires careful study to obtain the best results and to husband space. Accompanying illustrations suggest how the space may be best utilized, the drawings showing four different types of garages with varying equipment.

After reading this article one will naturally arrive at the conclusion that much equipment will be necessary to maintain an automobile and that the initial expense will run into hundreds of dollars. This is not the idea the writer intended to convey; in fact, it will be found to be exactly the opposite, for the average new owner will make his purchases from time to time as the tools, supplies and material are required. And he will frequently pick up at special or bargain sales a tool that which he has desired for a long time.

It is astonishing how rapidly one will acquire a complete set of tools by buying one here and another there. When it comes to the installing of a lathe, grinder, drill press and other machinery, that is a different matter. These are shown, however, in the floor plans of the garages and are not absolutely essential, as the machine work can be carried outside. There are, however, many owners who delight in using the lathe, etc., and among these will be found highly proficient machinists.

Keep the Carburetor Clean.

Keep the carburetor free from foreign deposits and strain the fuel in cold weather. Starting is none too easy when the engine is cold, and the presence of foreign matter in the spraying nozzle starves the mixture. The filter should be opened at least once a week and a small quantity of the fuel drawn off to avoid the possibility of water reaching the float chamber of the carburetor. Water in this part will freeze, and should it do so one will experience considerable trouble in releasing the float from the ice. to say nothing of starting.

Goodrich Rewards for Suggestions.

The B. F. Goodrich Co., Akron, O., utilizes the suggestion idea from employees on benefiting its production. Over 1,200 suggestions were received from 801 employees, one man presenting 25. He received prizes for four. The rewards vary with the nature of the suggestion, some being $25 and others as low as $9.

When It Is Safe to Remove Fan.

The fan can be dispensed with when the car is operated in low temperatures and when the cooling fluid is water or an anti-freezing solution which does not heat readily.

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Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

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Member of the Associated Business Papers.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, DECEMBER, 1917.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THE "NON-ESSENTIAL PLEASURE CAR."

The practice of referring to the passenger automobile as a "pleasure" car is in keeping with that of designating it as a "non-essential." There is no such thing as a "pleasure" car. There is only the so-called "pleasure" car. As a distinct type it never existed. There are thousands and thousands of these so-called "pleasure" cars and in amazing variety, but the greater majority will be found in commercial service. The city dweller who employs his car for business and the farmer who utilizes his vehicle for transporting merchandise and the members of his family can hardly be classified as owners of "pleasure" cars. The passenger car is a necessity. There is infinite business service in it.

DEADLY CARBON MONOXIDE.

Vaporized fuel when mixed with air and burned in the cylinder of the internal combustion engine is useful, but the products of this combustion consist mainly of carbon monoxide, which has a serious asphyxiating effect on anyone who may inhale these deadly fumes. It is not easy to educate motorists to realize the seriousness of the danger because the carbon monoxide itself has no appreciable odor, and very often the first warning of its presence is the sudden collapse of the person inhaling it.

Its effect is first noticed by a slight ringing in the ears or a slight giddiness, and frequently those who have inhaled a sufficient amount to develop these symptoms become unconscious even after they reach the open air. Cases have been recorded where the affected person has collapsed after leaving the garage and some time after breathing in the deadly fumes.

The new owner, and the more experienced motorist, for that matter, should avoid running the engine in the garage with the windows and doors closed. The practice of operating the engine "just for a minute," and while making an adjustment, is inviting danger. If the carburetor must be adjusted or other work performed which requires running the engine, do this work in the open air. Unless there be a sufficient draught to carry off all of the fumes, avoid running the engine in the garage. And it is a difficult matter to get rid of all of the fumes, as they accumulate very fast.

WILL BENEFIT THE REPAIRMAN.

Any curtailment in the production of motor vehicles cannot but help the repairman and all signs point to his enjoying an unprecedented era of prosperity during the balance of the war and for some time to follow, for thousands of owners who make it an annual practice to exchange their cars for the new models will continue to use their old machines. This means that there will be more or less work to be done on these vehicles and that the repairman must increase his facilities to care for this business. The manufacturer of tools, equipment and machinery will be benefited also, as will the maker of those devices making for ease, convenience and economical upkeep of the motor vehicle. A great many repairmen will find it necessary to enlarge their shops.

MAY SOLVE THE PROBLEM.

The disposal of the second hand motor car, the traded-in machine, has been and is more or less of a problem. Various plans have been advocated and put into practice, but while these have aided in disposing of the vehicles the dealers have not always obtained a reasonable profit. A practical solution of the problem is in sight. It is a healthy demand stimulated by the decreased output of passenger cars. Not only will the dealer be benefited, but those owners disposing of their machines will obtain a better price.

A SENSIBLE CHRISTMAS PRESENT.

At this season of the year one's thoughts naturally turn to Christmas. One of our subscribers makes a practical suggestion when he writes that he is to present his friend, who has recently purchased a motor car, with a year's subscription to the Automobile Dealer and Repairer. It is a suggestion worth entertaining by our readers, many of whom may have friends owning a car or contemplating the purchase of one.

BUILDING WINTER BUSINESS.

There was a time when the dealer and repairman viewed the approach of cold weather with alarm, as a season of depression. That was before the motorist was educated to the practicability of utilizing the automobile the twelve months of the year and before the enclosed body, electric lighting and starting, heating apparatus, priming devices, etc., were highly perfected. And previous, too, to the introduction of

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heating apparatus for the individual or detached garage. These articles obtaining comfort and convenience afford the dealer an opportunity to be very active in the winter, to so balance his business that the season when completed will be a highly profitable one. Every effort should be made to secure new trade during the winter, for it is building for the summer, for permanency.

WHERE A BIG MARKET WAITS.

The progressive manufacturer in planning his 1918 sales campaign will give careful consideration to that most fertile field, the small country and crossroads garage and repair shop. Catering to a prosperous clientele and free from the competition existing in the cities, the country garage and repair shop affords a most profitable market to the manufacturer of accessories, equipment and supplies. Personal solicitation of this most desirable trade may not always be practical because of the selling expense involved, but the owner of the garage or repair shop can be sold through the medium of the trade publication circulating in this field, for he reads his paper from cover to cover. Properly prepared copy cannot fail to develop this most fertile field.

THE POWER OF ADVERTISING.

It is estimated that upwards of $100,000,000 are spent in this country annually for advertising in the thousands of daily, weekly and monthly publications. And yet one of our intelligent congressmen —for whom his constituents ought to be thoroughly ashamed—stated on the floor of the House of Representatives last summer, that he had never read an advertisement in his life. He was advocating the idea of charging publishers a heavy extra price for postage on the advertising sections of each publication. In point of fact, that particular idea prevailed finally, and a section of the big tax bill provides that postage shall be collected beginning with July first on the reading matter at one rate and the advertising at another and much higher rate.

It is quite apparent that a campaign of education is needed in the House of Representatives, if not in the Senate, on the question of advertising and the tremendous influence it exercises in promoting the business interests of the entire country. The man who doesn't read advertisements, and read them regularly, watching out for new things, is missing a great deal.

The advertising department of any trade journal is usually of more value to its subscribers, so far as dollars and cents are concerned, than the reading matter. Our readers in writing to advertisers for circulars, catalogues, etc., are requested in each case to mention that the advertisement was seen in the Automobile Dealer and Repairer.

HELP US AND YOURSELF.

We would like to add several thousand new subscribers this winter. If each one of our subscribers persuades just one of his friends to subscribe, our ambition would be realized, and a great deal more.

We do not ask anyone to perform this service from purely philanthropic motives. We are willing to pay for it and in the following manner: We will extend for three months the subscription of any present subscriber who sends us a new subscriber, with a dollar, and the new subscriber can have the benefit of our new special offer, to subscribers only, or 15 months for one dollar. Any reader introducing the Automobile Dealer and Repairer to a friend will be conferring upon that friend an even greater benefit than he confers upon the publishers.

A WORD TO OUR SUBSCRIBERS.

It will soon be necessary for a great many readers of the Automobile Dealer and Repairer to decide whether or not they wish to renew their subscriptions.

If we are publishing the desired practical information you will want it another year. Many subscribers write us that they cannot secure from any other publication the same valuable information supplied by the Automobile Dealer and Repairer. One man wrote us the other day that one article in the first number he received after his subscription began was worth to him $10, or enough to pay his subscription for 10 years.

We receive hundreds of unsolicited testimonials from our subscribers as to the superior merits of our publication. The following are a few samples:

C. S. Hichborn, president of the National Granite Bank of Augusta, Augusta, Me., writes: "I know of no bill which I pay so cheerfully, and no publication out of which I get so much of interest to automobilists as the Automobile Dealer and Repairer. I read regularly four others."

R. G. Matthews, Barnesville, Ga., says: "I have seen a number of publications in this line, and want to congratulate you on getting out the very best of them all. Indeed, no others compare with the Automobile Dealer and Repairer. One can get from it more information at less cost than from any other source I know."

C. J. Arnold, of Northampton, Mass., writes: "I want the Automobile Dealer and Repairer as long as I own a car. I consider it the best paper that I take (I have three) for practical use. If the price were three times as much, I should want it just the same."

Dr. J. J. Simons, of Kingston, N. Y., says: "I have been a subscriber for five different automobile journals in the past, and I consider yours the best of the lot."

Readers should not forget that next July the rates of postage are going up to such a point that the publishers must contemplate the question of a raise in subscription rates. We are willing to take chances on a year more at the regular rate of a dollar, and will go even further than that, and take chances on two years for $1.75; but beyond that we cannot go, without the possibility of serious loss.

We suggest that subscribers send their renewals as promptly as possible. Each one will be notified when his subscription expires, and he will confer a distinct favor on the publishers by responding promptly with a check or a remittance in any convenient way.

Watch the Spark Plug Gaps.

It is a good plan to occasionally remove the spark plugs and test their gaps. This should be done with a gauge and not a dime as suggested by some instruction books, etc. With some types of plugs the action of the intensified current, the burning action, increases the gap. Often this increase is very slight, but it may be sufficient to be the cause of hard starting or that troublesome miss at low engine speeds. Too small is better than too large a gap, particularly where cranking by hand is done and when the source of current supply is mechanical.

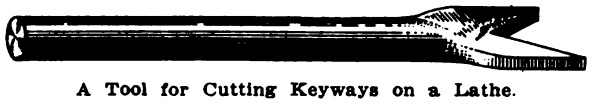
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Making the New Garage, Repair Shop or Service Station Pay More Than a Living Wage.

Why Some Achieve Success and Others Fail Even When a Large Volume of Business Is Transacted.—Suggestions for the Inexperienced.

BY W. O. MANN.

Making a start with a new garage, repair shop or service station is something that is done so often that one might easily be misled into the idea that it is a simple thing to do. It is such a commonplace occurrence, in truth, that many are misled, to their subsequent undoing. Certainly it looks simple enough on a busy day when the cars are rolling in



A Tool for Cutting Keyways on a Lathe.

and out and everyone is hustling around to take care of customers, and it is not at all astonishing that one who is inexperienced should get the idea that there is nothing to do but let the cars come and go, do the work on them and collect the bills. Yet the fact is that all this might be done and a large amount of work handled without making money enough for the proprietor to make the business worth his while.

Success and Failure.

Going around and inspecting other garages is unsatisfactory because the view obtained is an outside view solely. The inside workings are not on the outside, and the inside workings make the difference between success and failure. If a man with the garage or repair shop idea in his brain is so fortunate as to have a friend who will let him take a look into the very inside of the business machine it will be worth much. Otherwise he will have to stand on his own feet. There is a point to be borne in mind that is very steadying, if realized, and that is that of the hundreds of new businesses that are started up every year only a very small proportion ever get further than just making money enough to keep the proprietor alive. A great many do not even do that. There are so few that really become successful that it is as clear as daylight that the man who inaugurates a business with the idea that it is going to be smooth sailing right along, and that he can succeed with only ordinary effort, is reasonably sure to do one of two things. Either he will be awakened from his dream by the hard knocks of reality or the thumps will put him out of business—or at least keep him dribbling along, neither a success nor a failure.

System's the Thing.

It is utterly essential that everything that is done should be done in a systematic fashion. If the men are left to do as they please each time a job comes in, or if someone has to run to the boss every time and ask for his instructions, no one knows what will happen. It uses up a lot of valuable time and energy that ought to be put to better use. Everything that is done frequently, over and over again, should be brought down to a system. This done, when a job comes in the man who takes it will know exactly what to do next without asking anyone, and the boss will know just what is being done without giving any special orders on the subject.

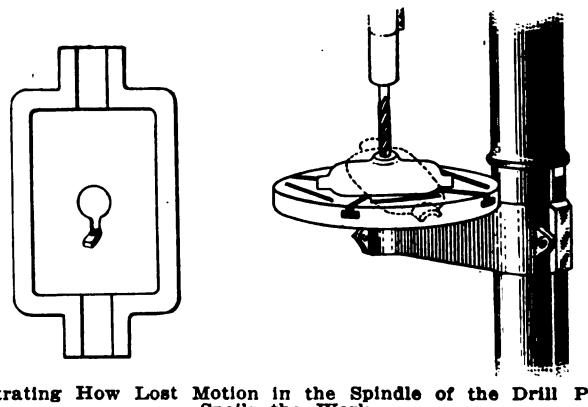
It is altogether improbable that a man without experience or without association with someone who has had experience, would attempt to launch a big undertaking. When an inexperienced man starts a garage it is usually on a comparatively modest scale. Therefore he does not need a big, cumbersome system; all he wants is just enough to keep all his transactions straight. And first and foremost he needs something in the way of a record of each job done.

When Differences Arise.

Differences are bound to arise with customers; it is unfortunate, but it is practically unavoidable. And there is nothing more unbusinesslike than for the garage man to be forced to rely upon his memory or the memory of his mechanics, as to what was done on a certain car. It brings the affair to a question of veracity or memory. The customer says, "I say you did this," and the garage man says, "I didn't!" and there they are deadlocked. But if the garage man has something in the way of an authentic record in black and white he does not have to do any arguing. And if he has the customer's signature on his record the trouble will be ended before it starts—and that's just another way of saying that there won't be any trouble.

Follow-Through Tags.

What the customer may say is not the only thing to be considered. The proprietor has his own good reasons for wanting to know as much as possible



Illustrating How Lost Motion in the Spindle of the Drill Press Spoils the Work.

about every job that goes through, without his having to make personal inquiries every time he needs information. He should not have to guess how long it took to clean out the carbon on a given engine, or how long it took to take up the play in the bearings of another, or how many hours and how many men it took to put a new pair of springs in. If the

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has to guess at these things he will have to guess how much to charge for them, and if he has no way of comparing one man's time with another he never will know when the men are "soldiering." He will not know whether he is charging too much or too little, and if he fails he never will know exactly why it happened.

Proper Tag to Use.

A follow-through tag system, properly handled, is a complete little bookkeeping system in itself, and works very well, whether the garage be a big one or a small one. A good-sized tag is tied to the steering wheel of each car that goes through, and is not detached until the car is ready for delivery. At the bottom of the tag is the job number in duplicate, the lower part of the tag being perforated so it can be torn off and given to the customer. That is his identification card, and it indicates his right to take the car away. At the top of the card is a space for the name, number, make and model of the car, owner's name and address, the date the car is received and the date upon which the work is to be completed. Below this is a space for instructions as to the work to be done.

The owner tells what he wants done and it is written in the blank space and then submitted to the owner, who indicates that it is right by signing. This leaves absolutely no room for question as to whether the customer said this or that, or didn't say this or that. So far as the shop is concerned he did not say a word beyond what was written on the card. If for any reason there is not room on the card for all the instructions the owner wants to give it is a simple matter to have an extra card, in blank, upon which the orders may be continued; but the owner should be asked to sign both cards, and there should be a notation made on each that it is not complete without the other.

The Mechanic's Part.

On the back of the card there are spaces to be filled in with a record of the work, as that work is carried along. When a man is assigned to work on a car the first thing he does is to put his name, the date and the exact time on the back of the tag, followed by the job; per example, "T. Jones, 11—4—17, 8:30 A. M., overhauling starting-lighting system." Then he should tell in detail what he did and how long it took. "Cleaned generator commutator and put in new brushes, 30 min. Cleaned and tightened connections, 20 min.," and so on. If the card is too small the blanks can be used.

Plugging the Leaks.

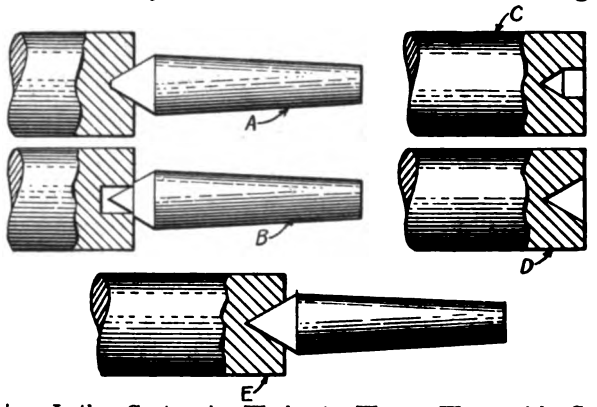
If it becomes necessary to take any part away to work on it, such as the radiator or the magneto, etc., the man who does the work should mark his time on the card just the same, the idea being, as will be seen, to have all records made at the same place and immediately the work is done, so there will be no strain on the memory and no chance of making mistakes. When the car has had all the attention the owner ordered it will have tied to its steering wheel the owner's order, signed by himself and a record of the performance of every bit of work ordered, together with the time spent on each detail. This makes it a simple matter to make out bills. The cards are filed carefully after the car goes out.

If the customer pays cash the card goes into a file kept for the purpose, and once a card gets into that file it is of no further use except for comparing times on various jobs, etc.; the job has been paid for and therefore it is merely history. In another place are kept "unpaid" cards, which are transferred to the "completed" file as the bills are paid off.

Shop Suggestions.

A considerable amount of trouble, and sometimes serious unpleasantness, may be saved if every car, as soon as it is received, is stripped of everything on it that is stealable. There is no use trying to dodge the truth that there are men everywhere who will not miss an opportunity to pick up things that they think they can get away with. So if everything is put away, carefully listed and checked and replaced on the car when it is ready for the owner, these fellows with itching fingers will just have to itch.

In these days of high-priced machinery it takes a prosperous citizen to install a complete outfit of new machinery in a shop, and even good second-hand machine tools are hard enough to get and hard enough to pay for. In case used machine tools are purchased, or the equipment already installed in a shop is taken over, it is the wise procedure to examine it carefully and make sure that it is in good



Making Lathe Center in Work—A, Wrong Way, with Center Punch; B, Drilling Hole Imposes Severe Wear on Center; C and D, Drilling and Countersinking, the Right Way; E, Proper Method.

working condition. In the accurate work that is required on an automobile good work cannot be done with machine tools that are not running true. The trouble is that a casual inspection will not always reveal anything wrong. There may be no slack in the bearings, and there may still be plenty of room for take-up. There may be no broken parts and no indication of excessive wear. Just the same there may be causes that will lead to trouble the first time close work is attempted.

A Case in Point.

To illustrate the idea there is a little yarn that is true and to the point. A garage man bought a small lathe from a concern that had used it for manufacturing purposes. It had been used on one class of work only, and had been doing, over and over and over again, a job that called for the movement of the longitudinal slide of the compound rest for about an inch and a half only, and only an occasional and very slight movement of the cross slide. The work was chucked, so all the wear the tail stock got was barely enough to take off the stiffness.

Where the Defect Was.

But one spot on the longitudinal screw of the compound rest was considerably worn, and it was all the

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more worn because the men who had used it had been on piece-work and were more interested in piling out pieces than in keeping up the machine. As long as the worn part was not used the machine seemed to be fine—which it was, all except that part. The man who bought it didn't discover the fault until one day he was doing a particularly close job, and for the first time he ran the rest over the bad spot while making a fine finishing cut. Things went beautifully until the carriage reached the loose place and gave a little jump, leaving a ridge on the job and practically spoiling it.

Centers Not Aligned.

This just illustrates the fact that you can't always tell. The centers of a lathe may be out of alignment so that it will be impossible to turn a job truly parallel without knowing just how much to allow for the error. It is true that in a great many old-fashioned shops the men could do really excellent work on machines that to an outsider would be simply hopeless. They would be so familiar with all their faults that they could allow for them to a hair's breadth and so turn out good work where a better mechanic, perhaps, but one unfamiliar with the conditions could do simply nothing but spoil stock But that sort of thing rarely holds good in the automobile business. If good work is to be done one must have good tools in good condition.

Disadvantage of Lost Motion.

Lost motion is always at least a nuisance, and sometimes it is a good deal worse. An excellent way of showing what it can do is to drill a hole with a drill press having a good deal of lost motion in the spindle. If the spindle is not counterbalanced—and even if it is, maybe—the drill is likely to drop through before it has quite finished drilling and catch. It may be that the drill will break. It may be that the job, if a casting, will have a little chunk of metal ripped out at the surface where the hole comes through. It may be that the drill and the metal both will hold and the job will thrash around on the table. And it may be that nothing will happen except that the drill will tear hard for a fraction of a second, and everything will end all right.

The Factor of Uncertainty.

But with a slack-spindle drill you never can tell just what is going to happen when a drill is coming through. It won't do any harm to add that a great help in working up slack in a spindle is the use of large drills that need grinding, so that excessive pressure has to be applied to make them cut. There are lots of jobs that a man can "bull" through with such a machine; but if he gets a nice piece of work he will put it through in fear and trembling and with much caution and loss of time, or he will turn his back on the drill press and do the job in the lathe, with a loss of time then too.

Little Helpers.

It is actually surprising the number of shops that are run without the help of little ways of doing things that save time and improve results. There are innumerable shops that rarely take any pains in preparing lathe centers in the work. Make a big dent in it with a center-punch—that's good enough! The point of the center has to dig in and finish the work, a job for which it never was intended, and it becomes blunt before its time. Or perhaps the lathe hand takes the trouble to drill a little hole for the point of the center to enter and lets the center make a countersink for itself. This saves the point, but it throws unnecessary and rather severe wear on the center just back of the point. And with both of these methods there is a tendency for the work to loosen up on the centers for some time after starting, which is not conducive to good results. Needless to say the proper thing is to use a small drill and then a countersink of exactly the same angle as the centers, or else a combination tool, which is still better and a good deal quicker.

Cutting Keyways in Lathe.

Cutting keyways on the lathe is something that is often referred to; but there is a man not a thousand miles away from New York City who does that work in an unusually neat, accurate and simple way. He had no elaborate milling attachment; his only special tool was a piece of round tool steel with one end flattened and made a little wider than the diameter of the stock. The flattened end had a V-shaped notch cut out in the middle, giving a sort of fish-tail shape, except that the two edges on each side of the V-shaped notch were straight and square; these were backed off to form cutting edges and the tool was hardened, tempered and carefully edged on an oil stone.

How Tool Is Used.

The shaft to be key-slotted was fastened in the tool-post of the rest in place of the usual tool. It was carefully packed up so that it was truly horizontal and exactly opposite the lathe center. After that all that was needed was to chuck the tool in the lathe and, after moving the shaft up against the tool with the longitudinal slide, work the cross slide until the desired length was cut and then repeat, taking each time a light cut the length of the keyway until reaching the required depth. Properly made and carefully used, the tool cuts beautifully. Of course end mills can be bought to do the same work, but they are quite expensive, and also they are quite easily broken. The little tool described stands up remarkably well and even if broken it is no great matter to re-forge and re-finish it, or even to make a new one.

Facts Worth Knowing.

Many a mechanic does not know what will happen when a copper rivet head in a brake lining comes in contact with a cast iron or steel brake drum. The natural first thought assumption would be that the soft copper would wear away rapidly—but that is just what it doesn't do. It wears, to be sure; but slowly, and in doing so it wears a groove in the drum. It is not safe to give a copper rivet any chance at all at a brake drum. For this reason it is worth the trouble to take pains to make a good job of lining brakes. It is easy enough to drill the lining for the rivets, and after that it is still easy enough to "whang" the rivets with a hammer and bed them down into the lining. The worst of it is that they do not stay bedded, as a rule; they go down a bit, and stay for a while, but spring back or, at best, come into contact with the brake drum after the lining has become but slightly worn. The whole trouble can be avoided by using a countersink. It is possible to obtain a combined drill and countersink, so that the two operations can be performed in the time of doing one, and good results obtained.

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A Lathe Suggestion.

A very nice finish can be made on a lathe job by taking a very fine finishing cut as follows: Take the last cut before the finishing cut just moderately heavy, and then run the tool back over the job without feeding it in any deeper. The spring will be just sufficient to permit a very light cut, sufficient to leave a fine, polished surface. The tool should be sharp and the work should be run at comparatively high speed and the feed should be very fine for this last cut. A little experience with this trick will enable the mechanic to turn out jobs that look as if they were burnished, and they will be accurate, too. The plan works just as well in boring as in turning.

Negative Economies.

Waste of material has no place whatever in a garage or repair shop. Everything that can be saved and turned to account should be well looked after. It is just as well, however, to be a little cautious. Don't take long strides unless you can see where you are going to plant your feet. There is at the present moment a repairman who is peeved because one of his plans for economizing turned upside down and proved to be an expense. He had been doing a good deal in the way of rebabbitting bearings and though he had made good jobs and the work had stood up well, he rather shied at the price he was asked to pay, and did pay, for new babbitt metal. So after a spell of thinking he gathered up all the old bushings he could lay his hands upon, and next time he had a set of bearings to babbitt he melted up the metal and poured it—or rather, his men did it under his instructions.

'Twas False Economy.

In a week the car was back with the crankshaft pounding like a trip-hammer, and the owner was howling an accompaniment with words relating to the kind of bearings that must have been put into his engines. With his attempt at economy in mind the repairman said nothing, but looked at the bushings when the engine was torn down and also had a talk with the men who did the babbitting. It turned out that the metal had acted queerly when it was melted; some seemed to come to the surface and to refuse all attempts to mix it, and some seemed to refuse to melt when it seemed that it ought to. But the men did the best they could with it and managed to pour it. The man who machined it said it had acted sort of unusual, but he hadn't worried about that, for it was outside of his province.

Where the Fault Lay.

The fact was that the repairman had been trying to handle a special composition designed for die-casting and difficult to handle under any conditions. The aluminum content had separated and refused to go back, while the lead and tin had gone to the bottom and, altogether, the bearings that he made were strange affairs. The moral is to use babbitt that you know how to handle, and that can be handled under ordinary conditions, if you have such work to do. But there is a much broader moral, and that is to find out what lies ahead before you collide with it.

Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2278 **Would Use a Battery.**

From G. P. Edenfield, Georgia.—I have a new Ford car equipped with a mechanical starter. The lights are not satisfactory and I am considering using an electric storage battery, providing it is not too expensive and can be used successfully. Kindly advise me. I do not want to invest in a lighting and starting system.

Reply.—A storage battery can be used for supplying current to the lamps, but the battery will have to be removed from time to time and recharged. This is one of the disadvantages of the method. If you install a battery you should use lamps of the same voltage as the battery.

2279 **Engine Starts Hard.**

From Roy S. Jamison, Indiana.—I have a 1917 model Ford car which I have driven only about 2,750 miles. This car runs as good as it ever did and develops as much power, but when it is not real warm I can hardly start it at all. The only way I can start it is to just keep spinning it till it goes. I have done the following without the least bit of help. Cleaned carbon out of cylinders, ground valves, cleaned carburetor (the timer is in fine shape), put shellac on cylinder head and inlet gaskets so they could not leak, drained carburetor and sediment bulb, cleaned spark plugs and adjusted same, but still it's just as hard to start. Have always kept engine oiled at the proper level, and the compression is as good as when new. Have gone over the wiring and the connections are all tight and the covering on the wires all good, although soaked with oil at times. The spark seems to be good, and never makes a miss when engine is started. Have the coils adjusted to a scant 1/32 inch, and am at a loss to know what is wrong. Please let me have your opinion on this, as I have done all I can find out to do. This trouble has developed in the last 300 miles.

Reply.—The usual cause of an engine to start under the conditions named is too weak or thin a mixture for starting speeds or a weak spark. A lean mixture will not ignite readily or burn quickly because of the presence of too much air in proportion to the fuel. After the engine warms up a somewhat lean mixture, a homogeneous one, will ignite. Try a slightly richer mixture. If the fault be not

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the mixture, examine the valve stem guides and valve stems. If there be space between the stems and guides it will permit air to be drawn in, diluting the mixture at cranking speeds. Any air drawn in other than through the carburetor will affect the operation of the engine at low speeds. It may be that the magneto does not develop sufficient energy at cranking speeds to ignite the mixture, or the magneto terminal may be dirty. If you have not cleaned the contact points of the coil, examine them and remove any pits, etc. In adjusting the units of the coil, adjust so that you will not have too much tension on the vibrator springs. With too much tension and a small output of the magneto the vibrators will not operate freely. A simple test for ignition trouble is to connect a set of cells with the coil and note if the engine starts easily. Before starting and after the engine has stood for some time, examine the spark plugs to note if oil has closed their gap.

2280 **Another Mixture Trouble.**

From W. A. Browning, Kentucky.—When an engine is throttled down until it runs without a miss and when it is opened two or three notches on the throttle, what causes it to choke and what is the remedy?

Reply.—The choking may be caused by too rich a mixture, which may be due to extra air being drawn in, as with worn valve stem guides or bushing, worn valve stems or leaks between the intake manifold and the cylinders, etc. If any of these leaks exist the mixture is made richer at slow or idling speeds to compensate for the extra air drawn in. As the speed of the engine picks up the amount of air drawn in through leakage is not in proportion to the flow of fuel from the jet of the carburetor. This results in a rich mixture. A simple test to ascertain if the mixture be at fault is to adjust the carburetor at the speed at which missing formerly took place. If adjustment or cutting down the amount of fuel eliminates the missing or choking, and the engine misses at low or idling speeds, it will tend to indicate that leakage exists. To ascertain if the mixture be correct, note the odor of the exhaust at the speed at which it chokes and at higher operating speeds. If the exhaust be acrid or pungent, it indicates too much gasoline and not enough air. The odor should be what is termed as "sweet." Leakage around the intake flanges of the manifold, carburetor, etc., may be tested by squirting gasoline on the suspected places and noting the effect upon the operation of the engine. Faulty operation of the needle valve of the carburetor can create similar symptoms, although they would be temporary.

2281 **Ammeter Needs Calibrating.**

From R. J. W. Krebs, Ohio.—I have a King Eight equipped with the Ward Leonard lighting system. My ammeter shows discharge of five points when engine is not running and only shows five points when charging when running at full speed. When I bought the car it had 34x4 tires in the rear. I took these off and replaced them with 35x4½. My speedometer is driven from the forward universal joint at the rear of the gearset. How fast am I running when the speedometer shows 15 miles per hour?

Reply.—Your troubles indicate that the ammeter is at fault, out of calibration. This can be easily tested by taking the car to some repairman who has a similar ammeter and wiring it in series with the present ammeter on the car. The fact that the instrument shows a discharge of five points when the engine is inoperative and five points when charging equals the rate of the dynamo, 10 amperes. If the ammeter be not at fault look for a ground or short in the system but this is not probable as you do not state that the battery discharges. The mileage registered by your speedometer will err to the amount of 3.1416 inches each revolution of the rear wheel; that is, the reading will indicate too little by that amount. The 34-inch tire makes 593.2 revolutions in a mile while the 35-inch shoe makes 576.2. Your real speed will be slightly in excess of that obtained with the old tire.

2282 **A Possible Pump Knock.**

From C. R. Burlingame, Michigan.—Have a 1916 490 Chevrolet which has a knock in the engine like a connecting rod knock but which only occurs at each revolution of the camshaft. It seems to occur about midway between the firing of the No. 2 and No. 4 cylinder. Main and connecting rod bearings have been taken up but knock remains. Gearset leaks at front end main bearing. What is the cause for these troubles?

Reply.—The leakage is doubtless due to the small bolts retaining the case working loose. Go over these and tighten. It is doubtful if the noise referred to is caused by the camshaft. Inspect the oil pump. This pump has plungers, and if these plungers wear and a shoulder results a noise similar to that mentioned will be heard.

2283 **Uses Too Much Grease.**

From J. W. Bayne, Pennsylvania.—I have a 1914 King which has been giving me considerable trouble with the grease leaking out of the rear axle on the right hand side. This axle is of the three-quarter floating type and the roller bearing is carried in the wheel hub with a grooved steel washer holding the felt washer. This did not give any trouble until about a year ago. I have installed new King washers also special ones cut for this purpose but the leakage continues. I saw in your paper that a ¼-inch hole bored in the axle housing about 10 inches from the wheel would stop the trouble and have tried it without any improvement. I find that practically all of the grease works out from the differential housing. Any suggested remedy for this trouble will be appreciated.

Reply.—Your trouble is probably due to using too much lubricant; that is, carrying the level too high. There is a plug or lubricant opening in the cover of the differential housing. Remove this plug and drain off all surplus lubricant above this hole. In renewing the supply do not fill above the opening. Use a heavy transmission type of oil. When too much lubricant is used it is churned and worked out as described.

2284 **Piston Inertia and Travel.**

From Frank Cais, Colorado.—Please explain why a piston travels faster when the crank is in the upper half of the crank circle than when the crank is in the lower half. Can you explain this?

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Reply.—The accompanying drawing shows the four positions of the crankshaft, these being indicated by figures 1, 2, 3 and 4. Figures 5 and 6 are the top and bottom of the piston stroke. Figure 7

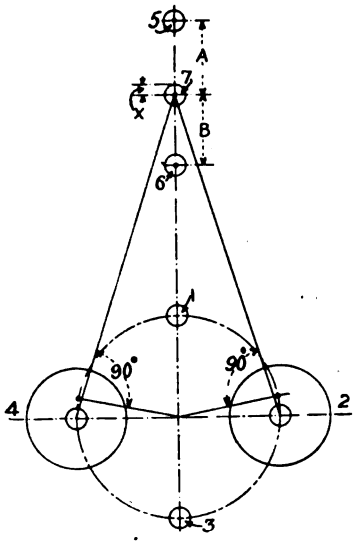


Diagram Explaining Piston Speed Changes.

is the position of mid-piston travel. If the connecting rod were of infinite length all four pistons would reach mid-stroke position and all other points at the same instant. Pistons 1 and 2 would have the same motion as do pistons 3 and 4. With the connecting rod of finite length, however, the positions of mid-stroke and mid-crankpin travel do not coincide, the error being shown at X.

The energy tending to keep the pistons in motion is dependent on their velocity and mass. Owing to the angularity of the connecting rod and the position of the pistons at mid-crankpin travel, piston No. 4, traveling upward, will go beyond half-stroke by the amount X, while the piston going down will travel less than half-stroke by the amount X in the same time, or in 90 degrees of crankpin travel. Therefore, the speed on the upstroke of the piston will be greater than on the down stroke, causing a difference in the inertia of the piston up and down respectively. This difference is a measure of the inertia unbalance and has the effect of an external force equal to the up and down inertia of the pistons. The longer the connecting rod the less X will be, but the amount of this variation can be reduced is slight unless the connecting rod be impracticably long.

2285 Concerning Aluminum Pistons.

From W. T. Sherman, Rhode Island.—I have a Stevens-Duryea six-cylinder car which I am to overhaul this winter. 1—Will I gain anything by putting in aluminum pistons? 2—Will they throw the engine out of balance? 3—What clearances must I allow on the aluminum pistons, top and bottom? 4—Will the walls and top of the pistons have to be made much thicker than the cast iron pistons and why? 5—What is the aluminum mixture for piston castings as I can have these made in our foundry? 6—How are aluminum pistons finished? Isn't the metal too soft to grind? If they grind them, what is used for a cutting lubricant?

Reply.—1—Advocates of the aluminum pistons claim that in addition to being about one-third lighter they will not score or cut the cylinder walls when extremely hot. It is also claimed that the inertia of the reciprocating piston is reduced approximately 67 per cent., and that this cuts down side pressure, reduces friction and makes for economy of oil. Greater speed and flexibility are also features. 2, 3—The average clearance is .002 per inch of piston diameter. One maker advocates this dimension and .004-inch for each one inch diameter at top of piston with a gradual taper to the bottom ring. 4, 5, 6—Would suggest that you purchase the pistons instead of attempting to cast them.

2286 Will Raise Carburetor.

From R. C. Miller, Florida.—I have been advised to raise the carburetor about two inches by cutting off the intake pipe as the intake manifold is much longer than those on modern cars. I will appreciate your opinion as to the advantage of same.

Reply.—Reducing the length of the intake manifold will bring the carburetor nearer the cylinders where the heat will assist in the vaporization of the fuel. The change will also make starting easier and reduce to a certain extent the tendency of the fuel to be deposited on the walls of the intake pipe. Reducing the length of this pipe will affect the flow of fuel if of the gravity system and this should be taken into consideration in making the change.

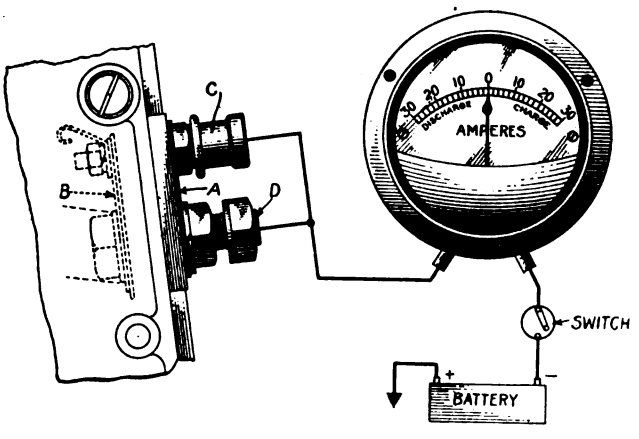
2287 Removing Oil and Tar.

From G. F. Mills, Pennsylvania.—What is the best thing I can use to remove road oil and tar from my car?

Reply.—Naphtha or gasoline will soften the material after which the parts can be cleaned as usual. Vaseline is held to be efficient in softening the deposits.

2288 Connecting the Ammeter.

From John F. Parker, Canada.—Could you show me how to connect an ammeter of the type similar to that made by the Ballman-Whitten Mfg. Co. on a 1914 model 33 Paterson car equipped with a Delco Junior lighting and starting system? One side is grounded to the frame. The other is live. There is



Illustrating How Ammeter Is Connected in Circuit of Paterson Car

no ammeter and I cannot tell whether the system is charging or not.

Reply.—The Dayton Engineering Laboratories Co. recommends the following method of procedure. By noting the accompanying illustration it will be seen

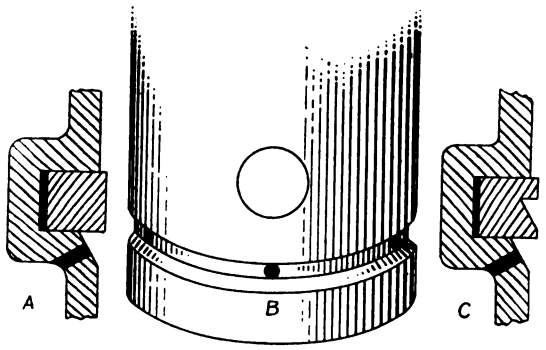
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that a brass strap connects the two terminals C and D. On some machines this strap is inside of the frame as indicated by the letter B and in others on the outside as indicated by A. If this strap is on the inside of the motor-generator it will be necessary to remove the motor-generator from the car and take it apart to cut the strap. Where the strap is on the outside, as shown by A, it can be cut with a hacksaw without disturbing the generator.

After the strap is cut one terminal of the ammeter should be connected to each of the two terminals; the other connected to the switch and storage battery respectively, but left precisely as before. For such an installation it is recommended that the meter be of the "dead beat" type, having a zero center and approximately 30 amperes charge and discharge range. The meter connected in this way will indicate the net charging current, but will not indicate the discharge current taken by the motor during the cranking operation.

2289 **Drilling Piston Ring Grooves.**

From Z. W. Seibert, Ohio.—I have some trouble with my Buick 6 D44 in that oil leaks past three pistons. Before I make any repairs I would like to ask if it would do me any good t install leakproof rings and have grooves turned on pistons and bore six or eight holes in same to let the oil through? If



Remedying Oil Troubles—A, Beveling Ring Groove; B, Groove and Holes; C, Grooving Ring.

so, where should the groove be cut on piston which has three rings above wristpin? If grooves and rings will do any good state where to groove, under the last ring on bottom of piston.

Reply.—The use of the rings mentioned should remedy the trouble provided the rings are properly fitted and the cylinders not scored or out of true. Using grooves and holes is favored by some and when this is done the drilling of the holes below the wristpin as shown at B in the accompanying drawing is recommended. Cutting a slight groove is also favored. A very satisfactory method is to make use of a scraper ring as shown at A. This is accomplished by beveling the bottom corner of the ring groove instead of cutting a special groove in the piston. This will not reduce the piston wall strength. Bore six equally spaced 5/64-inch holes at a 60 degree bevel. If this does not drain the oil back and remedy the trouble cut a small groove in the upper rings as shown at C.

2290 **Used Too Much Fuel.**

From I. N. Brainerd. Michigan.—What say you to this? My car (new) when running slow and not pulling much, has been bucking like a broncho. Never when pulling or running more than 15 miles an hour. Another doctor riding with me said that my mixture was too rich, and got out and thinned it. I have had no buckling since. Does a rich mixture when compressed explode more readily than a lean mixture, so much more readily that the explosion occurs with the piston on the wrong side of dead center, even when the spark is fully retarded?

Reply.—Your mixture was probably rich. Too rich a mixture, too much fuel in proportion to the air, does not burn readily, particularly at low engine speeds. The more perfect the proportions of fuel and air the quicker the mixture burns. The explosion would not occur with the piston on the compression or upstroke with the spark fully retarded even with the mixture referred to. Even with a homogeneous mixture the ignition of the charge would not occur before top dead center, assuming that the timing was normal and the spark lever fully retarded.

2291 **Wants Trebert Engine Parts.**

From A. E. McMurray, Colorado.—I have a Trebert engine the name plate of which reads as follows: "Trebert Gas Engine Co., Rochester, N. Y., No. 249—H. P. 45." I have written to this address as I need parts, but obtained no reply as letter came back marked "Out of Business." Can you tell me where I can obtain parts?

Reply.—We have no record of this company being engaged in the manufacture of engines. Perhaps some of our readers know where spare parts for the engine can be obtained.

2292 **A Question of Economy.**

From E. N. Mullis, Iowa.—1—Name the most popular types of headlight lenses. 2—What is the price of the Ford chassis, and can it be purchased without a body? 3—Give the address of one or more firms making a three-passenger body to fit the Ford chassis. 4—Would it be cheaper to buy a piston head or oversize pistons and rings for a Buick engine or would oversize rings do?

Reply. 1—This question is not a practical one to answer. 2—The price of the Ford chassis is $235 f. o. b. factory plus the three per cent. government war tax. 3—Try the Universal Car Equipment Co., 1305 Bellevue avenue, Detroit. 4—We would say that it would be more satisfactory and cheaper to instal new pistons and rings than to buy new cylinder bloc and attempt to use old pistons and rings, or to buy the bloc with new pistons and rings.

2293 **Cause of Clutch Grinding.**

From Leon Savard, New York.—Will you tell me why the dry disc clutch in my 1916 Reo six grinds when disengaging it?

Reply.—The grinding noise is caused by badly worn metal washers on each side of the ball-bearing or thrust bearing of the clutch assembly, and is undoubtedly due to lack of lubrication. These washers are case hardened, and after hardened part wears the balls cut through rather rapidly. Renewing the parts will cure the trouble.

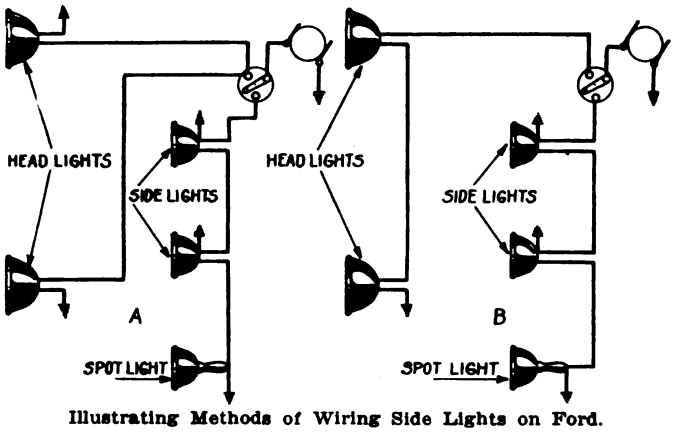
2294 **Wiring Spotlight for Ford.**

From A. D. Horskin, Massachusetts.—Will you supply a wiring plan for a 1914 Ford for a spot light

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and two side lights and so I can turn a switch and cut out the headlights? Also advise as to what size lamps to use.

Reply.—Two diagrams are presented herewith. That at B shows a series circuit or the way the headlights are connected at the factory. The new model Fords are equipped with an 18-volt magneto and two nine-volt lamps are used in series. Bulbs for the side members should be of similar voltage. The diagram is shown with a ground for each side light



Illustrating Methods of Wiring Side Lights on Ford.

as it is assumed the car mentioned has lamps mounted on a wood dash. The sketch at A shows a multiple circuit, in which the lamps are wired in parallel and with a ground for each. With this type and on old Fords use 12 to 16-volt, one ampere 15 c. p. bulbs. For side lights use 4 c. p. bulbs of similar voltage.

2295 Timing Model 17 Buick.

From George W. Porter, North Dakota.—I like your magazine, as I get lots of good information and suggestions. Can you give me the correct timing of the model 17 Buick engine when the exhaust valve closes and when the intake valve opens and closes? My car is out of time.

Reply.—According to the engineering department of the Buick Motor Co., the exhaust valve closes when the piston has dropped 1/16-inch past upper dead center, and the inlet valve should open when the piston has dropped 3/32-inch past the upper dead center. The company has no record of the number of degrees of the crankshaft angle at which the valves open and close.

2296 Gearing Ford for Racing.

From R. G. Kimball, New Hampshire.—I have a 1912 Ford with a 1914 rear end. I desire to gear this up. I am advised to gear it 2 to 1. Will you kindly advise me as to the new gears I will require and where same can be obtained? I am told I need a new pinion. I have a racing body on the car which holds the road perfectly. Can you give me any information regarding putting in a sliding gearset in a Ford? I would like to know of a practical and economical method. Have a garageman who will help me.

Reply.—The standard ratio of the Ford gears is 3 7/11 to 1. Changes can be made by purchasing the gears, and if you will write William Ganschow Co., Morgan and Washington Blvd., Chicago, Ill., they will supply you with the gears you require.

The ratios to use are as follows: For racing, 2 4/7 to 1. Fast roadsters, 2¾ to 1. For racing on dirt tracks where a quick pick-up is required, use a 3 to 1. The 2¾ and 3 to 1 are interchangeable. You will have to change both the pinion and the large or differential gear, the driving member.

The number of teeth are as follows for the different ratios:

2¾ to 1	gear 36 teeth	pinion 13 teeth
3 to 1	gear 39 teeth	pinion 13 teeth
3 7/11 to 1	gear 40 teeth	pinion 11 teeth
4 to 1	gear 40 teeth	pinion 10 teeth

The average speeds with these gears ratios are: 2¾ to 1, 60 to 65 miles per hour; 3 to 1, 50 to 60 miles; 4 to 1 varies according to weight; average 25 to 35 miles. A sliding gearset or transmission has been brought out by Woodward & Rowe, Chicago, Ill., for the car mentioned. It affords four speeds and is adaptable to all modern makes of Fords. The company will supply you with complete information and prices.

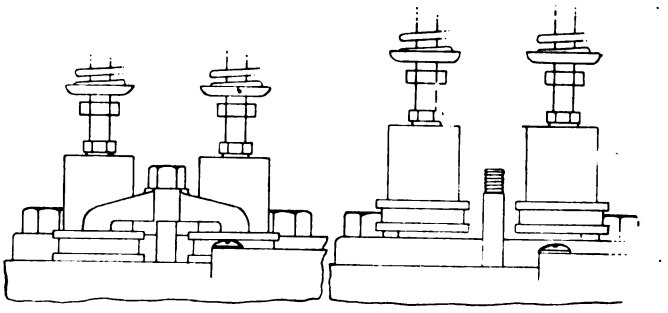
2297 Removing Buick Engine.

From Harry Flowers, New York.—I want to take my engine out of the car to overhaul it. Would like to know if after taking out the four bolts holding it to the frame if the engine can be moved forward by releasing the clutch? In other words, is there anything else that holds the engine? The car is a 1914 model B 25 Buick, a four-cylinder engine.

Reply.—If the clutch is of the cone type you should be able to remove the engine as stated. All wiring, etc., will have to be disconnected. A little study will enable you to determine how best to proceed with the work.

2298 Has a Clicking Noise.

From E., Reno.—My Overland model 83 has developed a clicking noise in the universal joint. It hits about once a revolution. Are these joints hard to take apart? I have a tappet noise and adjusting does not cure it. I have been told it is the pushrod



Illustrating Stirrup and Retaining Members of the Overland Valve Mechanism.

which has become flattened at the lower end. Will it do any damage if left as it is? Can the pushrods be taken out without removing the camshaft?

Reply.—The disassembly of the joint is not difficult. The valve plungers as well as their guides may be removed by displacing the nut retaining the stirrups as shown in the accompanying illustration. The valves will have to be removed, however. No material damage should result from the worn part. It is best, however, to inspect the parts and replace any badly worn.

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2299 **Would Disassemble Battery.**

From Irvin A. Resh, New Jersey.—If it becomes necessary to take the cells of a storage battery apart for repairs or cleaning how is this done? If the specific gravity is down to 1.150 is it safe to take the elements out of the acid and clean them in clean water? I would like to have full information on this subject. Of course, you will say that this should be done by an expert. Nevertheless, it can do no harm for a layman to know how it should be done.

Reply.—You are correct in your assumption that we do not believe the owner should disassemble his battery. If you desire to learn how the parts go together why not visit some battery service station and witness the work of the expert? This will be much better and cheaper than experimenting with your battery.

2300 **Has Too Advanced a Spark.**

From P. W. Olsen, Nebraska.—I have a 6-40 Chalmers, 32-B model, equipped with the Atwater-Kent K2 timer. Had the engine overhauled a short time ago and since am unable to crank it or start it with the starter on account of its kicking back. When it pulls it has a clicking sound in the timer when the spark is retarded as far as possible. Do you think the trouble lies in the wiring or in the timer?

Reply.—In replacing and adjusting the timer the time of break or interruption of the primary current was advanced or made to occur earlier. Reset or retime according to the timing of the engine. This will be supplied by the agent or manufacturer. In setting this type of timer the click indicates the time of spark. Try timing with the piston at top dead center or the completion of the compression stroke.

2301 **A Question of Speed.**

From J. C. Hallock, Michigan.—My car is a Studebaker, 1916 model, and has been run 9,500 miles. When engine is pulling it runs nicely, but when foot is removed from accelerator engine runs unevenly until engine is again pulling. I thought it was play in the universal. Both joints, clutch and transmission were looked over, but nothing found. Could sufficient wear in axle be the cause of the backlash? It is nothing serious, but is not desirable, and I will appreciate any suggestion you may offer.

Reply.—Your trouble is more likely to be due to faulty ignition, carburetion or valves. The fact that the engine runs well at speeds or with an open throttle and misses at low speeds indicates that either the mixture is too thin or rich at low speeds. Test the ignition and try adjusting the carburetor for the speed at which trouble occurs. Look the valves over thoroughly.

2302 **Has Weak Compression.**

From W. M. Hinkley, Maine.—I have a 1916 Dodge. Lately the engine shows signs of lost compression in the first and second cylinders. Valve grinding does not remedy the trouble. When cranking by hand a hiss of air is heard in the crankcase, so I have made up my mind to install Leak-proof rings. Am I right? If so, can you recommend as good a ring for this purpose as the ring mentioned and at a lesser price, or do you think they are best? If I have to take the pistons out, which is the easiest and best way? Can you give me the address of a concern making a valve reseater and cutter for the Dodge? Am I getting at the seat of my lost compression by installing new rings?

Reply.—If the valves seat perfectly and there is leakage past the rings it will be necessary to inspect the pistons, rings and cylinders to ascertain the fault. If the walls are in good condition the use of the rings mentioned should cure the trouble. To instal the rings the pistons will have to be displaced. The cylinder head is removable and is retained by 14 nuts. The water connections will have to be displaced and the wires disconnected, etc. Removing the lower crankcase will afford access to the connecting rod bearings, and the rods with pistons may be removed easily. The maker of the car has a tool for the work mentioned and which is supplied to its service station. No doubt you could secure one of these by making an application to the factory. The work of refacing the valves and seats can be accomplished with the conventional adjustable tool, which can be secured at any supply house.

2303 **Kerosene and Carbon.**

From J. Brenneman, Illinois.—Do you consider it good practice to use kerosene to remove carbon from the valve seats of an engine? The manner of application is to introduce the kerosene with the engine running and through the priming valve. It seems to get rid of the carbon, but I am told that the kerosene gets into the crankcase oil and lubrication suffers.

Reply.—The judicious use of kerosene in the manner described will not do any injury. The amount of kerosene that might reach the crankcase will not sufficiently thin the oil to cause any trouble.

2304 **Looking for Improvement.**

From Frank Johanneck, Minnesota.—I have a 1915 four-cylinder Studebaker which has been run 11,000 miles. I want to equip it with light gray iron pistons and the firm making these pistons claims they can fit the pistons without my sending them the cylinders if I will send the dimensions. Would the pistons fit without getting the cylinders reground? They do not appear to be worn at all. Would it pay to have the work done? The firm making the pistons claims more speed, power, less fuel consumption, vibration, etc. My engine is in perfect condition, never misses and will go from 1½ to 55 miles an hour. To make a long story short, would it pay me to make the change as long as the engine runs perfectly?

Reply.—If you supply correct dimensions the firm can turn out pistons as stated. They can be fitted and used without regrinding the cylinders, provided the latter are in good shape. It would not pay to have the work done if your engine is operating as claimed. If you can obtain the range of speed you state, we would suggest you let well enough alone.

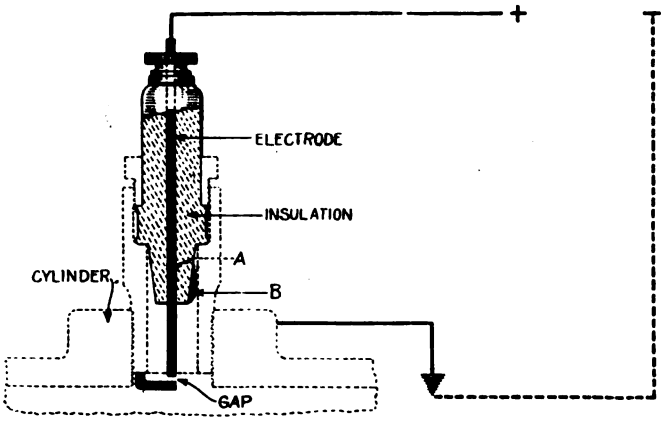
2305 **Path of Secondary Current.**

From E. J. Winebrenner, Maryland.—Who is the maker of the Marvel carburetor and what is his ad-

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dress? I would like to know what is the cause of the spark plug on my Ford car sparking in the plug as well as at the points when the plug is apparently in good condition.

Reply.—The maker is the Marvel Carburetor Co.,



Illustrating Why Intensified Current Takes Path of Least Resistance.

Flint, Mich. There are several reasons why the trouble exists. It should be borne in mind that the high-tension or intensified current seeks the path of least resistance. Starting from the source of supply to the coil where it is built up or intensified, it is conveyed by cable to the terminal of the spark plug, and passing down the metal electrode it encounters the gap. The current should jump this gap and pass to that electrode attached to the metal base of the spark plug, thence to the metal of the cylinder or ground, back to its source of supply. This completes the circuit. The electrode shown in the sketch is insulated from the metal of the plug. If this insulation was not provided the current would not take the path of the gap, as it would be much easier for the electricity to flow through the metal of the plug or its shell.

This high-tension current acts similar to water under pressure. If there be even a tiny crack in the insulation the current will pass through the crack to the metal part, as there is less resistance than at the gap. This is indicated at A. If carbon or soot, conductors of electricity, form on the insulated part as shown at B, the current is apt to jump across to the metal section of the plug. These conditions are termed a short circuit in that the current takes the shortest way home as it were. When sparks appear as stated the gaps or resistance points are very similar. Plugs in such a condition should be cleaned and tested, and if not in good working condition replaced by new ones.

2306 Has a Ground.

From Henry Kaufman, Louisiana.—I am having trouble with my Ford. I cannot crank (start) it without batteries. It runs all right on the magneto except at intervals. But when I switch on the lights it spits and sputters. I have installed new magnets and coils. The magnets were shipped all bunched together. Could they have become demagnetized by shipping in this manner? You can start by spinning the engine on the magneto when the engine is hot.

Reply.—Would suggest that the magneto be tested and that the wiring be inspected for possible short circuits or grounds. The magnets should not be injured by shipping in the manner stated. They can be tested if in doubt.

2307 Puzzles the Repairmen.

From J. F. Snedaker, Utah.—I have a 1916 Maxwell. When running at 15 miles or above an hour it runs fine, but slow it down to 5 or 10 miles and it jerks considerably. It can't be due to carbon or poorly seated valves, as carbon has been removed and valves ground and new rings fitted. It is not due to plugs or wiring. The compression is good. I have asked a number of repairmen, but they do not seem to know why it acts as it does.

Reply.—There are a number of factors contributing to the trouble mentioned. Too rich or too weak a mixture at the speed at which the trouble occurs will cause erratic operation of the engine. Weak valve springs, particularly the exhaust, and too large a gap at the spark plugs will create missing. Inspect the magneto and note if the contact points require cleaning and adjusting. Go over the wiring to see if any partial grounds exist.

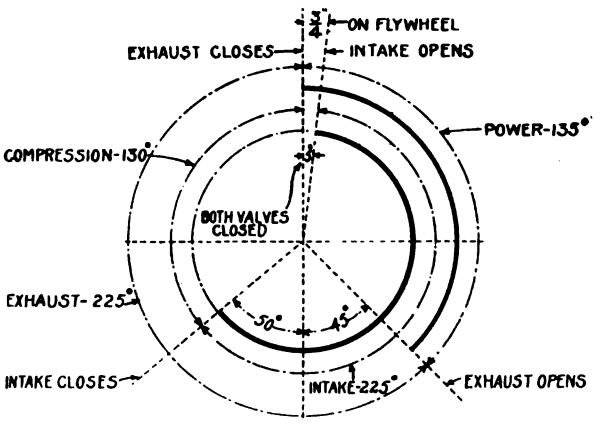
2308 Would Rebuild Old Car.

From G. W. Odgers, New Jersey.—I have a car six years old and the engine is out of date. Would it be good practice to replace the engine with a new one? The wheels, springs, rear axle, etc., are all good. Would it pay to rebuild the car, doing all the work myself?

Reply.—We are of the opinion that the cost of a new power plant and that of installing it would hardly repay you. There is considerable work in installing an engine, as stated, and more or less trouble will be experienced as the work progresses. When the job is completed you will have a car that will not be easily marketed and one that may give you more or less trouble, it depending on the work, etc.

2309 Timing the 12-Cylinder Engine.

From J. D. Burns, California.—Will you please publish the timing diagram of the 12-cylinder engine, the Weideley I think it is called. Please give



Timing Diagram of a Pathfinder Twelve-Cylinder Engine.

the periods of the various openings; that is, compression, firing, exhaust and intake in degrees. If you can, would like to have this in an early number.

Reply.—The accompanying sketch is the timing diagram of the 12-cylinder engine made by the

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Pathfinder Company, Indianapolis, Ind. As may be noted, the degrees of the strokes are given. The five degrees of the intake opening is equivalent to ¾-inch of flywheel travel, while the exhaust opens 45 degrees before lower dead center or 6½ inches flywheel travel. The intake closes 50 degrees after lower dead center, or 7¼ inches flywheel travel.

2310 Is Hard to Start.

From J. B. Lewis, New York.—I have trouble starting my 1913 Ford runabout on the magneto. The car is in good shape and runs as smooth as new. Have not experienced trouble in starting until recently, during the last three months. It has been growing gradually harder to start on the magneto, and finally it would not start after standing and cooling off. It starts on batteries and runs on magneto after starting. Three different garagemen have looked it over and cannot improve the starting. The car has been taken good care of. In the last five seasons it has been run 15,586 miles. It was overhauled last fall. Will appreciate any information as to the cause of this hard starting.

Reply.—The fact that the engine starts readily on batteries indicates that the magneto or the components of the wiring assembly, etc., are at fault. Test the output of the magneto and see that magneto contact point in transmission is clean. Look over connections between magneto and coil and examine the switch. We are assuming that the engine is not at fault and that the mixture is correct, also that the coils are properly adjusted. It would be advisable to check the gap of the spark plugs, and possibly a smaller gap may help.

2311 Weak Compression and Missing.

From Charles H. Rauschenbach, Connecticut.—I have a Reo that skips very badly. Have come to the conclusion that the trouble is due to a very weak cylinder. Kindly advise me if this would cause missing. If so, would reboring rectify the trouble and would it be necessary to rebore all four cylinders to have the engine run evenly? If the trouble lay with the cylinder would oil be on the plug, or would it be just black and smoky? The plug in the cylinder mentioned is black and smoky, while the others are clean.

Reply.—Very weak compression will affect the cylinder in question. Reboring or regrinding the cylinder and fitting new piston and rings should overcome the trouble. Relative to the balance of engine, we do not believe enough will be removed from walls to effect the balance. It is possible for both oil and the soot mentioned to be on the plug. Oil indicates the use of too much lubricant or poorly fitting rings or scored cylinders. Too rich a mixture will cause smoky deposits, but in your case it is probably the cylinder. Would suggest that the compression be tested, also the seating of the valves.

2312 Magneto Gives Trouble.

From S. B. Tucker, Tennessee.—I have a model 79 Overland with a model A Splitdorf magneto. The magneto has gone wrong. It will not throttle down. It will run at fast speeds, but chokes if you open the throttle suddenly, this with the engine running idle. And when I try to run my car the engine goes dead on the magneto, but when I switch on to the batteries it runs fine. The coil is all right. Have tested it and the wiring. Have cleaned the magneto and contacts and can find nothing wrong. The magnets are all right. The funny thing to me is that it will run idle, but goes dead as soon as I try to move the car.

Reply.—The fact that the engine runs satisfactorily when the batteries supply the current indicates that the circuit breaker mechanism and distributor are functioning properly. If the magnets are in good condition they should develop sufficient current to run the engine throttled down. Try changing the adjustment of the contact points and examine carefully the switch and other connections. Unless absolutely sure that the magnets are in good shape would have them tested.

2313 Sector Works Loose.

From A. Murphy, Indiana.—I own a 1912 Studebaker which is satisfactory in every respect except one, and that is the steering gear. I have trouble in keeping the sector tight on the post. It is a worm and sector type of steering gear and the sector is secured to the post by three rivets. It is impossible to keep these rivets tight. Have tightened them repeatedly and even had the parts welded. We thought welding would cure the trouble, but it has not. Can you suggest a remedy?

Reply.—From your description it is evident that both the steering arm and sector are worn. As we understand it, the sector is loose on this arm not on the steering column. Bushing the parts and using a key and a taper pin should hold if the work is properly performed. It will be difficult to make the parts rigid if any play exists.

2314 Is Bothered by Backfire.

From W. S. Raymond, Connecticut.—Is there any remedy for my model 31 Buick? It backfires in the muffler for about two miles every morning and after it has stood idle for some time. I have installed new carburetor, new rings and use hot air to the carburetor. The exhaust has a burned smell. Cylinders three and four miss.

Reply.—Symptoms are those of a weak mixture, too much air in proportion to the fuel. A weak mixture burns very slowly. Try cutting down the air until the engine becomes warmed up or slightly increase the fuel supply.

A Cure for Fouled Plugs.

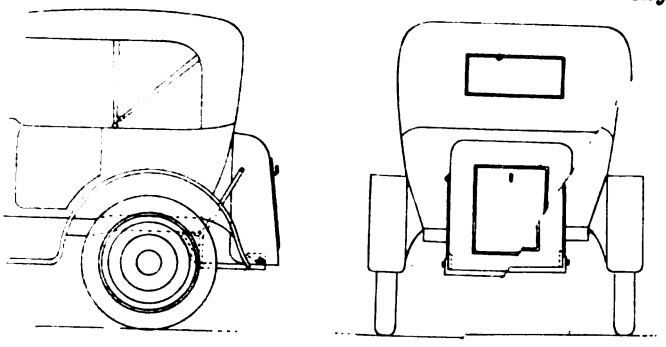
From W. M. Schwingel, New York.—Having profited by various articles in your journal, I will reciprocate. I think if No. 2222, who has trouble with his Maxwell, will use Maxwell oil (which is put out by the Wolverine Lubricants Co., of New York), and recommended by the makers of the car, also use nothing but high-grade spark plugs or at least be sure his plugs are in perfect order, he will have no further trouble. I have a Maxwell of the same model and had the same trouble as No. 2222. A mechanician who looked after my machine had hard work to convince me that my trouble was due to the plugs until he loaned me a full set, with the result my troubles are ended. I, too, thought there was trouble with the rings, but I am satisfied that

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such was not the case. I could usually drive about 20 miles when the trouble would begin. I would have to clean the No. 2 plug about every five or six miles. I also found that a very small gap in plugs worked better than the regulation thickness of a dime.

Novel Home Made Trunk.

From Neat Tanquary, Texas.—I am sending you two illustrations of how I made use of the rear deck or box of a Ford runabout for a trunk on my



Novel Use Made by Owner of Rear Box or Deck of Ford Runabout. It Provides a Roomy Trunk at Little Expense.

Hudson 6-40. I took a piece of 2x4 and placed it as shown in the illustration and bolted the wood down to the trunk rack. The box is supported by two irons, one on either side, and running from the trunk rack as shown. These irons should be painted the color of the body and varnished to make a good job. The box is not only light, but I find I can store a considerable amount of stuff in it. The idea may not be original, but it is new around here.

A Remedy for Leaking Axles.

From Samuel Francis, California.—I am a reader of your magazine and find it very interesting to read the different articles printed for the benefit of motorists. I am contributing an article dealing with the leakage of grease through the hubs of the rear wheels of automobiles, and hope it will interest your readers. As we all know, the trouble is generally caused by having an excess of grease in the differential. So many complain about the Ford leaking grease. I have found other makes of cars are troubled the same way if too much grease is kept in the differential casing, which is likely to happen with the novice.

The most satisfactory method I have experienced is to drill two 1/8-inch holes close together on the under side of rear axle tubing and on each side of the differential, say about 12 or 15 inches from the center line of gear casing. Leave these holes open all the time, as no dirt will enter, as the holes will be full of grease running out.

Cures Trouble by Heating.

From H. J. Ripper, Pennsylvania.—I am always waiting for the Automobile Dealer and Repairer and am glad when it arrives. It has helped me out of many tight places. I notice that Henry Lobeck, No. 2222 and his oil trouble. I have an E. M. F. 30, 1911 model. Two years ago I installed new rings in the third and fourth cylinders for the same cause, but they did not help. By accident when in a hurry one day I left without a drop of water in the radiator and it was not noticed until I had driven about two or three miles. I had to go another mile before I could get water. The engine was good and hot, you can bet, because I was mad and in a hurry. Now don't laugh, but I filled her up as soon as I stopped, but filled the radiator very slowly. And I haven't had any oil trouble in the third and fourth cylinders since last winter. I put new rings in the other cylinders and had the same trouble, oil, then some more oil. I decided to try the no water cure. I took a supply of water with me and two of my boys and we started with no water in the radiator. And we just ran the old tub until she commenced to buck and jerk. When we stopped we had gone six and one-half miles at a speed of 20 miles an hour. Before this the cylinders were always covered with oil, but now they are not. And what is more I can go up grades on the high that I could not before and I have not found anything injured by the operation of the "no water" treatment. I have some more things to tell, but not at present.

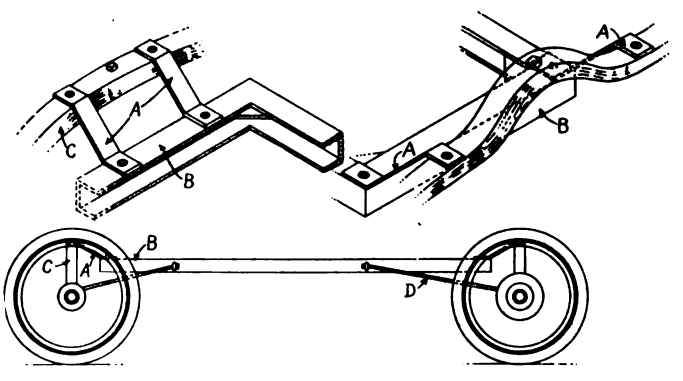
Ed. Note.—We do not advise the use of Mr. Ripper's method. While an engine can be operated for a brief period without water and provided there is plenty of oil, one is apt to invite serious trouble. The effects of overheating an engine are too well known for further comment.

Suggestion for Starting.

From C. E. Hubbard, North Carolina.—To start a car on a cold morning dip a rag in boiling water and lay it on the carburetor and intake pipe. Pour some of the hot water on it and let it stand five minutes. The engine is then ready to crank. This method has never failed me.

Lowering Ford Frame.

From William Spooner, Rhode Island.—Am sending you a sketch of how I lowered the frame of my Ford so as to obtain a lower center of gravity when driving at high speeds. This plan drops the front of the frame about six inches, and the frame is held in position by the two L-shaped bars A. One end of the bar members is bolted to the frame as shown



Showing How a Reader Lowered Frame of Ford.

at B, and the other is fastened to the spring section as indicated at C. This will, of course, make it essential to lengthen the front radius rod so that the bars L won't touch the axle. The rear of the frame will have to be altered. It is necessary to cut off about six inches of the frame and the support is replaced by the members D, which must be

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cut to the right length and so as not to increase the wheelbase. If the wheelbase is increased one will have to lengthen the drive shaft. This is why one must be careful to have the bars of the proper length.

Plugs Holes With Shells.

From Lea Moore, Delaware.—In scraping carbon from the cylinder heads of the Ford, plug the water jacket holes with 22 calibre rifle cartridges, used shells, and the cylinder head bolt holes with 32 calibre, rifle or revolver. I find this much better than rags, as the shells cost nothing and can be used over and over again.

UNITED STATES WANTS REPAIRMEN.

Soldier Workmen Needed for Overseas Service in the Repair Shops of the Army.

Back of the fighting front of the American army in France there will be established warehouses and repair shops for handling vast amounts of ordnance equipment. General Pershing is very anxious that these shops should be established at the earliest possible moment. A division of the Ordnance Department of the United States army, known as the American Ordnance base depot in France, will be in charge of this work. This division will be a military organization, all of the men in it to be soldiers of the United States army under military discipline.

Men are needed to enlist in this division, not as fighters but for overseas service as skilled or unskilled soldier workmen. About 9,000 men will be required at first, and of these about 2,000 are expected from the Chicago area. The Chicago office for this recruiting is at 435 South Dearborn street and is in charge of the Ordnance recruiting committee of the Military Training Camps Association.

Men between the ages of 18 and 40 will be enlisted for the duration of the war as privates, but there is opportunity for promotion to higher grades. They will receive free quarters, rations, clothing, bedding, medical and dental attendance, and pay ranging from $30 to $61.20 a month. Men with minor physical defects may be accepted. Men of almost every vocation and trade are needed, particularly automobile repairmen, cooks, gunmakers, harnessmakers, machinists, millwrights, optical instrument repairers, painters, steel polishers, plumbers, etc. In addition to the headquarters at 435 South Dearborn street, information can be obtained from any United States army recruiting station.

At present men who are exempt from the National army, under the provisions of the selective service draft, cannot be accepted for this division. But men over or under draft age or men of draft age not yet ordered into camp, may be accepted. Wives or dependents are provided for. The wife receives half of husband's pay, plus $15 a month, plus $10 a month for one child, plus $5 a month for each additional child.

AWARD SPACE AT BOSTON.

Motor & Accessory Manufacturers' Association Gives Out Locations to Members.

The first allotment of space at the Boston show has been made by the Motor & Accessory Manufacturers' Association. Twenty-nine members have been given places, and although many have taken large areas there is still room for additional members who may desire to obtain space before the show opens on March 2. Although New England members of the association are well represented, New York, Pennsylvania, Illinois and Michigan manufacturers will display their products. The first allotment is as follows:

Auto Pedal Pump Sales Corp., New York City.
Brunner Mfg. Co., Utica, N. Y.
Century-Plainfield Tire Co., Plainfield, N. J.
Champion Ignition Co., Flint, Mich.
Corcoran-Victor Co., Cincinnati, O.
Corning Glass Works, Corning, N. Y.
Detroit Pressed Steel Co., Detroit, Mich.
Dixon Crucible Co., Jos., Jersey City, N. J.
Du Bois Piston Ring Co., Inc., Albany, N. Y.
Electric Storage Battery Co., Philadelphia, Pa.
Gray & Davis, Inc., Boston, Mass.
Halladay Co., L. P., Streator, Ill.
Harris Oil Co., A. W., Providence, R. I.
Hartford, Inc., Edward V., Jersey City, N. J.
Kellogg Mfg. Co., Rochester, N. Y.
Kelt Mfg. Works, Atwater, Philadelphia, Pa.
Mal Co., F. W., Milford, Mass.
Meta Stamping Co., Long Island City, N. Y.
Mosle & Co., A. R., Mt. Vernon, N. Y.
Moto-Meter Co., Inc., Long Island City, N. Y.
Piel Co., The G., Long Island City, N. Y.
Rand Mfg. Co., Inc., Haverhill, Mass.
Rowe Cal. Co., Hartford, Conn.
Schrader's Son, Inc., A., Brooklyn, N. Y.
Syracuse Malleable Iron Works, Syracuse, N. Y.
Vacuum Oil Co., New York City.
Veeder Mfg. Co., Hartford, Conn.
Warner Lenz Co., Chicago, Ill.
West Side Foundry Co., Troy, N. Y.

IS FINANCIALLY SOUND.

Chalmers Co. to Continue Production in Large Quantities, Says President Flanders.

The Chalmers Company has issued a remarkable statement over the signature of President Walter E. Flanders of the Chalmers and Maxwell companies. To show that the Chalmers concern is sound financially the company has authorized its distributors to state that it will post $200,000 to back up the prophecy that the Chalmers company under the Maxwell management will stand ahead of 15 producing companies and making cars selling between $1,100 and $1,500 in 1918, and ahead of 20 of these companies in 1919. The statement is authorized to show the purchasing public that Chalmers cars will be continued to be marketed and in increasing numbers.

Disteel Wheels for Motor Cars.

The Detroit Pressed Steel Co., Detroit, Mich., which is manufacturing a very interesting type of metal wheel for the passenger car called the Disteel wheel, is issuing an unusually attractive de luxe brochure showing the use of its product on various makes of machines. No expense has been spared in the art work, material or printing, and as many as eight colors are utilized in the illustrations. The method of changing the wheels and the ingenious demountable feature of the Disteel wheels are clearly shown, and the sketches are so clear that explanatory matter is not required, although

New Oil Field Opened.

A new oil field has been opened about eight miles from Los Angeles, Cal. One well put in by the Standard Oil Co. is flowing about 7,000 barrels a day, of 24 gravity oil, from a depth of about 1,000 feet.

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Explaining the Operation of Various Types of Engines and How the Construction of Cylinder Heads is Varied

BY AUGUSTUS A. WEST, M. E.

A mixture of gas vapor and air is burned in the cylinder of the gasoline engine, the heat thus generated being converted into useful work by the expansion of the products of combustion. The action in gas, oil and hot air engines is very similar.

An accompanying illustration shows a comparison of the steam and gas engine of the two and four-cycle type. In the steam engine each stroke is a power stroke, the steam acting alternately on each side of the piston. This double action does not work well in the gasoline or internal combustion engine, as it is called, because of the great heat that results from the explosion, so a "trunk" or single-acting piston is used.

Various link steam valve movements are used in steam engines, and we have shown the type used in steam pumps, which does not permit of using a variable "cut off," such as is used in locomotives and other power steam engines. There are two great properties in steam, one being the velocity, the other the expansion, the latter being obtained by the "cut off." Steam has a third benefit obtained by "condensing" or decreasing the space occupied by cooling the steam and turning it back to water, which causes a vacuum pull on the piston. A steam engine has a steam velocity and expansion push and a steam condensing vacuum pull. If the exhaust gases from a gas engine were rapidly cooled there would result a vacuum pull on the trunk piston. The muffler of the gas engine acts the reverse of a steam "condenser" in that it retards the flow of the exhaust gas and puts a back pressure on the piston, hence more power is obtained when the muffler is eliminated, but more noise results.

The Two-Cycle Motor.

The two-cycle gas engine gets a power stroke every alternate stroke or cycle, it has no movable valves, gives about 60 per cent. more power than the four-cycle in the same time space, but has a number of disadvantages. The two-cycle engine is limited to about 900 revolutions per minute because of the small time space in which it can intake and exhaust gas, resulting in fouled gas in the cylinder. In the two-cycle engine the gas from the mixing valve or carburetor goes into the crank case, where the downward stroke of the piston partially compresses it. The mixture goes into the cylinder and during the time of exhausting the burned gas. There is a dividing wall on the head of the piston which is supposed to separate the incoming fresh gas from the outgoing burned gas.

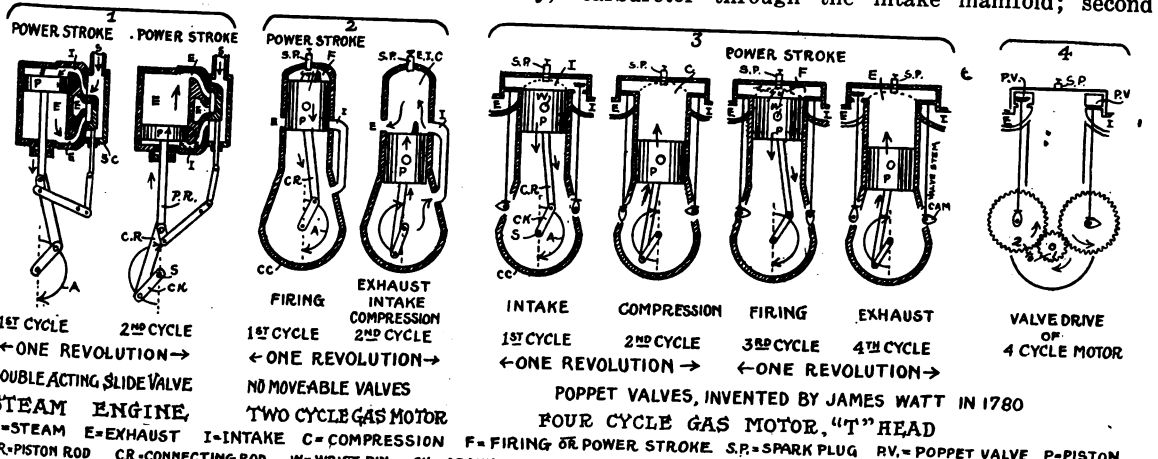
Four-Cycle Engine.

The modern automobile engine is the four-cycle. Four and six upright cylinders are used, also eight and 12 cylinders in V shape or set 60 to 90 degrees apart. These engines run as fast as 3,500 revolutions per minute by using small diameter, light-weight pistons and reciprocating parts. The four-cycle strokes are: first cycle, gas intake from the carburetor through the intake manifold; second cycle, the piston compresses the gas mixture; third cycle, the compressed mixture is fired; fourth cycle, the exhaust.

Six-cycle gas engines have been built, the first four cycles being as above, the fifth drawing in cold air and the sixth forcing the air out. This method of scavenging the cylinder results in a loss of power and time and is seldom used nowadays.

The poppet valve is in most common use. In some modern motors two intake and two exhaust poppet valves are used. Other forms of valves are used, such as Knight's sleeve valve, and disk and rotary valves. The poppet valve is operated by a cam on a camshaft, driven at one-half the speed of the crankshaft. There are air-cooled and water-cooled gas engines, the latter predominating.

An accompanying illustration shows how an explosion or power stroke is obtained each half revolution when using four cylinders. If two double-acting pistons were used there would result the same



Illustrating the Operation of the Two and Four-Cycle Internal Combustion Engines.

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power as obtained from four single-acting pistons, but there are structural difficulties in using double-acting pistons.

A study of the cycle of operation shown will give a clear idea of the power action of the four-cycle, four-cylinder engine. The cranks are set at 180 degrees, or one-half of a circle. By using six cylinders and three cranks set 120 degrees apart there results an overlap of power, and by using eight or twelve cylinders there results a more continuous application of energy. If twelve cylinders were placed in a line, a long crankshaft and hood would be required, so that designers resort to the V placing of cylinders in eights and twelves.

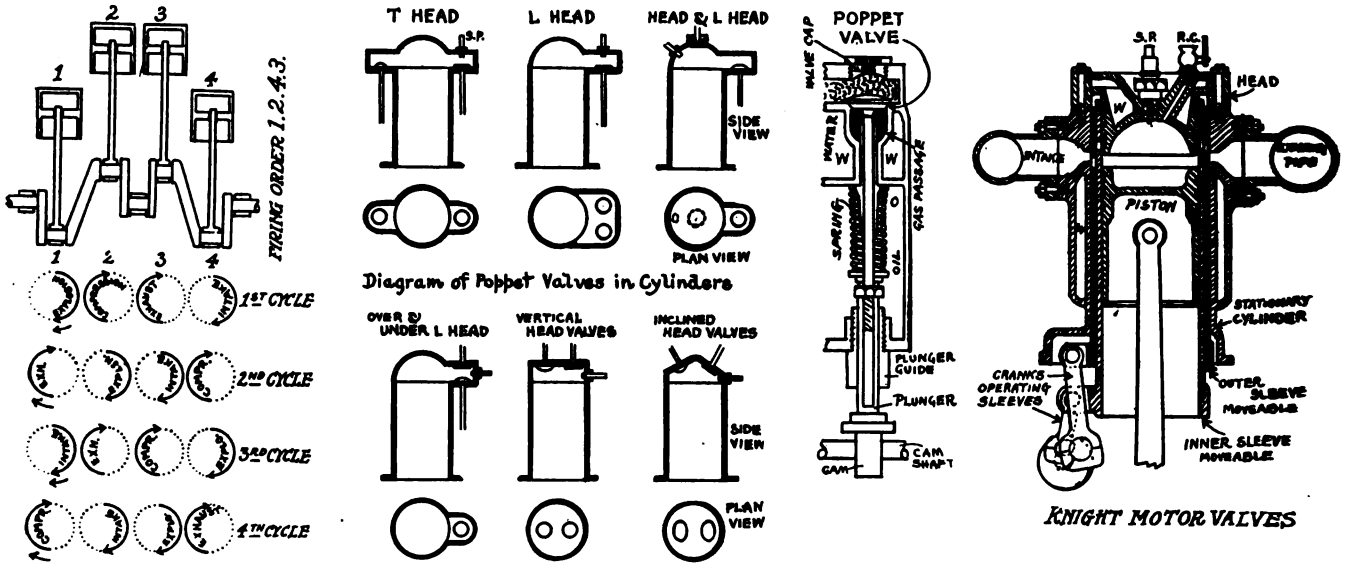
The power of the gas engine depends also upon the piston displacement, the number of times per minute the piston travels back and forth, etc. Many other factors enter in the power factor so that actual operating tests differ from indicated horsepower. Some designers double the number of intake and exhaust valves of the poppet type. Two intake

Various other types of gas engine valves have come and gone and the end is not yet. The refinements of the gas engine are in the minor parts, especially in the valve mechanism. In automobiles the two-cycle type has given way to the four-cycle, the air-cooled to the water-cooled, the one and two-cylinder to the four and six-cylinder, and modern practice points to the V type of eights and twelves.

The Lenoir Engine.

In a brief resume of the history of the gas engine we find that the Lenoir engine appeared about 1860 in France and was much used in both France and England but not for automobiles. It was a double-acting engine, built very much like a steam engine and had a valve chamber much the same as the steam chest on the steam engine.

In 1862, a French engineer, Beaude Rochas, suggested a piston power travel entirely different from the steam engine. The mechanical difficulties of the Lenoir engine were carbon deposits, piston rod pack-



Showing the Different Types of Cylinder Heads and Illustrating How the Poppet and Slide Valve Engines Differ.

and two exhaust valves means sixteen poppet valves with a four-cylinder engine.

An accompanying illustration shows various forms of poppet valve and their location in the cylinder. Other types of valves are used with varying results. Prominent among these is the Knight sleeve valve, shown in the illustration. In this valve system there are two long sleeves or movable cylinders worked by eccentrics. The inner sleeve acts as the piston cylinder and is surrounded by an outer sleeve. Both having an up and down movement. The sleeves have slots forming intake and exhaust openings as they pass each other and the slots in the stationary cylinder. As the sleeves move in opposite directions their friction speed is doubled, but this is taken care of by oil grooves supplied by an oil pump.

The silent action and large gas ports make the Knight valve efficient in carefully built engines. Continued operation is said to benefit its efficiency, which cannot be said of the poppet valves. The water cooling of the Knight is through the stationary cylinder, the outer cylinder or sleeve, thence through the inner cylinder or sleeve and then to the piston. The cylinder head is a separate casting.

ing troubles and valve troubles. The Rochas and the Otto engines made use of the four-cycle principle and a trunk or single-acting piston.

About 15 years ago the gasoline automobile came into commercial use with one cylinder, then came the two-cylinder, horizontal opposed motor, which gave way to the present four-cylinder upright type. Four cylinders are used because of the more continuous power impulse obtained. The cylinders are numbered in rotation 1, 2, 3, 4, and the cranks of Nos. 1 and 4 are up while the cranks of Nos. 2 and 3 are down and the firing orders are 1, 3, 4, 2 and 1, 2, 4, 3.

Locating Leaks.

Locating minute leaks is a simple matter if a mixture of soap and water is employed. Soap suds will be found to be exceedingly useful for locating puzzling punctures in inner tubes, for ascertaining faulty connections in the pressure fuel system, exhaust line, etc. Apply the soap suds with a brush. Any leak will be instantly noted by the bubbles given off. This method is successful where the usual treatment fails.

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TRUCK SALES POSSIBILITIES.

Suggestions for Investigating Conditions by Dealer Contemplating Agency.

BY F. L. MEAD,
Sales Manager Dearborn Motor Truck Co.

Wonderful possibilities exist for the wide-awake dealer who has been fortunate enough to secure an agency for truck units, and better still for those who have taken exclusive territories for the sale of these units, for the day is fast approaching when every small town and hamlet will see the development of motor truck for hauling purposes. This condition is being fast brought about by the unprecedented publicity given in almost every magazine, newspaper and periodical at the present time.

These publications are pointing out the advantages, economy and efficiency of motor truck hauling over horses, urging business concerns, merchants and farmers everywhere to adopt this method of transporting their product, for their own good, as well as the general good of the public at large. It means lower food cost, less hauling expense, better service and a quicker means for marketing the product.

Possible Profits.

Dealers should be quick to take advantage of these conditions and prepare to reap the benefits bound to follow this wave of publicity. It opens up an avenue for the dealer for the disposal of used cars he is compelled to take in trade by converting these cars into one or two-ton trucks and disposing of the completed truck at a handsome profit. It affords the dealer an opportunity of suggesting to the owner of a dilapidated looking passenger car a means of converting his car into a truck and the purchase of a more up-to-date passenger car for his own use.

Dealers contemplating an agency can easily investigate conditions in their local territory, assuring themselves that such a market exists. This can be accomplished by calling upon a few business men and farmers and getting their opinions regarding the use of trucks in their own business; also interviewing owners of old cars who are endeavoring to trade them in on new ones and ascertain whether or not they would consider converting their used cars into trucks at a reasonable cost and a slight charge for attaching same.

How to Secure Sales.

The best method for determining sales possibilities is for the dealer to equip himself with a demonstrating truck, place it on display at his place of business and use the local newspaper for the announcement of the motor truck agency. This demonstrator can be used on the streets as an advertising feature and when the opportunity presents itself it is well to call on the merchant or business concern with the request that the dealer be allowed to give them a practical hauling demonstration for a comparative test over their present horse-drawn equipment.

At various periods the demonstrator can be run into the country and exhibited to the farmer, showing him the many uses to which it can be put around the farm as well as for hauling his product to market, thus relieving his horses and men for more important work. Nearly every farmer has an old passenger car which can be converted, and this would eventually lead to the sale of a new passenger car to take the place of the old one.

Making Truck Pay.

Numerous instances have occurred where the dealer has rented his demonstrator for hauling purposes which paid him a handsome profit over its cost and at the same time closed actual sales for other trucks. The business man using a motor truck once is soon convinced of the many advantages it has over horses for hauling purposes and is ready to purchase.

Manufacturers of truck units have their own methods of allotting agencies, and it would be well for the dealer to investigate and accept the one whose reputation is established and the merits of their product beyond question, also to ascertain to what extent parts are carried in stock and how promptly same can be supplied.

No dealer in motor trucks or truck units renders free service to customers beyond a short period of time after sale is made, but a nominal charge is made to cover the cost of keeping the truck in good condition, which the customer is only too glad to pay.

The manufacturers of truck units are always ready to make good any defective material or workmanship on the unit for a period of 90 days from date of delivery, and the dealer can use this feature in closing his prospect on the sale of truck units. Complete literature and advertising is generally furnished the dealer taking an agency, and a request from the dealer contemplating an agency will bring full particulars.

Trucks Beat Railroad's Time.

The economy of trucks was demonstrated recently when a machine saved three hours in time and $2.89 per man in transporting 18 soldiers and their marching equipment over a 135-mile trip, as compared with a special train. The men were transported from a fort at Atlanta, Ga., to another fort near Chattanooga, Tenn. A test made of the truck service over the same route and carrying supplies demonstrated the concrete value of the commercial vehicle in war service, as well as that of the Dixie highway, over which the machines travelled.

Goodrich Truck Book.

Announcement is made that the 1918 edition of "Motor Trucks of America," of which S. V. Norton, manager of truck tire sales of the B. F. Goodrich Rubber Co., is the author, will be ready for distribution on January first. The book, consisting of 200 pages of reading matter, illustrations and specifications, is the sixth to be issued in as many years. It is hand sewn and of heavy binding.

Complete specifications of nearly 150 of the leading gas and electric-driven motor trucks are contained in the volume. There are thirty-one specifications for each model. These details are absolutely dependable, as the approval of each truck manufacturer is obtained before specifications of his model are inserted. For the reason it offers opportunity to the buyer and manufacturer to compare models, lists all makes according to sizes and affords a perspective on changes of design by comparison with previous editions, "Motor Trucks of America" is accepted throughout the motor world as one of the authentic handbooks of the truck industry.

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Patriotism to Be the Keynote of Exhibits and Decorations at the New York Show.

Flags of the Allies, Old Glory and Liberty Shields to Greet Visitors.—Many New Devices and Inventions to Be Shown.

Plans for the national automobile shows to be held in New York and Chicago indicate that the 1918 exhibitions will surpass all previous efforts. The New York show will be held in the Grand Central



Samuel A. Miles, Manager of the Show.

Palace during the week of January 5-12, while the Chicago exhibition will be held in the Coliseum and Armory from January 26 to February 2. Both expositions will be held under the auspices of the National Automobile Chamber of Commerce and will be managed by Samuel A. Miles.

Every bit of exhibition space in the show buildings has been allotted to makers of cars, parts and accessories, and many very interesting products will be shown, some for the first time. In all there will be 86 different makes of cars and 260 accessory displays at the New York show, and a like number will exhibit at Chicago. More than 300 new, glistening models of automobiles ranging all the way from tiny runabouts selling for a few hundred dollars to the largest, roomiest limousines costing more than $5,000 will be shown. Among the exhibitors are several makes of electric cars and steam cars.

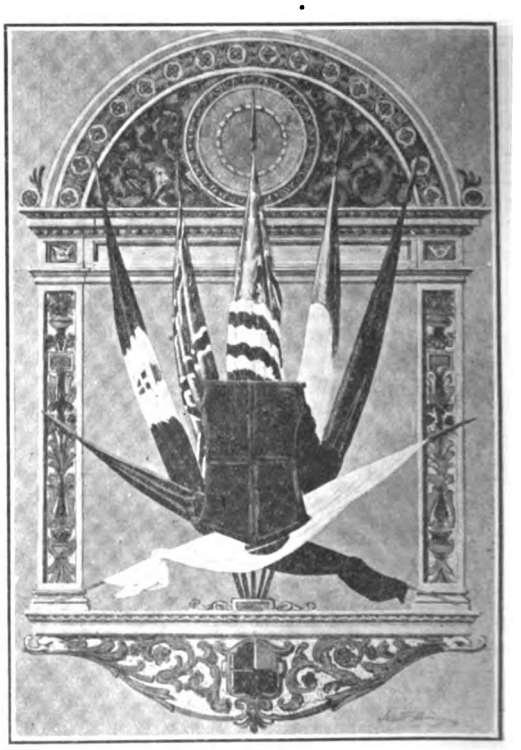
From present indications an unusually large number of out-of-town visitors will be in New York for the show. Already the hotel men are making special plans for the accommodation of visitors.

While the cars themselves will be the main attraction, there undoubtedly will be much interest displayed in the accessory and sundry line, and two of the four floors used for the show will be used for these exhibits. The bulk of this space will be occupied by members of the Motor and Accessory Manufacturers' Association. Many of the devices and inventions promised for the show are absolutely new. New starting and lighting systems, horns, wire wheels, magnetos, carburetors, transmissions, engines, castings, tachometers, wind shields, etc., nearly all of new or improved design, will be displayed.

Manager S. A. Miles has spent much time in devising a decorative scheme quite different from that of other years, as this is America's first wartime show. Realizing what an important part the automobile is playing in the war, it is but natural that a patriotic tone should be given to the exhibitions and the decorations. The flags of the Allies and Old Glory will predominate in the decorations. Shields representing "The Flame of Liberty," upholding the flags of the Allied nations will be used to decorate the gigantic pillars on the main floor of the building.

The lattice work and plaster cast of former years have been entirely discarded, and in their places will be found a higher degree of art, the work of artisans in various artistic pursuits. Mural paintings, hundreds of them, will be used throughout the entire four floors of the building to resemble tapestry hangings. On the main floor the windows will be decorated by specially made curtain effects having the appearance of tapestry. These will be painted on transparent material affording plenty of opportunity for the light to come in, and will be hand painted in the designs of the standards of the various Allied nations. At the base of the windows will be boxed plants and flowers.

There will be special features during the New York show. Thursday, January 10, has been set aside as S. A. E. day. During the day the society



Shields Representing "The Flame of Liberty" Will Be Used on Pillars.

will hold a big session and in the evening the members will hold their annual banquet at the Biltmore. The Motor and Accessory Manufacturers' Associa-

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tion will hold several meetings during show week and, like the National Automobile Chamber of Commerce, the association will hold its annual banquet at the Waldorf during the week.

TENDENCY IN DESIGN.

What the Visitor at the Show May Expect in the Way of Improvements and Innovations.

BY CHARLES E. DURYEA.

Those who have followed the development of the motor vehicle look forward to the annual exhibition at New York with interest. Radical departure from conventional engineering practice is not to be anticipated for the designer cannot very well offer other than refinements in design and slight improvements in certain components of the chassis.

Economy the Keynote.

The splendid work being done by the power vehicles in many—one may almost say all—lines undoubtedly will be shown and much information not well known to the public will be brought out. Conservation will attract more attention than ever before, as for example heaters for the carburetor or the supply pipe or the air inlet do much to make the fuel vaporize more readily and completely thereby insuring proper burning and maximum development of the engine's power. These devices vary from an electric coil in the carburetor bowl or manifold to a complicated stove heated by the exhaust from the engine. Never before has there been such a variety of this type of improvement. And it is most timely for while we still have ample fuel to take care of our needs even in war times we are at the point where wastefulness is culpable.

Regulating Engine Temperature.

It is also being recognized that there is no advantage from saving fuel if the heat produced is wasted instead of being used. So we find an ever-increasing number of devices for preventing overcooling of the engine. Thermostats in the water pipes to slow down the circulation as the water gets cooler; shutters in front of the radiator to shut off the air draft when not wanted; fan regulators to speed up the fan when needed; water pumps that only pump when hot, and similar devices are now being used to keep the cylinders working hot and yet prevent them from becoming too hot. With modern fuels the cool walls of the cylinders condense the heavy fuel parts and send them down to the crank case where they are wasted so far as being burned is concerned, but where they also become a danger because they affect the lubricating oil.

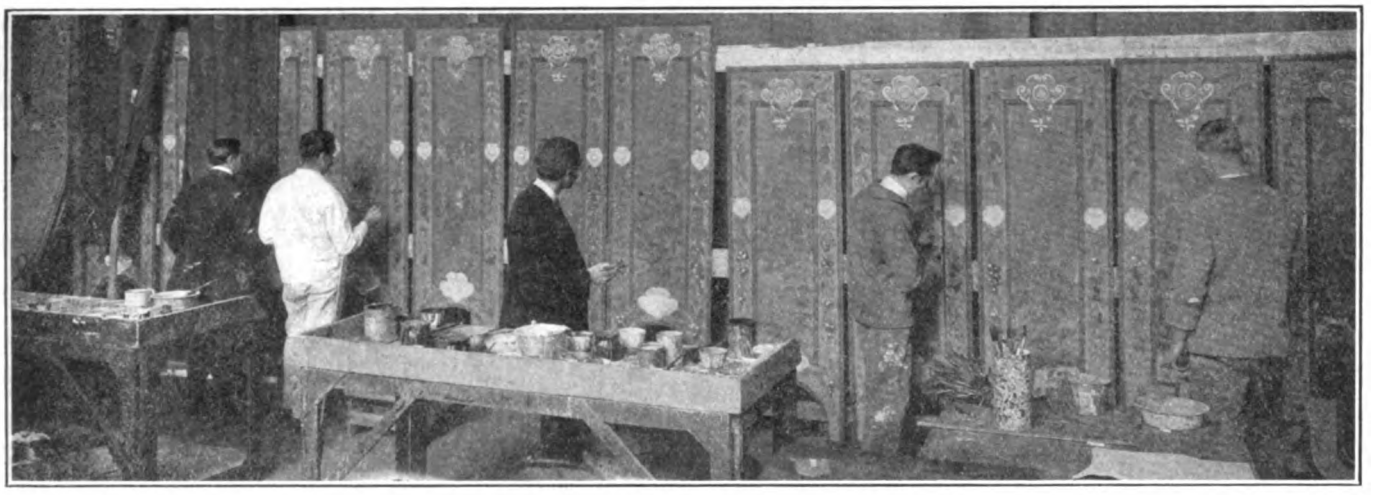
Annual Motor Boat Show.

Automobilists and the trade interested in the motor boat industry will have opportunity to note the progress made in marine engines, etc., at the fourteenth annual motor boat show, which is scheduled to take place at the Grand Central Palace, New York City, January 19-26. It is predicted that the show will surpass all previous exhibits and that more high-powered engines will be exhibited than heretofore.

War Tax to Hit New York Show.

The war tax will apply to tickets at the New York show. The general admission will be 50 cents plus the 5 cents tax, and the only persons who will be admitted free will be those actually employed by exhibitors and working in the show.

A plan has been worked out by the National Automobile Chamber of Commerce whereby manufacturers may themselves assume the tax on tickets that they distribute, thereby still making it possible for them to distribute tickets that will cost the recipient nothing to use. Season tickets given the members of the N. A. C. C. and M. A. M. A., will cost the users 5 cents each day of use. Single admission passes, on which no tax has been paid, will cost the user 5 cents each.



Artists Constructing and Painting Decorative Panels and Mural Paintings to Be Used in Grand Central Palace.

Will Exhibit Body Designs.

The annual Automobile Salon will be held January 2 to 9, inclusive, in the ballroom of the Hotel Astor, New York City, and in the Elizabethan room of the Congress Hotel, Chicago, January 26 to February 2, inclusive. Space has been taken for exhibits of imported and high-grade American cars, and the exhibits will be noticeable for special body designs. These shows always attract a large attendance, affording as they do an opportunity for the body designer and dealer to note the progress made in custom made bodies, upholstery, equipment, etc. A limited number of accessories will be displayed.

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Motor Vehicle Makers and Allied Industries Vote to Support Government.

Factory Organization to Be Kept Intact and Take on War Work. —Some Decrease in Passenger Car Production Is Expected.

At a meeting in Detroit last week more than 150 automobile manufacturers voted unanimously to support the work of the Automobile Industries Committee at Washington, pledged to the War Industries Board and the War and Naval Departments their heartiest support and to a man expressed their readiness to turn over the vast productive facilities of the industry to the government as fast as the government can make use of them. In the meantime, automobile makers will keep their organizations intact so as to conserve the greatest possible potential strength for the present and future war programs of the government. President Charles Clifton, of the National Automobile Chamber of Commerce, presided, with every prominent company in the industry represented and also representatives of the Motor & Accessories Manufacturers' Association.

THE INFLUENCE OF THE AUTOMOBILE INDUSTRY.

Capital Invested.	
Makers of Passenger Cars and Trucks	$736,000,000
Bodies, Parts, Accessories	336,000,000
Distributors	41,000,000
Dealers, Repairmen and Garages	184,000,000
Total	$1,297,000,000
Annual Production to June 1.	
1,806,194 Passenger Cars	
112,200 Commercial Cars	$917,000,000
Wages Paid Employees.	
Passenger Cars and Trucks	$275,000,000
Bodies, Parts, Accessories	288,000,000
Distributors	25,200,000
Total	$588,200,000
Number Employed.	
Passenger Cars and Trucks	280,000
Bodies, Parts, Accessories	320,000
Dealers, Repairmen, Garages	230,000
Distributors	2,800
Total	832,800

No Cause for Alarm.

It was very clearly shown that the Washington authorities had no intention of arbitrarily cutting off the automobile business and that automobile men themselves have offered to reduce passenger car production according to the government needs for war materials or as the government may require the facilities of the automobile and accessory manufacturing companies. The heartiest response to the committee's efforts has been received from the War Industries Board and from the Army and Navy Departments.

Increase Not Expected.

Manufacturers appreciate that business cannot be entirely as usual during the war, as the principal business now is making war and not making automobiles, so that the industry cannot expect to increase production as in the past. The manufacturers attending the meeting were surprised at the great number of automobile men in the service and the spirit of co-operation which has been shown by the makers giving their best men to the government at great sacrifice to themselves and their plants.

It is realized that rather than give munition orders to companies which have to buy new machinery and build new plants, advantage should be taken of the productive capacity of the automobile and parts plants. An immense amount of war work is being done and preparations are being made to take over more work for the government.

A. W. Copland and Hugh Chalmers, of the Automobile Industries Board, who, with John R. Lee, were appointed to co-ordinate the government war requirements with the facilities of the automobile industry, explained the work going on at Washington. Their need for additional engineers was promptly answered by nine manufacturers volunteering the services of nine of their engineers to work with the committee at Washington for the period of the war.

Why Production Is Essential.

It was felt that selling transportation for millions of people and thousands of tons of freight as supplied by the modern motor car and truck, coupled with the War Railroad Board's request for greater motor transportation to relieve the railroads of short haul traffic, demands continued productive facilities in the industry, now rated as third among those of the United States.

By unanimous vote of the meeting the following telegram was sent to Daniel Willard, Chairman of the War Industries Board, at Washington:

"The automobile industry as represented by more than 150 manufacturers in session here to-day volunteers its hearty support to our Automobile Industries Committee in Washington and pledges to the War Industries Board and the War and Naval Departments their heartiest support and to a man expressed their willingness to turn their facilities over to the government as fast as the government can make use of them. In the meantime we hope to keep our organizations intact so as to conserve the greatest possible potential strength to the present and future war plans of the government."

Dealers Pledge Support.

Loyal support by 27,500 dealers was indicated by reports from different sections of the country expressing their willingness to help win the war by rearranging their organizations for the new situations created. The automobile men expect to make cars to as near a normal number as the materials and coal situation will permit, but it may be expected that there will be some decrease in the number of passenger cars produced, making them harder to get and higher in price.

Statistics of Industry.

The meeting was supplied with some interesting figures which proved the far-reaching influence of the automobile industry. They showed 230 makers of passenger automobiles and 372 makers of motor trucks in 32 states, with a capital investment of $736,000,000 and with 280,000 workers, to whom $275,000,000 in wages and salaries is paid annually. The production for the year ending June 30 was 1,806,194 motor vehicles, of which 112,200 were trucks, the total value of both being $917,470,938.

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Depend on Production.

It was shown that 1,080 manufacturers of bodies, parts and accessories have a capital of $336,000,000, employ 320,000 workers and pay $288,000,000 annually in wages. Last year 18,000,000 tires were made, valued at $450,000,000. There are 27,800 automobile dealers and 25,500 garages, located in almost every town and village in the United States, all dependent on the production of motor cars. They have a capital investment of $184,000,000 and employ 230,000 people.

The Export Situation.

Exports for the year ended June 30 were 64,834 passenger cars and 15,977 trucks, the latter mostly for our allies in Europe. The value of these exports, including tires and parts, was $133,411,000. There are now 4,500,000 automobiles registered in the United States, of which 400,000 are trucks which

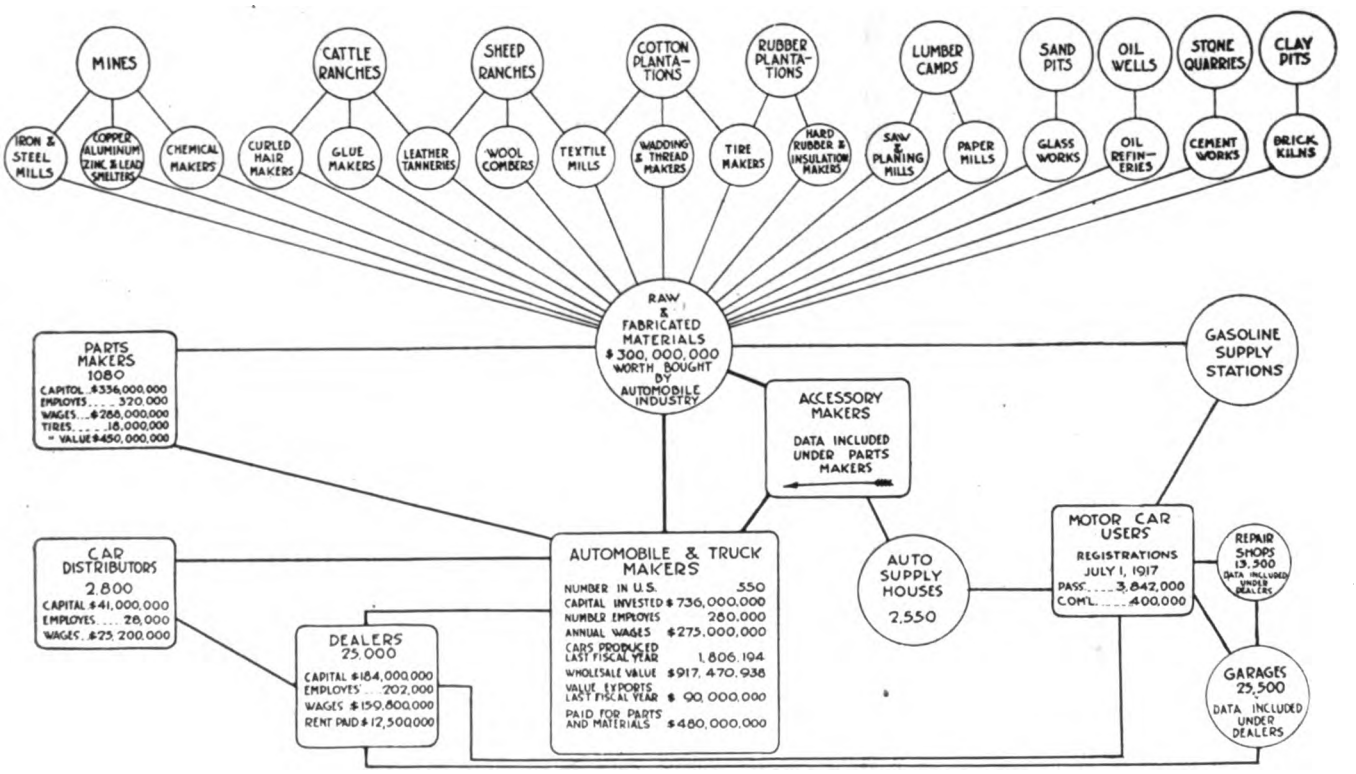


Chart Showing Sources of Supply and System of Distribution in Motor Car Industry, Capital Invested, Labor Employed, Wages Paid, Etc.

are annually transporting goods to a total of six billion ton-miles and relieving the railroads of short-haul traffic.

To Discuss Liberty Engine.

"The Reasons Behind the Liberty Engine" has been scheduled as one of the leading engineering subjects to be considered by the Society of Automotive Engineers at its winter meeting in New York Thursday, January 10. Major Jesse G. Vincent, who was largely responsible for the design of the engine, and who is now in charge of its development at the aviation headquarters in Dayton, O., will present a special address, going into the engineering reasons of the present Liberty engine. Instead of presenting a prepared address, which would have to be completed several weeks in advance, Major Vincent is going to deliver a comprehensive talk which will bring the question of aviation engineering up to the last minute. A special discussion will follow which will be opened by Colonel Clark, who is chief in charge of aviation engineering in the Signal Corps. His phase of the discussion will have to do with military requirements of aviation engines.

Form Commercial Body Corp.

For the purpose of centralizing under one head the distribution of commercial vehicle bodies for motor vehicles to chassis builders, through warehouses located in New York, Chicago and Detroit, the Commercial Motorbody Corp., with offices at New York, has been formed. Sales agents are to be established throughout the country.

At the warehouses bodies will be mounted, painted and lettered on the chasses. A most complete line of bodies will be carried in stock, ranging from the lightest to the heaviest types. This will, the company claims, eliminate the delay now experienced in securing a suitable body for a commercial chassis.

The directors of this corporation are: P. H. Patriarche, president; Charles M. Eaton, vice-president; Paul D. Langdon, F. Gates Porter, A. Harriman, T. W. Cole, J. K. Robinson, Jr., and Frederick A. Wagner.

Cause of Lost Compression.

A cause of lost compression and one generally overlooked is the registering of the slots of the piston rings on the piston. This trouble is not uncommon with some type of floating piston rings; that is, the rings are not anchored at one end in the groove of the piston. In replacing rings the slots should be equidistant.

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Read What Car Owners Say:

Rev. H. Voisin, Red Deer, Albta, Canada.
So far your carburetor has given me good satisfaction; several times I have averaged 30 miles to the gallon. Sept. 17, 1917.

Methodist Episcopal Church, Gustave A. Frodie, Pastor, Blunt, South Dakota.
Some time ago I ordered a Ford size carburetor from you. After a good test I find it to be THE Carburetor. Sept. 8, 1917.

W. T. Thompson, Maricopa, Cal.
I have purchased one of your carburetors and I like it fine and would like to take the agency for them for the State of California or if not for the whole state would like for Kern County. Please send me your lowest price and all your particulars as soon as possible as I have three sales in view. August 30, 1917.

P. H. Grace, Los Angeles, Cal.
The carburetor received and I make 35 miles to the gallon of distillate. Sept. 12, 1917.

Chas. H. Wishmeier, Indianapolis, Ind.
Carburetor received and after attaching on Saturday last I drove the car 128½ miles, part of this trip through Brown County, the hilliest part of Indiana. Almost all the hills were very rough, making it impossible to attempt them on high, one especially being three miles over, took us a half hour to cross, all of which was run on low. I was following a friend of mine who also had a Ford standard carburetor and found that when we came to a hill where the roads were good I would have to lie back about a quarter of a mile behind him, as even with this distance between us I would almost always catch him before he got to the top, then have to follow him up the rest of the way on low. My wife used to be afraid of every little hill but after putting on the SUNDERMAN she said she is willing to go any place now. When we got home after this 128½ mile run I found that I had used just 5 gallons of gas, almost 26 miles per gallon. I certainly was well pleased as I made no effort to run the car to save gas. The best I have ever done before was 22 miles per gallon all on a level road. August 6, 1917.

Edw. G. McCarthey, Denver, Colo.
I received and installed your carburetor yesterday; after two hours test I found it to be just as you claimed. I would like your agency proposition as I have a large order for you.
Sept. 18, 1917.

John L. Bradley, 243 W. 50th St., N. Y. City.
Since having your carburetor attached to my car I have increased mileage very near double, that is from about 14 I was getting to close to 28 miles with it on. I have out of necessity had to put this car through the severest tests domonstrating our shock absorbers, and you can see from this that the saving in gasoline alone is really remarkable, and with this the increased power I have received makes it an *ideal* carburetor. Sept. 28, 1917.

Standard Poster Advertising Co., E. T. Broderick, Gen. Mgr., New Rochelle, N. Y.
I want to say right here if it wasn't the best I could find, price and all considered, that I would not have anything to do with it, and here in New Rochelle I have an Oakland 40 and three Fords using the carburetor and in Peekskill two Fords, and am anxious to get it on the Cadillac Oct. 10, 1917.

W. H. Fisher, Grand Rapids, Mich.
The writer has now used one of your carburetors a little over one year and am more than pleased with the results as I am getting very good mileage, and it gives me more power and speed. Made a trip down in Ohio a couple of weeks ago and averaged a little better than 27 miles to the gallon. Oct. 17, 1917.

R. F. Sturgeon, Empress, Alberta, Canada.
The carburetor you sent me is doing great work. Have got as high as 30 miles on a gallon with my 1913 Buick. I used to think I was doing fine if I got 15 miles out of the old one. I just put in new cylinders in the car as the old ones were scored, so there is no telling what I will get now, as I made the 30 with the scored cylinders. I made one trip 155 miles actual mileage (not speedometer) on 5 gallons (Imperial) of gasoline with three badly scored cylinders and a lot of oil working through above the pistons. Am perfectly satisfied with the carburetor. Sept. 20, 1917.

Elmer McKee, Richmond, Indiana.
I am using one of your carburetors with very good satisfaction on a Lexington car.
Oct. 25, 1917.

D. O. Johnson, Santa Rosa, Cal.
I received the carburetor and it works at all times to perfection, making the old Buick "40" run like a modern car. Oct. 7, 1917.

Our Satisfied, Enthusiastic Money-Making Dealers

Our advertising is an easy job. In every mail, every day, surprised and satisfied users, contented dealers who are making profits on Sunderman Carburetors, write us enthusiastic letters of endorsement. Printed just as they come to us, they make excellent advertising copy.

They Prove the Value of the Sunderman They Prove the Market and the Profits

The Sunderman Carburetor is without a peer in the the field of automobile accessories and parts—it is the only instrument that will make substantial profits for dealers, and at the same time make more money for the car owner who buys it.

The Saving in Gasoline Pays the Owner a Perpetual Profit

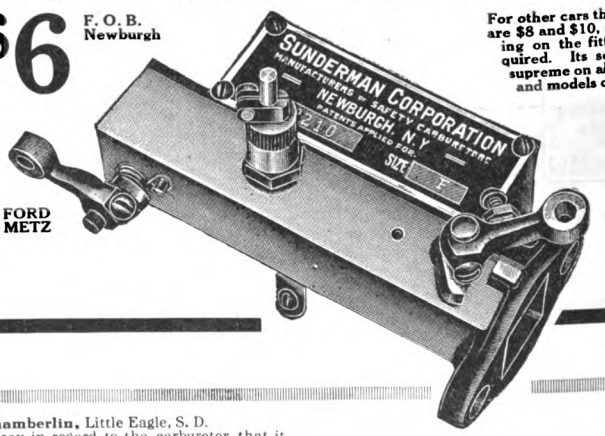
The Sunderman Carburetor is uniformly saving from 30 to 50% in gasoline on every car. Look at the letters on the left of this page, and let the owners prove this statement.

This saving alone sells the carburetor—the extra power, flexibility, pick-up and hill climbing ability come as good measure—an unexpected dividend on the investment.

SUNDERMAN

Vacuum Carburetor

$6 F. O. B. Newburgh



For other cars the prices are $8 and $10, depending on the fittings required. Its service is supreme on all makes and models of cars.

For FORD and METZ

O. W. Chamberlin, Little Eagle, S. D.
I will say in regard to the carburetor that it gives good satisfaction. 27 miles to the gallon is about the best we have done, but the roads are very bad and twenty miles is very good, in fact about 15 is the average for a Ford. My Ford is mechanically in bad shape, which I expect to remedy and then will give these people something to think about.
Oct. 7, 1917.

Chas. C. Kneeland, Groveland, Mass.
In regard to the carburetor I received from you a short time ago will say that I installed same on my Maxwell Roadster and fiud it is the best thing in the line of a carburetor that I have ever seen, in fact I am doing stunts with my car that seem impossible to the average car owner. I gave a demonstration to a friend of mine and on the strength of it I am ordering one for him. May 20, 1917.

F. H. Pierson, Poughkeepsie, N. Y.
I am sending you carburetor which I used on my Maxwell car with such good results that when I disposed of it I removed the carburetor, which I wish you would change and adjust so I could use it on my Ford. May 17, 1917.

H. W. Stebbins, Watertown, N. Y.
I am using one of your carburetors on a 22 H.P. Motor with so much satisfaction that I beg to inquire if you recommend that the same will work equally as well on a 8-10 H.P. 4 cyl. 2 cycle Motor.
June 15, 1917.

Bourne Brothers, House Painters and Interior Decorators, Milton, Mass.
I have had one of your carburetors put on my Ford truck and am much pleased with it.
July 16, 1917.

D. G. Douglass, Washington Mills, N. Y.
I bought a carburetor from you last year and it certainly did fine work. My Overland never ran better since I had it than since I have installed this carburetor. July 2, 1917.

F. E. Howard, Faribault, Minnesota.
Have a Sunderman Carburetor on a Reo car and it works O. K. Will run on kerosene when the motor is hot. July 12, 1917.

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Users, and Our Hustling Have Written This Ad.

The Sunderman Principle Is Right— It Is Sure, It Has Been Proved

Designed on the only fundamentally correct plan, which produces finer vaporization, therefore quicker, more complete combustion and consequent greater power, the Sunderman Carburetor is the marvel of present-day carburetion.

CAR OWNERS—Don't Delay—Save Gasoline and Money all Winter—Buy a Sunderman Today.

DEALERS—Look to the right, and read what your fellow tradesmen say. Profit speaks in every line, satisfaction and service in every letter. Get hold of our proposition to-day—and then talk to us at the Shows.

Exhibiting { New York Show, Grand Central Palace, Space D-8
Chicago Show, Armory Balcony, Booth 5

SUNDERMAN CORPORATION

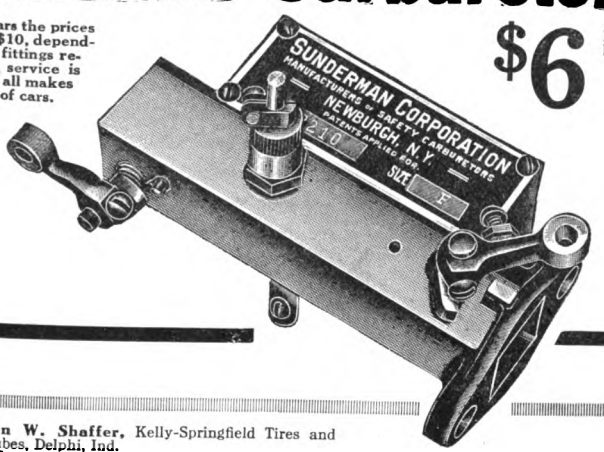
13 CHAMBERS STREET NEWBURGH, N. Y.

WESTERN BRANCH: 403 Kresge Bldg., Detroit

SUNDERMAN

Vacuum Carburetor

For other cars the prices are $8 and $10, depending on the fittings required. Its service is supreme on all makes and models of cars.



$6 F. O. B. Newburgh

For FORD and METZ

John W. Shaffer, Kelly-Springfield Tires and Tubes, Delphi, Ind.

I recently purchased through the Universal Accessories Co. a Sunderman Carburetor and installed it in a 1913 Ford car. The results so far have been so surprising that I am writing in regard to territory. June 20, 1917.

A. M. Lockett & Co., New Orleans, La.

So far as economy is concerned, we do not think that your carburetor can be excelled, as the mileage obtained with the old carburetor was from ten to eleven miles per gallon of gasoline, whereas we are now getting from eighteen to nineteen miles per gallon. May 25, 1917.

G. D. Gates, Albion, R. D. No. 4, Pa.

Received the carburetor and the Sunderman is the best I have ever used. I have sold a number of your carburetors and they all give good satisfaction. June 9, 1917.

The New Adirondack Garage, T. J. Lynch, Prop.

Kindly ship me two more carburetors for small Saxon four-cylinder runabout cars. I have used four or five of them and can place at least 100 more. They are giving entire satisfaction and great mileage. May 24, 1917.

J. Berdquist, Fitchburg, Mass.

Have received and tested out Ford Carburetor you sent me recently. Find that it is working very good and I could without doubt sell a large quantity of them in this district. June 4, 1917.

Simmons Hardware Co., St. Louis, Mo.

Recently we wired you an order for a SUNDERMAN CARBURETOR to be used on a Ford car. This carburetor was for one of the employes of this firm and he states that it is giving excellent service. June, 12, 1917.

H. H. Palmer Garage, Bishop Hill, Ill.

I sent to Chicago and got two of your carburetors and put them on Ford cars and they worked fine. June 22, 1917.

P. H. Brown, Auto Repairing, Chepachet, N. Y.

I installed one of your carburetors on a Ford car and it worked so fine would like to sell them. July 27, 1917.

Dealers Who Handle Sunderman Carburetors Write as Follows:

Redden Motor Truck Co., Inc., 235 West 58th Street, New York.

Recently it was brought to my attention that the Sunderman Carburetor was a decided gasoline saver on the Ford car, and as my firm are always on the lookout for anything that will reduce the operating expense of a Ford car, I took it as a personal matter to try out one of your carburetors. The performance of the carburetor is certainly satisfactory in every respect. I notice that it is hardly ever necessary to use a throttle when on country trips, as the carburetor seems to be in itself an automatic throttle when coming on to grades or when pulling is hard in heavy going. As for gasoline economy, on my last trip I used a trifle over 6¼ gallons of gasoline on the run from Albany to New York. I certainly appreciate your arranging to have a service man at your factory on a holiday to attach a carburetor to my car.

Yours very truly,
L. S. HIGHAM, Sales Manager.
November 23, 1917.

Motor Car Equipment Co., Indianapolis, Indiana.

Received the carburetor and after installing it and getting the proper adjustment it certainly does work fine. Would like to try out one or two more before ordering in quantities. July 2, 1917.

The City Garage, Terlton, Okla.

Your carburetor arrived and we placed it on the Ford car and every one that has tried it thinks it works fine. July 11, 1917.

Russell & Wineland Auto Repair Co., Berwyn, Neb.

We received the SUNDERMAN VACUUM CARBURETOR a few days ago and have tried it out on my Maxwell and find it very satisfactory. We want to handle them here. May 14, 1917.

Thomas McClusky, Los Angeles, Cal.

I will write you again in regard to the SUNDERMAN CARBURETOR, as I have so many calls for them and I could install lots of them, as every one that rides with me in my car wants me to get them one and I tell them I will have some of them on hand shortly. If you can't do any better, send me literature and the prices so that I can satisfy those that I have promised. If you want me to have the agency, let me know and if so send me a half dozen at once, and by that time I can have you to send me fifty or more. And let me know the best price on them by large amounts. It would be impossible for you to get this little carburetor away from me if I could not get another one. Oct. 6, 1917.

Crown City Sheet Metal Works, Pasadena, Cal.

I am using one of your carburetors on a Ford machine which is giving almost double the mileage the one I took off did. I have never seen any carburetor to equal it. The machine runs smoother, with more power, and starts almost always on the first turn. Oct. 12, 1917.

Neikirk & Miller, Hardware Specials—Buggies, Implements and Autos, Greenspring, O.

We received carburetor for Ford car and have been using it since and have found it to be very satisfactory. June 14, 1917.

United States Automobile Supply Co., Omaha, Neb.

We have had very satisfactory results with the SUNDERMAN CARBURETOR and hope to greatly increase our sales in the near future. Oct. 24, 1917.

T. J. E. Pinson, Platte Center, Neb.

Once more I am impelled to write you about your carburetors. I now have 43 here working in good shape, they fire the engine all right, pull all right and have plenty of power. July 29, 1917.

Groveland Street Garage, Haverhill, Mass.

I ordered 6 carburetors yesterday, the 30th, and I wish to change that order and make it 12 in all, 10 Fords and 2 Maxwells. I wish to say that the carburetors are performing some wonderful stunts on the cars I have put them on. July 31, 1917.

N. J. Floan, Hibbing, Minn.

Received your carburetor last week, had it installed and it works fine. I can sell quite a few here and would like to get agency for same. May 23, 1917.

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HOW TO FIGHT FIRES.

What to Do When Your Machine Catches Fire and How to Prevent Fires.

An authority on motor vehicle insurance states that the average automobilist rarely gives a thought to the ways and means of extinguishing a fire on his car should one occur. As fires are occurring with frequency the following suggestions are made and will prove of value in an emergency:

1. The most important thing to remember in case of a fire of this kind is to keep cool. A few seconds lost in panic at the start may result disastrously.
2. At least one small fire extinguisher should be on every car. It should be placed where it may be readily accessible in an emergency. The small extinguisher is indispensable in handling a gasoline fire, and is also useful in fighting any other kind of blaze about the car.
3. In the absence of an extinguisher sand or dirt can be used, but it should be remembered that if sand is thrown into the carburetor trouble is likely to result.
4. Do not use water in attempting to extinguish a carburetor fire or other gasoline fire. This merely tends to spread the fire.
5. If the engine backfires use the starter to turn the engine. If this does not draw the flames into the manifold use the extinguisher. This should put out the fire with little difficulty.
6. If the fire has reached the drip pan extinguish that first, and then work up to the carburetor.
7. If the fire is caused by ignition of gasoline from hot exhaust, short circuit or other condition about the car, the extinguisher should also be used with equally good effect.
8. Do not invite destruction of your car, and probable injury to yourself, by lighting a match to see how much gas there is in the tank.

Value of Corporation Schools.

To afford opportunity to those who wish to perfect themselves in retail and general selling in the trades, office work, etc., a number of leading industries of the country have formed the National Association of Corporation Schools, located at Irving Place at Fifteenth street, New York City. The object of the association, which includes a number of automobile manufacturers, is to bring into cohesive organization all of the large business institutions in order that, by analysis and comparison of methods adopted by the various members, the most effective plans may be devised for educating and training employees for their work. Practically every industry is represented.

Denver Dealers Prosperous.

The Denver dealers are enjoying a season of prosperity, having sold thus far 30,650 cars in Colorado, New Mexico and Wyoming, territory covered by Denver distributors. This is a gain of 50 per cent over last year. Industrial conditions are responsible for the big increase.

Battery Hints.

Keep the storage battery properly charged during cold weather. The chemical battery is affected by the cold and its output is not as great in winter as in warm weather. The points at which the electrolyte will freeze are as follows: Specific gravity 1.150, 13 degrees above zero; specific gravity 1.160, zero; specific gravity 1.225, 38 degrees below zero. If the battery becomes frozen, place it in a warm place until it thaws out. Have the cells recharged and replace the old electrolyte with new of 1.300 specific gravity. Batteries to be stored for the winter should be fully charged.

Ford Is Making Cars.

The report that the Ford plant has been entirely given over to the manufacture of munitions, etc., appears to be unfounded, judging from the number of cars stated to have been produced during the month of October. The total manufactured was 79,575 machines, bringing the total for the past six months up to 469,135 cars.

COMING EVENTS.

New York, N. Y., January 2-9.—Salon, Hotel Astor Ballroom, Automobile Salon, Inc.

New York, N. Y., January 3-4, 1918.—Quarterly Meeting, Automobile Electrical Association.

New York, N. Y., January 5-12.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.

New York, N. Y., January 9-11.—Annual Meetings and Banquet of Motor and Accessory Manufacturers.

New York, N. Y., January 11-16.—Meeting of National Association of Automobile Accessory Jobbers.

Washington, D. C., January 11-18.—Carnival and Open House Week, Automobile Trade Association of Washington.

Philadelphia, Pa., January 11-19.—Show, Philadelphia Automobile Trade Association.

Providence, R. I., January 11-19.—Show, R. I. Licensed Automobile Dealers' Association.

Rochester, N. Y., January 14-19.—Show, Rochester Auto Trades Association.

Milwaukee, Wis., January 18-24.—Show, Milwaukee Auto Trades, Inc.

Detroit, Mich., January 19-26.—Show, Detroit Automobile Dealers' Association.

Montreal, Can., January 19-26.—National Motor Show of Eastern Canada, Montreal Automobile Trade Association.

Cleveland, O., January 19-27.—Show, Automobile Show Co.

York, Pa., January 21-26.—Automobile Show, the York Auto Dealers' Association.

Scranton, Pa., January 21-26.—Show, Scranton Motor Trades Association.

Portland, Ore., January 21-26.—Show, Motor Car Dealers' Association.

Mifflintown, Pa., January 22-26.—Show, Automobile Trades Association.

Allentown, Pa., January 23-28.—Show, Lehigh Auto Trades Association.

Harrisburg, Pa., January 26-February 2.—Show, Capital City Motor Dealers' Association.

Chicago, Ill., January 26-February 2.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.

Minneapolis, Minn., February 2-9.—Show, Minneapolis Auto Trades Association.

Kansas City, Mo., February 9-16.—Show, Kansas City Motor Car Dealers' Association.

Bronx, New York, City, February 9-16.—Show, Bronx Automobile Dealers' Association.

St. Louis, Mo., February 11-16.—Show, St. Louis Automobile Manufacturers' & Dealers' Association.

Kansas City, Mo., February 11-16.—Third Annual Tractor Show, Kansas City Tractor Club.

Newark, N. J., February 16-23.—Show, N. J. Auto Exhibition Co.

San Francisco, Cal., February 16-26.—Second Annual Automobile Show, San Francisco Automobile Dealers' Association.

Waterbury, Conn., February 18-23.—Show, United Shows Co.

Springfield, Ohio, February 18-23.—Show, Springfield Auto Trade Association.

Syracuse, N. Y., February 18-23.—Show, Syracuse Automobile Dealers' Association.

Pittsfield, Mass., February 18-23.—Show, State Guard.

Grand Rapids, Mich., February 18-23.—Show, Automobile Business Association.

Des Moines, Iowa, February 18-23.—Show, Des Moines Automobile Dealers' Association.

Brooklyn, N. Y., February 22-March 9.—Show, Brooklyn Motor Vehicle Dealers' Association.

Omaha, Neb., February 23-March 2.—Show, Omaha Auto Trades Association.

Boston, Mass., March 2-9.—Automobile Show, Boston Automobile Dealers' Association.

San Francisco, Cal., March 19-24.—Show, Motor Truck Dealers of San Francisco.

Trenton, N. J., March 20-23.—Show, Trenton Auto Trade Association.

Stockton, Cal., April 9-13.—Show, San Joaquin Auto Trades Association.

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Same Smoothness after 12 months' service on Ford

Almost doubled hauling capacity of Ford and trailer



←Note thickness—showing little evidence of wearing down in 12 mo. service

This Cork Insert equipped band was photographed after 12 months of the most severe service equal to 3 years wear on the average Ford car—read the letter of the Warner Mfg. Co.

WARNER MFG. COMPANY, Beloit, Wis.

Dear Sirs:

We have been operating our shop Ford equipped with your Cork Insert Transmission Linings for the past year. We have been using this Ford attached to one of our 2500-pound two-wheel trailers of which I am herewith enclosing a photograph.

Before equipping the Ford with your Cork Insert Transmission Linings we were using the usual linings that are furnished with the car and we were unable to haul more than 1500-pound loads successfully with the old style linings as we would frequently kill the engine in attempting to start the load in low gear. Also there was a decided chatter and racking noise in working the foot brake which led us to use Cork Insert Transmission Linings.

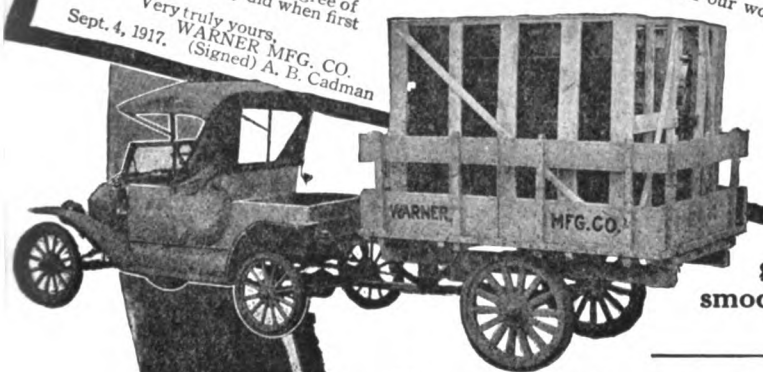
We have been operating this outfit very successfully hauling loads as high as 2500 lbs. and have experienced no difficulty in starting or stopping as they produce a smooth friction action without jar or chatter.

In other words, the use of Cork Inserts has enabled us to do all of our work with this Ford car and trailer which has practically eliminated the use of the one ton truck as it is doing all the work that we were previously doing with this one ton truck.

These linings are apparently working with the same degree of smoothness as they did when first installed.

Very truly yours,
WARNER MFG. CO.
Sept. 4, 1917. (Signed) A. B. Cadman

ADVANCE
CORK INSERT
TRANSMISSION LININGS FOR FORDS



Note good condition of corks. They are soft and as full of grip as ever after 12 months service and, as letter says, give same degree of smoothness as when first installed

$3 for set of three

Keeps the fan fanning—
Keeps the motor cool

ADVANCE
CORK INSERT
FAN BELT FOR FORDS

$1 for 1917 Ford
—85c for Earlier Models

ADVANCE AUTOMOBILE ACCESSORIES CORP.
Dept. L5-1
56 E. Randolph St.
Chicago

EALER
OUPON
dvance Auto-
obile Accessories
orp. Dept. L5-1
5 East Randolph Street,
hicago
end by express, subject
regular dealer discounts,
e following:
☐ 1 dozen sets Cork Insert Transmission Linings.
☐ 1 dozen Cork Insert Fan Belts, 1917 size.
☐ 1 dozen Cork Insert Fan Belts, 1916 size.
ame.....
ty.....State.....
bber's Name.....

FORD OWNER COUPON
Advance Automobile Accessories Corp. Dept. L5-1
56 East Randolph St., Chicago
Enclosed find $.....
Send me:
☐ 1 set Cork Insert Transmission Linings.....$3.00
☐ 1 Ford Fan Belt for 1917 Ford $1.00
☐ 1 Ford Fan Belt for 1916 or earlier Ford models 85c
Name.....
City.....State.....
Dealer's Name.....

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AMONG MISSOURI GARAGES.

Complaints of the Mechanic and Dealing With Nuts Hard to Reach With Ordinary Wrenches.

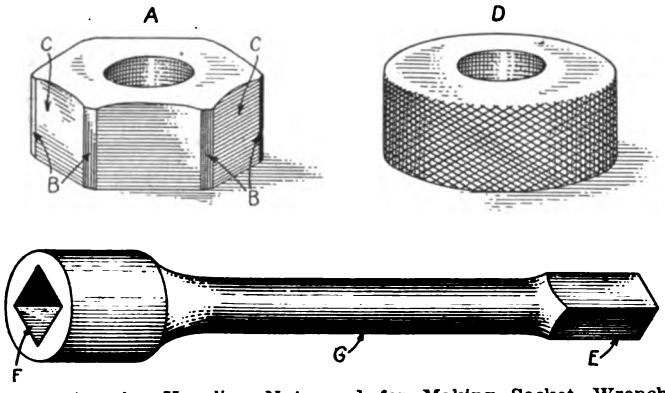
BY JAMES F. HOBART, M. E.

The mechanic was working hard to remove the nuts retaining the radiator bolts in place. He did not have a wrench which would reach the bolts in question and the work required a socket wrench having a shank at least 14 inches long.

"Not much room for a wrench there," remarked the writer to the mechanic. "No, there isn't," he replied, "and they are not improving engines either. Pretty soon you won't be able to find a cubic inch of space around an engine but what has something stuck into it. I tell you, Boss, it is a fright how they do crowd things up nowadays. Just look at these nuts, will you?"

The nuts certainly were in bad shape, so much so that the writer made a sketch, which is reproduced herewith. That shown at A had the corners B all worn off by constant use of wrenches which did not fit. The sides C were merely flat spots on the face of a collar, and the nut might as well be entirely round as flattened occasionally as shown.

As a suggestion, why not make such nuts entirely round as shown at D, so that almost any kind of a



Suggestion for Knurling Nuts and for Making Socket Wrench Extension.

pipe or alligator wrench would bite and enable one to tighten or remove the nut easily? I believe there are many nuts around an automobile which should always be made round and knurled, and we would know exactly what kind of a wrench was needed to handle these nuts.

The solid end ratchet wrench so much used by mechanics, carries a lot of very short socket wrenches. Added to these, there should be several socket shanks of varying lengths. The shank E of all these "extensions" should be the same size as the square hole in the socket ratchet wrench head or handle. The square hole F should be the same size as shank E, and two or more of these extensions may be joined together to form a rod of the required length, after which the proper wrench socket may be inserted at F, the wrench head applied and nuts in places difficult of access reached.

Then there is another use for such wrenches, that of putting on nuts on parts which are difficult to get at. Who has not, at one time or another, been put to a deal of trouble when trying to start nuts or bolts at the bottom of a deep or narrow space? When radiator bolts are to be replaced, that trouble will be met up with, and the extension socket wrench would permit of such nuts being started easily. It would only be necessary to daub the nut with thick grease. The nut would then stay in the socket wrench and not fall out when turned upside down.

The loose joints in the socket wrench extension could be made to hold together by placing a piece of paper in each joint and pressing them together. With the extension thus arranged, and the ratchet head removed, a nut could be started on a bolt and the nut screwed far toward home with the fingers upon the socket extension, the ratchet lever being applied only for tightening the nut after it had begun to turn harder than the fingers could manage.

An Enterprising Dealer.

F. W. Rohrs, of Rosedale, Md., conducts a garage and repair shop as well as deals in supplies, equipment, etc. After 20 years' experience as well as that gained by factory work, he believes in advertising his experience and his products. The following is one of the letters sent out by him and is interesting in that Mr. Rohrs is very frank in his statements as to his service, etc. Extracts from the letter follow:

To the public: I serve you with unadulterated gasoline at less than cost, measured without fear—and free air with good cheer.

If this service is of any value to you and you wish its continuation please remember that I sell everything that can be used on an automobile and repair everything that can be repaired on an automobile. I have spent approximately $11,000 in the past 18 years to gain the knowledge required to give the service I offer you. That I am one of the pioneers in the garage business, and that I have made distinctly separate studies of each of the following branches: Car repairing, ignition and carburetor adjusting, vulcanizing, welding, storage battery charging and repairing, etc.

I employ no mechanics except my immediate family, therefore all work is begun and finished by myself. Nor do I employ skinning methods to even up the loss of one job or sale, by extortion on the other.

I do not guarantee any work. I do same as near right as possible in the first place.

I do not strip old casings to use the weakened fabric for vulcanizing. Only new fabric, cut on the bias, and the best obtainable gum is used in my garages.

I do not use inferior welding rods for profit's sake.

I do not add acid to storage batteries to give the inference that they have been properly charged.

I do not conduct a price-cutting garage. I feel entitled to a profit on everything I sell, just as my customer desires a profit on his goods and labor. I give the public a square deal and expect the same from the public.

I do not recommend anything that I have not personally tried and tested.

I do no credit business. I buy for cash and sell for cash only. You pay for what you get and get what you pay for.

Respectfully, F. W. ROHRS.

Combination File and Gauge.

The vibrating type of ignition coil requires periodic attention as the platinum points become fused and pitted, setting up considerable resistance to the passage of the primary current. To clean the points it is customary to utilize a very fine file. These may be obtained at any supply house. As it is important to observe the proper space between the points of the spark plug, the following suggestion to combining a file and a gauge will be of value: The tang or end of the file is, as a rule, 1-32-inch thick. Grind the tang to the desired dimension, or proper gap, 1-64 or 1-32-inch.

To Tax the Army Truck.

The Commissioner of Internal Revenue has ruled that motor vehicles sold the government for service in the army are subject to the three per cent tax imposed by the war revenue act. This means that the huge fleet of war trucks will be taxed.

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HEADLIGHT LAWS USELESS.

Representatives of Seven States Discuss Regulation With S. A. E. Committee.

That the laws governing the use of headlights are mainly quite useless was the decision arrived at by the legislative representatives of seven eastern states after a conference with the standards committee of the S. A. E. in New York City recently. The visitors were shown that the most effective regulation was that of the height of the light beam commonly called the 42-inch rule and that it is quite easy to apply this law by the use of very simple apparatus.

Another instance of where the laws came in for criticism was in an address made by Magistrate House of the Traffic Court of New York City, before the members of the Motor Truck Club of America. In speaking of the New York lighting law, he said:

"I don't know who prepared that bill, so far as lights are concerned, but it is a serious proposition. I don't believe that it is possible to comply in all respects with that law. One part of it says that the beams or the rays of your light shall not go a greater distance or be seen at a greater distance than 200 feet. And then, down in the next line, it says they must be of sufficient power to show an object 250 feet away.

"The man who drew this present bill, so far as the lights are concerned, had a 'nigger in the woodpile' somewhere. That is all there is to it. That law was drawn for some purpose. Whether it was drawn with the idea that somebody had or could get up something that might comply with the law, I don't know. But I don't believe that there is a genius in the United States today who can take the law of the State of New York, as it is regarding lights, and do anything that will make it possible for people to comply with that law."

Japan After Used Cars.

There appears to be an increasing demand for used cars in Japan. One New York dealer shipped over 100 passenger cars in 30 days recently, while others are shipping lots of 20. The demand appears to be for open cars and those in good mechanical condition. It is said that cars valued at $500 in this country fetch $2,500 in Japan.

Municipal Coal Gas Stations.

The use of coal gas as a fuel in engines is increasing in England. An innovation in connection with its use is the establishing in various sections of the city of municipal coal gas stations for general use of cars. These stations correspond to the curbside gasoline stations in vogue in this country.

Dealers Lose Cars.

Dealers in and around Indian country have a new peril in doing partial payment business. That is in the Federal statute providing for the forfeiture of vehicles used in transporting liquor into Indian country. In a recent case the statute was upheld by the United States District Court for the Eastern District of Oklahoma, an automobile having been seized, and the dealer who sold it having arisen to protest that he had a note for $400 secured by the machine. The court held, however, that the statute provided that the matter of ownership did not enter; the car had been illegally used, and was forfeited because of that.

Drain the Crankcase.

Too much emphasis cannot be laid upon the necessity of draining the old oil from the crankcase, flushing it with kerosene, and renewing the supply with fresh lubricant. Manufacturers of motor vehicles are conducting an educational campaign along this line and the owner will do well to follow the advice of the car maker. After oil has been in service for some time it loses its lubricating qualities. The result of using oil too long is trouble, and trouble means a repair bill.



How to Sell Automobiles

By C. P. Paxson

A valuable little book has recently been brought out, entitled, **"How to Sell Automobiles,"** but the information contained therein applies just as forcibly to the sale of anything else.

Those of our readers who are ambitious to become capable salesmen should order a copy of this book and study it carefully.

The price is $1.00, postage prepaid.

A check or money-order will be acceptable.

ADDRESS ALL ORDERS TO

MOTOR VEHICLE PUBLISHING COMPANY

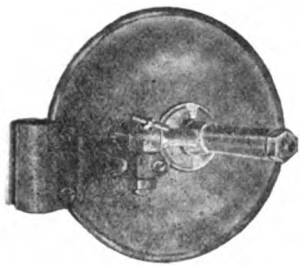
71-73 MURRAY STREET NEW YORK CITY

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NEW AND INTERESTING THINGS IN MOTORDOM

Williams' Silverbeam Spotlight.

A unique feature of this lamp is its convenience when detached and used as a trouble lamp, it being light in weight and easily grasped and held in the hand by the focusing tube. The switch socket also is notable for an arrangement which



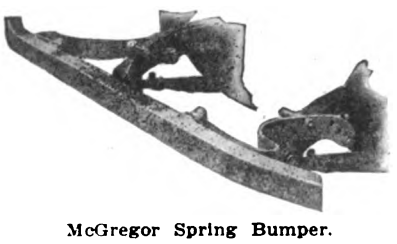
Silverbeam Spotlight.

renders it completely dust and waterproof. The light is especially handsome in appearance and is finished in heavy nickel with baked enamel in black or colors. The light illustrated has the Williams locking device, whereby the range of elevation ahead may be set at whatever limit the law specifies, making the light fully law complying.

The Silverbeam spotlight, it is said, will sell more rapidly than lower priced lamps when placed on the dealer's counter, because of the above named features. The value of these lamps has been shown by three years' of satisfactory test and service. Liberal discounts are allowed to dealers. Write for interesting literature, prices and full particulars to the Williams Mfg. Co., 308 N. Flower street, Santa Ana, Cal.

The New McGregor Combination Spring Bumper.

Illustrated herewith is a new bumper which has several meritorious features. This bumper combines rigidity with springiness, and this combination in a bumper is very desirable. It is made in different types of channel, diamond, round, tee and spring bars and high carbon steel is used in its construction. The bumper is fitted with universal adjustable brackets which fit any make of car, except the Ford, Chevrolet, Saxon, Jackson and Franklin. The new McGregor will also fit on the rear of all cars having extended frames. This



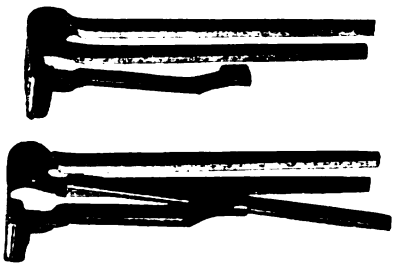
McGregor Spring Bumper.

bumper does away with the necessity of the jobber stocking a number of special bumpers to fit Packards, Cadillacs, Dodges and other makes with mud fender aprons. This bumper is made by the U. S. Auto Bumper Co., 115-117 East 30th street, Chicago, Ill. The same company manufactures a large line of other bumpers, including special rear bumpers for the Buick, Cadillac, Overland and cars requiring special brackets. Readers who are interested should write for prices, discount and electros for 1918 catalogues.

Auto-Scope Windshield Wiper.

The White Lock Co., 1241 Michigan avenue, Chicago, Ill., is marketing a new windshield wiper, the Auto-Scope, which cleans both the front and the back of the windshield. Speaking of the Auto-Scope windshield wiper, R. B. Lacey, the general manager, states that a back wiper member is a most valuable addition to a windshield wiper. Every driver is familiar with the days when fog, moisture or condensation makes the back of the windshield in as much need of wiping as the front. Without some method for wiping this means ruining the gloves or soiling the hands. The rear wiper member of the Auto-Scope is made of absorbent felt. It is heavy enough to absorb the moisture which accumulates on the back during foggy, misty days but not heavy enough to cause dragging. This is held to be a decided advantage especially on rainy days when only the front of the windshield needs wiping.

The Auto-Scope windshield wiper works very easy. The front wiper mem-



Two Types of Auto-Scope Windshield Wiper.

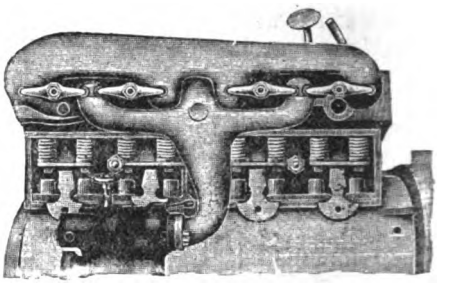
ber is made of the best grade squeegee rubber. It will not become spongy, will not lose its efficiency and will not scratch the glass.

The Auto-Scope is practically universal in its application. It requires only a scant sixteenth of an inch at the top, works under a very close fitting visor and can be inverted and used through the opening between the upper and lower half of the windshield. No bolts, nuts or screws are used in attaching. It is quickly attached. Always exerts an even wiping pressure under all conditions. Absolutely cannot break the glass.

The Auto-Scope is made in three models: The Junior with no rear wiping member, furnished in black enamel, retailing for $1; the No. 1, cleaning both front and rear of windshield, furnished in oxidized finish, retailing for $1.50; the No. 2, cleaning both front and back of windshield, made of solid brass nickel plated and retailing for $2.50.

Warnola Power Valve Spring Compressor.

The Warnola power valve spring compressor is designed to solve valve grinding problems for owners, dealers and repair men of Ford cars. This specialty eliminates the necessity of removing the valve springs when grinding valves. The operation of the device is very simple and requires no mechanical knowledge. The price in sets of four is $2, or 50 cents for each compressor. This is a good seller for any dealer. Readers who are interested should



Warnola Power Valve Spring Compressor.

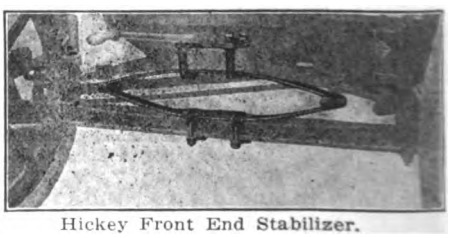
write to the manufacturers, Warnola Mfg. Co., 73 Wooster street, New York City.

Brunner Air Compressors.

A complete line of air compressors for garages is made by the Brunner Mfg. Co., Utica, N. Y. This company will have an attractive exhibit at the New York and Chicago shows. At the New York show, this company will occupy spaces D 151-152, D 179-180. At the Chicago show the Brunner compressors will be found in spaces 203, 204, 205, 206, 207 and 208 in the Coliseum. Jobbers will find competent sales representatives ready to explain the Brunner sales plan for 1918 at both shows.

A Ford Front End Stabilizer.

Illustrated herewith is a new device which has been brought out by Dan. S. Hickey, Jr., 40 Iffley Road, Boston, Mass. It is a Front End Stabilizer for the Ford Car. Everyone who has driven a Ford car realizes the value of such a device. This attachment is not only a stabilizer, but it also serves as a rebound check and easy steerer. It can be put on by anyone in 20 minutes. There are no holes to drill and no mechanic is needed. It can be put on Ford trucks as well as passenger cars. With this device installed you can drive your Ford car or truck at high speed and eliminate the danger of the car lurching from side to side when riding the ruts, rough spots and sand. The price of this



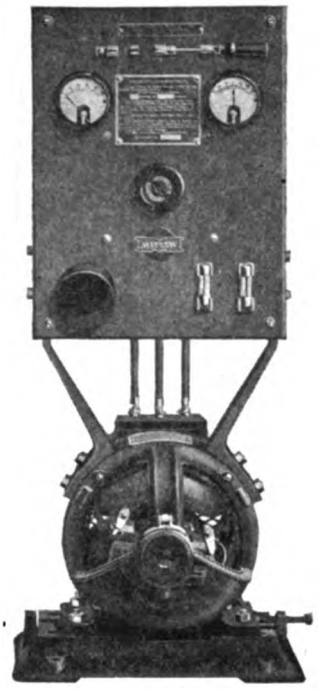
Hickey Front End Stabilizer.

extremely clever attachment is only $4, and the manufacturer makes a special offer to send this attachment to you, freight prepaid, on receipt of this remittance, but you must pay charges if the article is sent by express or C. O. D. Standard discounts allowed to jobbers and dealers. This is a quick selling specialty which ought to interest a great many dealers.

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Country Garage Owners Should Investigate This.

Many owners of garages and repair shops reading this magazine are located where it is inconvenient or impossible to obtain current for electric lights and power. All such readers will be interested to know that a thoroughly practical electric lighting plant for comparatively small installations for farmers, small factories, garages or shops, is being marketed. Farmers and others who buy these plants know it is economy to buy the best and there are many country dealers and repairmen who could in the first place install one of these plants for their own use and convenience and then become successful agents among the farmers in their immediate neighborhood, as the equipment in the shops would afford them an opportunity of making a practical demonstration of the lighting plant for the benefit of possible purchasers.



Mayhew Electric Lighting Plant.

The Mayhew-Electric shown in the illustration has been placed on the market by the Mayhew Co., Milwaukee, Wis., to meet this condition and the plant and the entire sales policy has been worked out to give the dealer the best possible proposition and to eliminate some of the petty annoyances that have been encountered previously in handling this business.

The plant is of the belted type and consists of a generator and switchboard made up in one unit and a storage battery which is shipped separately. The generator and switchboard are shipped in one box, the batteries are packed in two boxes so as to keep the weight of each box as low as possible and permit more careful handling while in transit. The special method used in packing the batteries has entirely eliminated the breakage of shipment.

The various elements of the plant are of well-known standard makes. The generator is made by the Peerless Electric Co., Akron, O., and the batteries by the Globe Electric Co., Milwaukee, Wis. Jewell instruments and a Cutler-Hammer rheostat are used on the switchboard, which also includes a Mayhew-Electric cut-out which is of an improved design and positively guaranteed. Glass fuses are furnished. These plants are made in three standard sizes provided with 60, 90, and 120 ampere-hour batteries, respectively. The generator has a capacity of 800 watts.

Ajax Trunk Equipment.

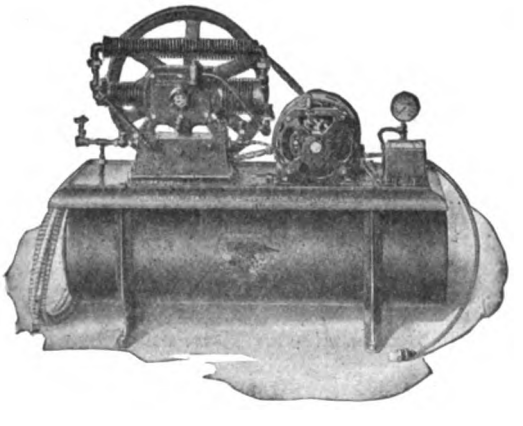
For long trips or even for moderate journeys, trunks and suit cases are absolutely necessary for the motorist. The Ajax Trunk and Sample Case Co., 144-150 West 18th street, New York City, between Sixth and Seventh avenues, manufacture a very complete line of trunks, sample cases, tire trunks, etc., for the auto trade. Dealers and car owners should write for complete catalogue to this company.

U. S. Two Stage Air Compressor.

An air compressor to afford that service to which it is intended, must not only be constructed of the best of material and have incorporated high grade workmanship, but operate quietly and be capable of providing an inexhaustible supply of air. It must avoid the possibility of oil, moisture or other foreign elements reaching the inner tube, and the correctly designed compressor must be proof against leakage.

The United States Air Compressor Co., Cleveland, O., is making a compressor which embodies the above named features and many others which will appeal to the owner of the garage and repair shop. The leading feature of the U. S. compressor is its two stage feature, so-called because the resistance of air under high pressure is taken care of by using a large diameter low pressure piston, and a small diameter high pressure piston, these so acting that a highly compressed charge is obtained in the tank, providing maximum efficiency at all times. This two stage feature also is held to save power and to reduce the cost of upkeep to the minimum.

One of the advantages emphasized of the two stage unit is that it will fill a tank in record time. The design comes with an automatic control which maintains the pressure in the tank and which can be adjusted to the desired pressure. There are 14 distinct features of merit which are described in the little booklet issued by the company which will be mailed free to those writing for same. The equipment of the de luxe H 34 U. S. compressor is most complete and the user has nothing to purchase to place the unit in service.



The U. S. De Luxe Two-Stage Air Compressor.

The E-Z Quick Tire Pump.

An entirely new tire pump for 1918 has just been placed on the market by the Mayo-Skinner Mfg. Co., 2115 Elston avenue, Chicago, Ill. The name of the pump is indicative of its merits. This pump is easy to operate because it is a small diameter pump, therefore the piston area is reduced, resulting in very much less effort being required to pump a high air pressure. It is also easy because the pump works perfectly free inside the barrel and has a large size air valve in the center through which the barrel is liberally supplied with air and to its full capacity. This valve is very simple in construction, having a flat leather washer which closes to an air tight seat on the pumping stroke and opens freely on the upstroke to admit a full charge of air. The pump is quick because it has a 22-inch barrel, thus enabling the operator to take long, full stroke, and every stroke carries with it a complete capacity of the barrel which has been supplied with a maximum charge of air, due to the large valve described. This pump is a quick seller for any dealer to handle and readers who are interested should write for prices, discounts and full particulars direct to the manufacturers.



The E-Z Quick Tire Pump.

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Fawsco Oil Cock Wrench and Cleaner.

Illustrated herewith is a useful tool needed by all owners of Ford cars, as it will not only accurately measure the gasoline in the tank, but provides the only sure means of learning whether oil is in the crank case or not. The pin will prove if the oil cock is stopped up or the oil used up. This new design is made of coppered Bessemer steel rod, nickel



Fawsco Oil Cock Wrench and Cleaner.

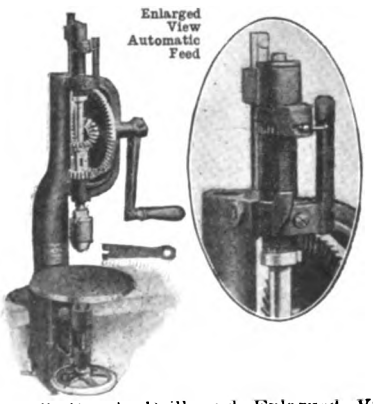
plated and black enameled, and is guaranteed to give complete satisfaction. These wrenches are packed in a heavy corrugated carton, 12 of them being contained in each carton. They not only are attractive to owners and dealers, but jobbers will find them easily sold, easily shipped and quickly reordered. Readers who are interested should write for prices and full particulars to the manufacturer, J. H. Faw, Inc., 41 Warren street, New York City.

Automatic Feed Bench Drill.

The labor shortage is bringing into garages and repair shops an unusually large number of mechanics of little skill; and in many instances this lack of ability is reflected to an astonishing degree in losses from tool damage and breakage, thereby adding to the overhead expense.

The practical check to such losses is, obviously, to install fool-proof machinery and tools, so far as possible. Drill breakage is a large item of expense in the average shop. And the evident thing to do is to use a drill tool possessed with some of the "thinking" capacity that many workmen lack.

The "Yankee" automatic friction and ratchet feed drill, a product of the factory of North Bros. Mfg. Co., Philadelphia, Pa., is equipped with a mechanism that automatically regulates the drill pressure according to the size of the drill point and the hardness of the metal that is being drilled. The friction feed operates automatically in moving the drill quickly to and from the work. The feed changes automatically from friction to ratchet the moment the drill be-



"Yankee" Bench Drill and Enlarged View of Automatic Friction and Ratchet Feed.

gins to cut into the work. Hand feeding is done away with entirely. There is no guesswork as to the pressure the drill will stand. Besides the operator has one hand free at all times for holding or manipulating the part he is drilling into.

A bracket at the top of the frame, with right and left arms, disengages the ratchet feed at the extreme up or down movement of the spindle and prevents jamming. The table can be raised or lowered with the sliding bracket, and also independently by means of the feed wheel. Or, it can be removed entirely, as for work which can be supported from the floor.

Altogether this "Yankee" bench drill, which is strong, rigid and gracefully constructed, has all the features a practical bench drill can have for speeding up work, insuring positive action and correct feed, and generally withstanding the varied uses and commonly rough handling that garage and repair shop owners have to contend with.

Frezalene.

Readers who are interested in obtaining a good preparation to prevent the



Frezalene.

water in the radiator from freezing are referred to the advertisement of the Frezalene Mfg. Co., 602-4 Bulletin building, Philadelphia, Pa. This company manufactures a compound called Frezalene which is an economical and safe anti-freezing radiator solution. It is not injurious to aluminum, will not gum the rubber connections, and it is absolutely harmless in every way. This is a quick seller for dealers who should get in touch immediately with this manufacturer.

An Ideal Hose Clamp Display.

Two different assortments of the most called for sizes of the well-known Ideal hose clamp are now offered to the trade by the Ideal Clamp Mfg. Co., Inc., 200-202 Bradford street, Brooklyn, N. Y. Six months ago, this concern placed on the market the Ideal hose clamp display box in an effort to supply the dealer with a practical assortment that he might display on his show case or in his window. This box was designed with great care and contained in display form 180 clamps, arranged in 18 compartments, according to size. The retail value of the clamps was $12.

This large assortment proved so successful and such a good business-getter that the manufacturers decided to put out a "pocket" edition of the display box to suit the needs of the smaller trade. This new assortment consists of 100 clamps of 10 different sizes, ranging from



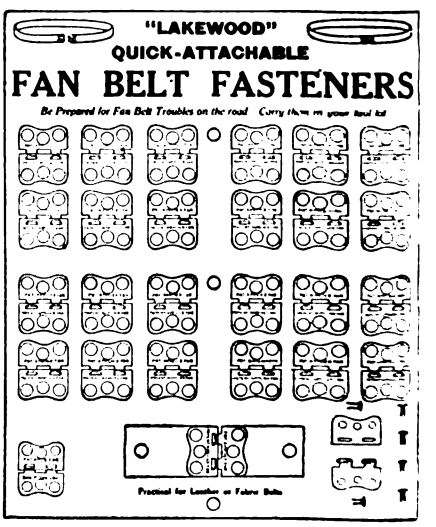
Ideal Hose Clamps.

1¼ inch to 2⅝ inch outside diameter, neatly arranged in compartments as in the larger box. The total retail value is $8.00, and as the clamps are sold, they may be replaced conveniently.

The Ideal clamp itself needs no introduction to the trade. It is constructed as to act concentrically and forms a perfectly tight joint at all points and yet will not buckle or cut the hose, no matter how great the tension. By a special device of extra notches, one clamp is adaptable to several sizes of hose. It has proven a big seller.

A Clever Display Card.

Illustrated herewith is a display card which is provided by the Lakewood Fabric Belting & Mfg. Co., 1516 Highland avenue, Lakewood, O., for dealers in their well known fan belt fasteners. Readers who are not already familiar with these fasteners should get in touch with this manufacturer immediately. Car drivers appreciate these fasteners because they can be put on or taken off



Display Card for Dealers.

in a jiffy. They enable the dealer or repairman to quickly handle special fan belts to order. They are so durable that the manufacturer states they will outlast the belt. Dealers should find out about this line immediately.

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The Shaler Roadlighter.

Long continued study and experiment by two expert illuminating engineers, during which the prime thought was the production of a smooth, broad illumination of the road without sacrificing intensity of distance light, has resulted in a new headlight lens with features that mark it with originality. Tests of the new lens convinced the C. A. Shaler Co., Waupun, Wis., for many years a leader in the vulcanizer field, that the perfected lens possesses merit that warrants it being marketed under the Shaler trade-mark and this company has secured the sole selling rights for the device, which will be known as the Shaler Roadlighter.



Shaler Lens.

Headlight laws in the various States conflict. The Shaler Roadlighter was designed with a view to eliminating objections and difficulties common to headlight lenses. It is not a dimmer, This lens is made of moulded optical glass, smooth on the front and having a series of prisms on the back, so arranged that all of the light is put down on the road and no rays reach a level greater than 42 inches above the ground at any point while the car is standing on the level. At the same time the light is spread over the roadway, giving a broad flood-light that illuminates from ditch to ditch. This light is of such intensity that one can see through the ordinarily blinding rays of an approaching light that glares.

The construction of the lens may be briefly described thus: A little more than half of the lower part of the lens is a series of oblique prisms that meet in the center of the glass from right to left. In the upper part of the lens are two prisms, one smaller than the other, each beveled so that one gives a strong light for long distances and the other for intermediate distances, but none of the rays can reach a level greater than 42 inches above the ground. The oblique prisms take the rays from the lower half of the parabola and bend them downward and to the sides of the road, producing the effect of two spotlights, while the two upper lenses illuminate that part of the road directly in front.

As the result of exhaustive tests these features are claimed of the Roadlighter: 1—Illuminates the full width of the road as far as the driver would care to see, even in daylight. 2—The sides of the road and the ditches are brilliantly lighted—equivalent to using a spotlight on each side of the car. 3—The light on the road is of such intensity that the most glaring headlights approaching cannot take away a clear view of the ditches and road, even beyond the approaching car. 4—The rays illuminate the fog-shrouded road farther than one could see through the same fog in broad daylight. The reason for this is apparent. The small particles of water that make up fog reflect light back into the driver's eyes when the light from the lamps is thrown straight out. The Shaler Roadlighter bends the rays downward so that the reflection of light by the particles of water in the fog does not strike the driver's eyes. 5—Due to this bending down of the rays of light, it it not necessary to dim lights when approaching other cars as none of the rays can reach the level of the approaching driver's eyes.

In addition, the construction gives a smooth glass in front, eliminating the catching of dust, since the prisms are on the inside. Any type or style of lamp bulb can be used and it is stated that accurate focusing of the bulb is not necessary to produce a good light. The Shaler Roadlighter works equally well with acetylene lamps.

This lens successfully withstood tests made at Syracuse, N. Y., recently. The C. A. Shaler Co. have made exhaustive tests and others are scheduled for early dates. The lens has been widely approved by municipalities and an extensive selling campaign is under way. The lens comes in sizes for Fords at $2.75 per pair and for all other cars at $3.50. Marketing the Roadlighter does not mean that the Shaler vulcanizer production is to be curtailed; in fact, additions have been made to the Shaler factory that will make it possible to more than double the vulcanizer output in 1918.

Veteran Set of Cork Insert Transmission Linings.

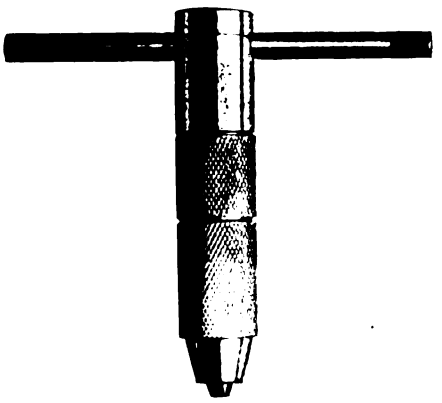
The Cork insert transmission lining on the brake band pictured above is one of a set that was used for more than a year's service on a Ford attached to a trailer. This particular Ford and trailer is in use every day hauling loads which run as high as 2,500 pounds. As the picture indicates, this lining is still in excellent condition and good for thousands of miles more of hard service. The long service secured from this set of linings is attributable to the buttons of cork inserted in high grade, long-wear fabric. Cork produces a wonderfully smooth friction action, and stops the slip which is very severe on fabric. Cork has also the advantage of wearing very slowly. As a result, Cork insert transmission lining is able to deliver a length of service which makes it decidedly economical. Cork insert transmission linings are manufactured by the Advance Automobile Accessories Corp., 56 E. Randolph street, Chicago, Ill.



Cork Insert Transmission Lining.

Ratchet Tap Wrench.

The Moss-Ochs Company, Cleveland, O., has recently placed on the market a new and very handy tool, a ratchet tap wrench, in two sizes. The No. 1 holds taps from 0 to ¼ inch and No. 2 ¼ to ½ inch. It is made with a sliding T-handle, permitting its use in the most difficult corners, which makes tapping and reaming a pleasure instead of a burden. The handle may be held center by means of a dog which automatically fits in a milled flat surface of the handle. Adjustment is made immediately to either right or left ratchet or rigid by turning a knurled sleeve. The chuck and ratchet is carefully hardened and all other parts are substantially made, insuring unusual durability.



Ratchet Tap Wrench.

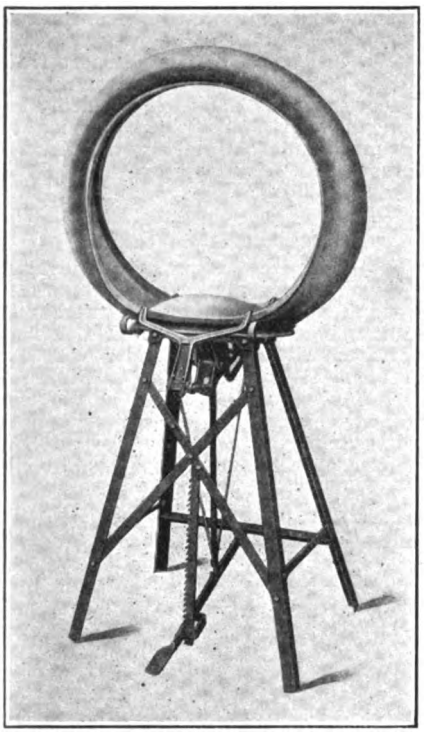
Curtis Air Compressors at the Shows.

The Curtis Pneumatic Machinery Co., St. Louis, Mo., will be represented at both the New York and Chicago shows as usual with a complete working exhibit of Curtis garage air compressors. The exhibit this year will consist of the five different sizes of compressors, also the different sizes made up in different electrically driven combinations, such as a portable outfit, stationary wood base outfit and an iron base geared outfit with an automatic starting and stopping device. All of these compressors are of the "Curtis air—free from oil" type, which system of lubrication will be thoroughly demonstrated by the operation of a cut away model of the Curtis compressor. This will be an actual machine cut through the center of same, showing all parts in working position and under actual operation. Larger space has been taken this year, especially at the New York show, in order that the exhibit will not be crowded in any way, and that a more attractive setting can be had for same. This exhibit will be found in spaces D-171-172, 4th floor, Grand Central Palace, New York, and spaces 23-24, Armory balcony, Chicago.

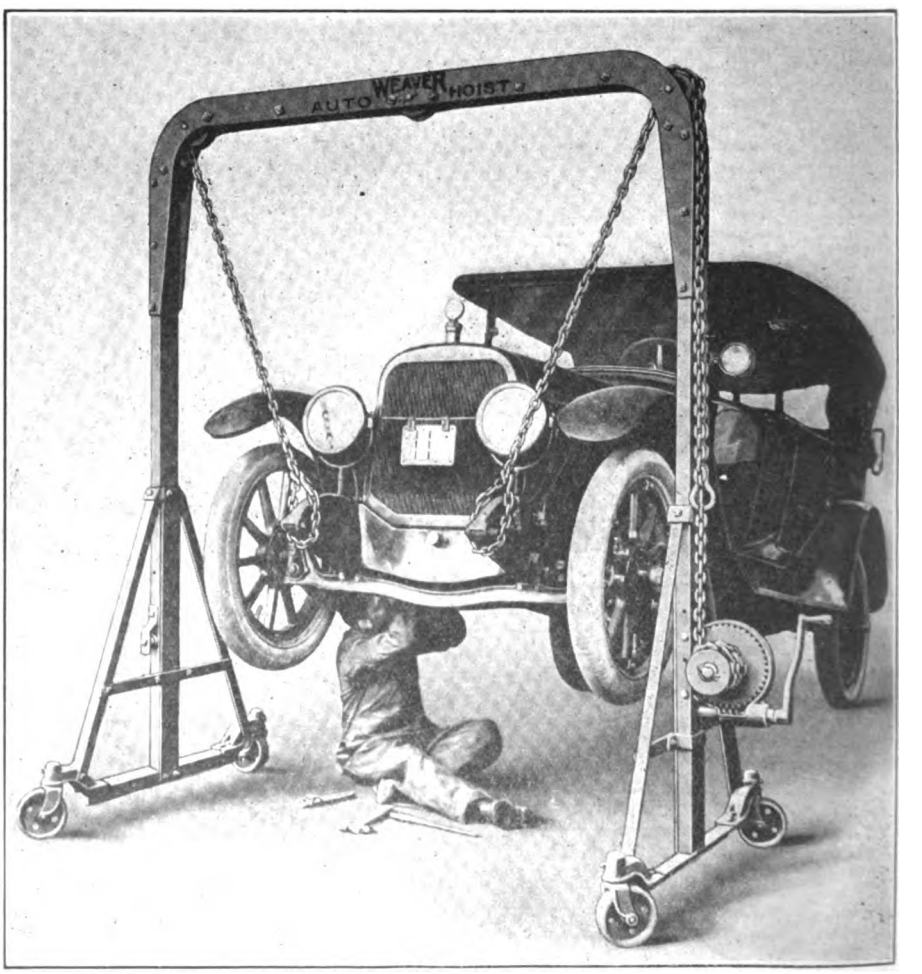
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Some Important New Garage Specialties

The Weaver Mfg. Co., Springfield, O., is bringing out several very useful and important garage specialties for the season of 1918, three of which are illustrated herewith. The Weaver tire spreader is designed for the quick and convenient inspection of tire casings. It affords an efficient means for inspecting the interior of casings, and this operation is always necessary in repairing a puncture, blow-out or other damage to either a tube or a casing. By means of a quick acting foot lever the casing is spread to its limit, thus exposing the interior for convenient and efficient inspection. The illustration tells its own story and will be readily understood by every tire repairman. Another equally important specialty is the Weaver auto hoist. This hoist occupies only a small area and its peculiar design permits it to be operated in very cramped quarters. It can be run into position over a car in a crowded shop without requiring more than 12 or 14 inches space on either side of the machine. The frame of this hoist is so designed as to permit the height of the arch to be increased approximately 12 inches, allowing the uprights to be raised to the desired height in the braces on either side by means of the worm hoist. This increased height enables the hoist to raise the rear end of a limousine or touring car with the top up, for removing the rear axle. One chain of the hoist may be carried over the pulley in the center of the frame for performing work which can be handled to better advantage by a single suspension. This hoist is perfectly safe, as it is strong enough to enable handling with ease and safety the heaviest passenger car. It will lift 3,000 pounds but is tested far in excess of that weight Still another live specialty is the Weaver auto oiler which combines the services of the ordinary funnel, oil can and oil measure and also eliminates the inconvenience, the waste and dirt which always accompanies the handling of oil in the ordinary manner. It is constructed of heavy galvanized iron and has a capacity of two gallons. The indicator is very accurate, being controlled by a compensating float which will record accurately in any position. The shipping weight of this oiler is 6½ pounds. In regard to prices and particulars on these and a large number of other live specialties for garage and repairmen, readers should write direct to the Weaver Mfg. Co., Springfield, Ill.



Weaver Tire Spreader.



Weaver Hoist.

Repainting Your Car.

F. O. Pierce Co., 12 West Broadway, New York City, offers to owners of cars and to dealers a system of repainting which should be interesting to a great many of our readers. With this system anybody can paint a car in three days and completely obliterate the marks of the summer's usage with a hard, wearing, beautiful surface on all parts. The three coats are put up in convenient sets comprising the following articles: One can Auto Preservative undercoat for first coat, one can of Auto Preservative color coat for second coat, one can of Auto Preservative varnish for third coat, one sheet No. 0 sandpaper for sanding lightly after first coat is applied, one brush for first and second coats, one varnish brush for finishing coat, and two sheets No. 1 sandpaper for cleaning car. The paint and varnish comes ready for the brush and can be easily applied in black; or, if desired, the paint can be furnished in 12 colors. These paints cover old paint perfectly. Fifty years of experience is behind every can. A great many of our readers will be benefitted by writing to this company for what is called the "Simple System" booklet and price list.

The Silvex Company Reorganized.

The Silvex Co., of Bethlehem, Pa., manufacturers of Bethlehem spark plugs and other automobile accessories, have announced the formation of a new corporation under the laws of the State of Delaware, capitalized at $2,000,000, which will be divided equally in an issuance of $1,000,000 common and $1,000,000 preferred stock. The new board of directors includes: F. H. Schwab, president; J. H. Ward, E. B. Turn, W. M. Davidson and W. H. Lumpkin, all of Bethlehem. This company will shortly move into its new quarters, a modern concrete and steel factory that has been outfitted throughout with new machinery, deliveries for which were contracted for a year back.

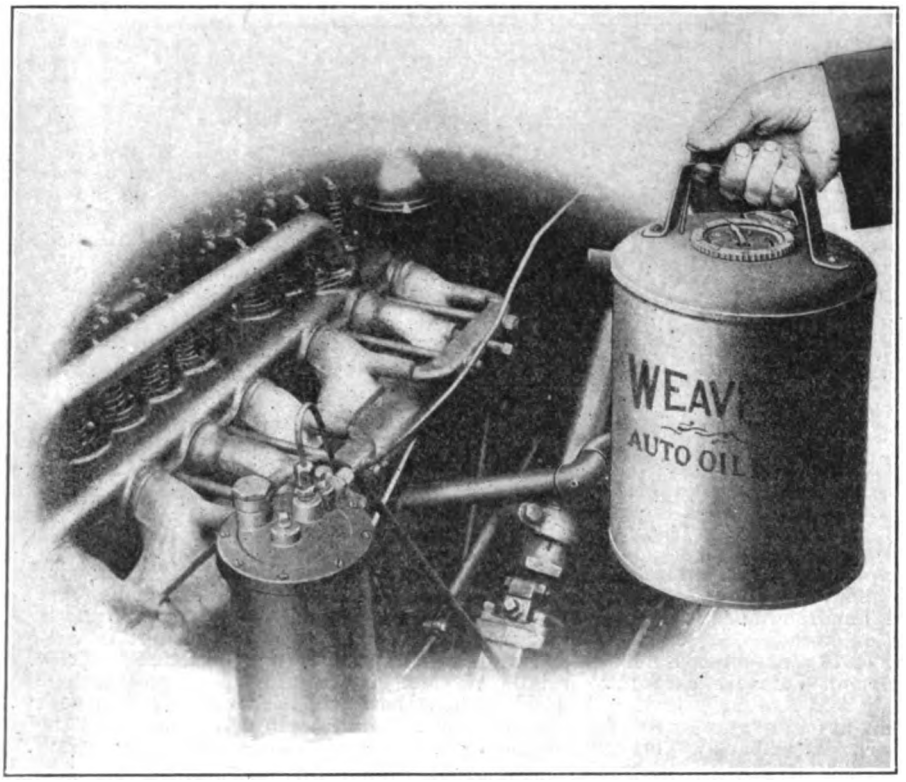
It is reported that the increase in capital and facilities has been necessitated by demand for this company's products, particularly spark plugs for use in the various types of aviation engines now being developed.

Tools for Garage and Repair Men.

A very useful line of tools for garage owners and repair men is manufactured by H. G. Paro, 1412-1414 Michigan boulevard, Chicago, Ill. This line in-

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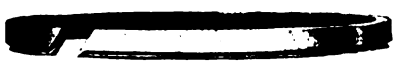
cludes Ekern's celebrated grease guns, also Ekern's Ford towing device, auto stands, motor stands, drive shaft tube supports, emergency axles and trailer hitches. Mr. Paro also controls the sale of the Fosnacht valve reseater, the Nasco valve grinder and the No-Leak-O piston rings. Jobbers and dealers should write for special prices as this line is well worth investigating.



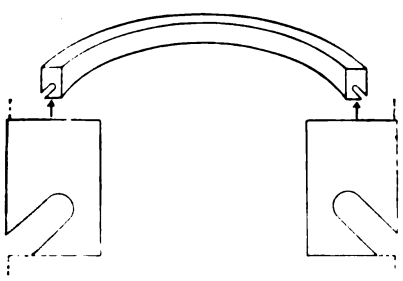
Weaver Auto Oiler.

McQuay-Norris Superoyl Ring.

After three years of wide experimentation, the McQuay-Norris Mfg. Co., St. Louis, Mo., are putting on the market a special ring, designed and manufactured for the correction of oil trouble exclusively. It has been named the McQuay-Norris Superoyl Ring and is to be installed in the top groove of each piston solely as an oil ring; to keep excess oil out of the combustion chamber.



McQuay-Norris Superoyl Ring.



Showing Construction of Superoyl Ring.

Probably no piston ring problem in the last several years has bothered engineers, dealers and garagemen alike as much as the increase in oil troubles. Fouled spark plugs, smoking exhausts and carbon deposits have increased markedly with modern engine construction. Much of this is due, it is said, to the high speed engine and the manner in which it operates most of the time. They run under only partially open throttles with resultant high vacuum, low explosion pressures and low compression, so that abnormal oil conditions are produced. It is to control oil troubles in such motors that McQuay-Norris Superoyl Rings are being manufactured and marketed.

While stating that this ring will hold compression as well as it is possible for any well made one-piece ring to do, its manufacturers state that it is a special ring for a special purpose—the control of excess oil—and recommend its installation in conjunction with McQuay-Norris Leak-Proof piston rings.

The Superoyl ring is a concentric ring, with an oil reservoir which collects all of the excess oil from the cylinder walls on each down stroke of the piston. Just the film necessary for lubrication is left. The position and shape of the oil reservoir is the exclusive McQuay-Norris Superoyl design. It is not a mere groove in the face of the ring.

This reservoir is cut into the ring with mathematical exactness at an angle of 45 degrees from the intersection of the cylinder wall bearing face of the ring and the ring's lower groove bearing face, as illustrated in the cross section cut accompanying this article. This makes a scraping edge of the lower end of the face of the ring which forces the excess oil in the reservoir along its upper surface.

The oil cannot, while it is being scraped into the reservoir, strike against the lower groove bearing of the ring, where it could creep into the groove and around the ring into the combustion chamber, because the lower edge of the reservoir terminates at a point slightly inside of the piston's outer surface. The oil is constantly kept building up against the upper wall of the reservoir until the down stroke is completed, when it is emptied again over the lower rings.

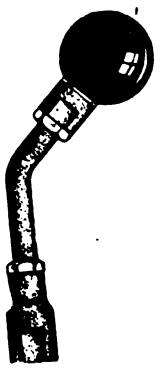
It is only by placing the oil reservoir exactly at the intersection of the ring's two bearing faces—the cylinder wall and the lower groove—that this action can be produced, it is asserted by the McQuay-Norris Company. A groove or recess in the ring at any other position, they declare, does not make it impossible for the excess oil, which is always under pressure on the piston's down stroke, to be forced under the ring and into the groove to work its way around the groove and then out into the combustion chamber. The ring is covered by patents and the trade-mark Superoyl is registered.

Economize on Gasoline.

England does not permit the use of gasoline, or petrol as it is called there, in passenger cars or commercial vehicles. The hauling is handled by steam trucks burning kerosene or by trucks using artificial gases of various kinds. For patriotic reasons the American truck owner should substitute kerosene for gasoline wherever he can. Thousands are now doing so by means of the Duntley hydro pneumatic generator which is an exclusive feature of Little Giant trucks. With this device Little Giant trucks and Convert-a-Cars (Ford one-ton unit) may be operated on a mixture of 50 per cent. gasoline and 50 per cent. kerosene or on kerosene or distillate alone at one-half usual fuel costs. The Little Giant is made by the Chicago Pneumatic Tool Co., Chicago, Ill.

Mellin's Gearshift Extension.

To obviate the necessity for leaning forward while shifting gears, The M. & H. Novelty Co., 857 E. 24th street, Los Angeles, Cal., is placing on the market Mellin's adjustable gearshift extension. It consists of an extension lever in three sections by means of which the operator can, with a single movement, shift gears easily, quickly and without moving the body. It is claimed that with this device the need for leaning over is obviated and the driver need not take his eyes from the road during the operation. The extension lever is reversible and can be attached in a very few minutes. The device is heavily nickeled and in no way detracts from the appearance of the car. The company also markets the Mellin tire lock.

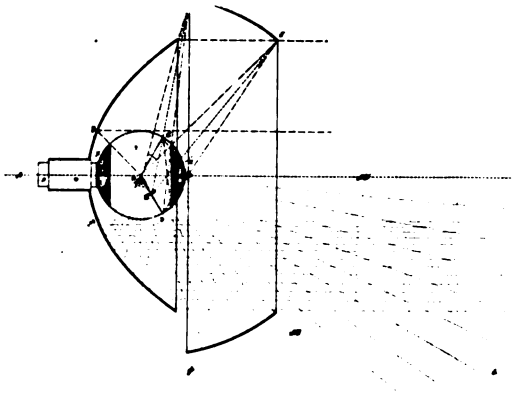


Mellin's Adjustable Gearshift Extension.

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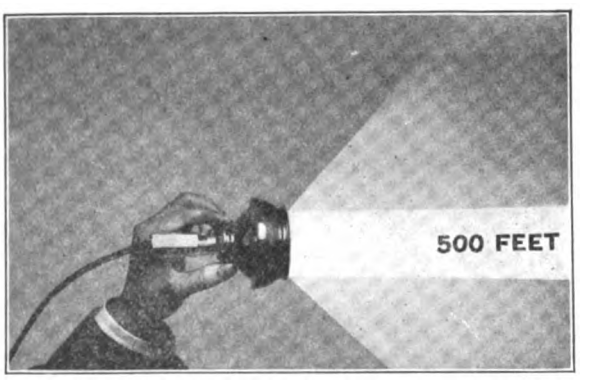
Cellbeam Concealed Spot Lamp.

Illustrated herewith is a new electric searchlight for automobiles, which has recently been brought out by the Cellbeam Mfg. Co., 1101 Bedford avenue, Brooklyn, N. Y. This compact light has an exceptionally powerful projector of



Illustrating Principle of Cellbeam Rays.

both spot and diffusive illumination. The concentrated beam of projected light extends 500 feet, while the objects close at hand are illuminated by a diffusived glow of indirect and transmitted light, devoid of the annoying direct filament glare. The principles used in the construction of this light are clearly shown in the diagram cut. The dimensions of the Cellbeam are such as to permit the concealment of the lamp in the side door pockets of an automobile. Wiring is as usual, to the battery cells, following the door hinges of the car. All lamps are hand patterned to steel dies and furnished in polished nickel with silvered reflectors. The lamp sells for only $8 at retail and a high grade switch is included in the handle, also an external focusing adjustment, five feet of flexible cord, a standard six-volt nitrogen bulb, while other special voltage to fit any electric current source can be supplied



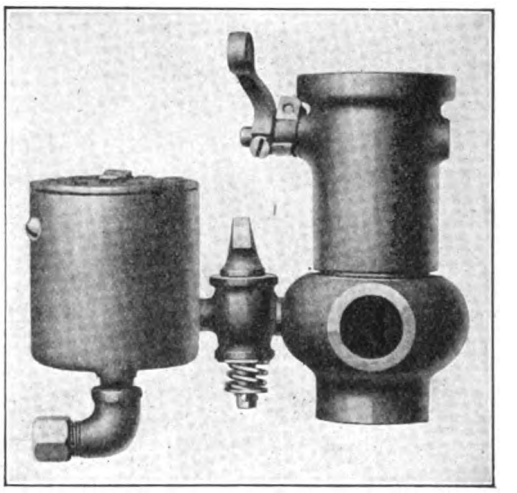
Cellbeam Concealed Spotlight.

upon request. This is a quick selling specialty for dealers and all inquiries or orders should be addressed to the main office of the company in Brooklyn.

A Kerosene Carburetor for Fords.

Illustrated herewith is the Detroit kerosene carburetor especially made for Ford cars. The manufacturers make the following important claims for this new device. They state that it is possible to use kerosene as a motor fuel, if this carburetor is installed on any Ford car. They also state that this carburetor is non-adjustable, throttles down smoothly, idles without loading, increases mileage, is a positive fuel and money saver, eliminates condensation in cylinders and reduces speed changing. They estimate the reduction in cost of any Ford car owner using kerosene instead of gasoline to be about as follows:

One hundred miles cost on gasoline, $1.16; on kerosene, 40 cents; making a saving of 76 cents on each hundred miles. The Detroit kerosene carburetor retails for only $22 f. o. b. Detroit. It is sold with an absolute guarantee of 30 days' trial or money back. This carburetor will be exhibited at the New York and Chicago shows. In the meantime, readers who are interested should write for full particulars to the Detroit Kerosene Carburetor Co., Dept. 66, Kresge building, Detroit, Mich.



The Detroit Kerosene Carburetor.

Keeps Driver's Hands Warm.

Dealers in automobile accessory supplies are glad to welcome any article which helps them extend their selling season. One device that is now on the market that accomplishes this purpose is Steer Warms, an electric hand-warmer, put out by the Interstate Electric Co. of New Orleans, La. Because Steer Warms make driving comfortable in the coldest weather, many people will drive cars who ordinarily would put them up. This means more business for the accessory dealer. As an actual instance of the importance of this device to the accessory business, the case of the Madison Motor Co. will be cited. The Madison Motor Co., Madison, Wis., bought 13 pairs of Steer Warms. These were sold in four days and many more pairs were ordered. In the course of one month's time from the sale of Steer Warms their accessory business was increased 50 per cent. in an off month.

The automobile industry is vitally interested in the matter of keeping cars in use the entire year. Steer Warms is a device that helps do this. It is simple, inexpensive and practical. Steer Warms give comfort and pleasure no matter how cold the weather is and with them a motorist can drive his car all the time. Ladies particularly appreciate Steer Warms. Jobbers and dealers will find it to their advantage to push the sale of this hand-warmer.

Triplexd Hose for Motorists.

Dealer, garage owner and repair man knows the importance of using high quality gasoline hose and the Triplexd hose is recommended by all who have used it. For the appearance of this hose and a sectional construction, we refer readers to the very interesting full page announcement which appears for the first time in this issue of our magazine. The high service qualities are due to its three part construction, metal, rubber and loom woven fabric, the three parts being welded into a unit of strength and compactness through vulcanization. Triplexd hose is wonderfully durable. It can withstand weather, wear and hard usage, because it is strong, flexible and leakproof. The manufacturers state that 48 per cent. of the gasoline pump manufacturers of this company have adopted this hose as standard equipment and over 50 per cent. of the oil companies have adopted it. Readers who are interested should write for interesting literature and full particulars to the Metal Hose and Tubing Co., Raymond and Tillary streets, Brooklyn, N. Y.

Cylinder Grinding, Piston Rings and Gears.

Any of our readers in need of cylinder grinding, special over size piston rings or if they desire gears or sprockets of any description, should write to Nilson-Miller Co., 1302 Hudson street, Hoboken, N. J., as this firm is equipped to duplicate any machine part of any car, domestic or foreign, and the work is guaranteed as to quality, workmanship and material.

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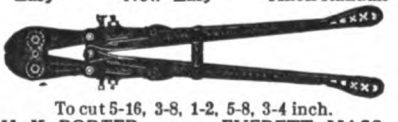
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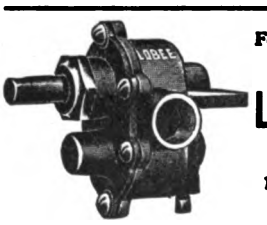


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Double Tread Tires and Tubes

GUARANTEED

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SO ARE OUR TIRES.

Size	Plain	Non-Skid	Tubes
28x3	$4.40	$4.95	$2.00
30x3	5.50	6.05	2.00
30x3½	6.60	7.15	2.50
32x3½	7.15	7.70	2.75
34x3½	8.25	8.80	3.00
30x4	7.70	8.25	2.75
32x4	8.80	9.35	3.00
33x4	8.80	9.90	3.50
34x4	8.80	9.90	3.50
35x4	9.90	11.00	3.60

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Size	Plain	Non-Skid	Tubes
36x4	$9.90	$11.00	$3.60
32x4½	9.90	11.00	3.75
34x4½	11.00	12.10	4.00
35x4½	11.00	12.10	4.10
36x4½	11.00	12.10	4.25
37x4½	12.10	13.20	4.35
34x5	11.00	12.10	4.50
35x5	13.20	14.30	5.00
36x5	13.20	14.30	5.00
37x5	13.75	14.85	5.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street NEW YORK CITY 112-A East 110th Street

THE HOME OF DOUBLE TREAD TIRES

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

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30x3	2.50	3.50	4.48
30x3½	3.00	5.00	5.98
32x3½	3.25	5.25	6.24
34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
36x4	4.25	7.25	8.25
36x4½	4.50	8.50	10.00
37x4½	4.50	8.50	10.00
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Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$5.00	35x4	$9.00
30x3½	5.50	36x4	9.50
32x3½	6.50	36x4½	10.00
32x4	7.00	36x5	10.00
33x4	7.50	37x4½	10.00
34x4	8.00	37x5	10.50
34x4½	8.50		

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TIRES Fresh Stock ALL NON-SKID

Our Guarantee—4,000 Miles

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32x3½	12.50	35x4½	24.75
33x4	17.18	36x4½	25.25
34x4	19.00	37x5	29.75

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10% deposit required, 2% off if cash accompanies order.

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—ON—
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AT A SAVING OF 75%

A Special Discount of 5% When Cash Accompanies Order. We Also Give Special Discount to Dealers

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28x3	$4.50	$5.00	$1.95	35x4	$9.00	$10.00	$3.70
30x3	5.50	6.00	2.05	36x4	9.00	10.00	3.80
30x3½	6.60	7.35	2.40	34x4½	10.00	11.00	4.40
32x3½	7.00	7.70	2.55	35x4½	10.00	11.00	4.50
34x3½	7.70	8.25	2.70	36x4½	10.00	11.00	4.60
31x4	7.70	8.25	3.15	37x4½	10.00	11.00	4.75
32x4	7.70	8.25	3.35	35x5	11.00	12.00	5.35
33x4	8.80	9.50	3.45	36x5	11.00	12.00	5.45
34x4	9.90	10.50	3.60	37x5	11.00	12.00	5.55

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Make sure when ordering tires to state whether Q. D., Straight bead or Clincher type.

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NEW AND SECOND HAND
Tires and Tubes
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Patents

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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Inquiries Invited

Instruction

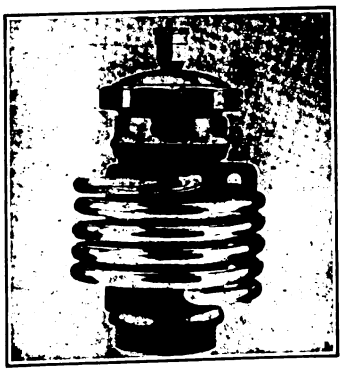
AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Tire Repairing

TIRE SPECIALTY CO.
EXPERT TIRE REPAIRING
Guaranteed Work Moderate Price
757 Seventh Ave. 'Phone, 528 Circle. New York City

Burke Condenser.

A device for preventing loss of fluid from the radiator of a car, whether the liquid be water, alcohol or other solutions used to prevent freezing, has been brought out by the Automobile Devices Co., 1621 Samson street, Philadelphia, Pa. The Burke condenser makes use of the principle of the worm used by moonshiners in distilling whisky. It consists of a shell for receiving the vapors, and it replaces the radiator cap as indicated by the accompanying illustration. A worm connects the top and bottom of the shell, and a double acting relief valve on the top of the shell governs the pressure in the radiator. Inasmuch as the overflow pipe of the radiator is closed, there is no loss of liquid, as any vapors given off are condensed, and the resultant liquid is used over and over again. Another advantage is that the proper level can be maintained in the radiator without loss. The device includes a relief valve which opens whenever steam is generated, and the steam can be easily noted. The Burke condenser is made in two models. The maker has a very interesting booklet describing the causes of loss of water, alcohol, etc., in the cooling system, and the brochure will be sent free upon request.



The Burke Condenser, a Device Converting Vapor Into a Liquid and Preventing Loss of the Fluid.

Front Wheel Roller Bearings.

Some car-owners report trouble with the standard cup and cone bearings furnished with Chevrolet 490 and Ford cars, in that the balls continue to break and eventually jam up in the cup and the broken parts grind up and destroy the cup. The balls also wear through the case-hardening of the cup and finally through the complete thickness of it. When such wear takes place it causes the wheels to become loose and throws them out of line, making steering unsafe and causing excessive tire wear.

All of these troubles have been overcome in the construction and operation of a Taper roller bearing which is being placed on the market by the Bearings Shop, 1402 Michigan avenue, Chicago, Ill. This bearing is made of the very best grade of steel and is scientifically ground and finished. It will replace the standard cup and cone bearing of the Ford and Chevrolet cars without any mechanical operation and will not require any changes to the hubs or spindles. Future delivery orders now in hand prove the worth of this bearing and present users have found it highly satisfactory.

Is Piston Ring Season.

Many owners put their cars in storage during the cold weather, and take advantage of this time to have the machine overhauled for the more regular use in the spring and summer. The conservation of gasoline and power can be greatly increased when these cars are being overhauled by the installation of a complete set of Gill piston rings. The Gill piston ring is manufactured by the Gill Mfg. Co., 351 West 59th street, Chicago, Ill. It is a piston ring noticeable for its simplicity and the perfection of its results. It is as easy to install as the old time split ring and has a distinctive joint which forms a seal that will absolutely prevent the escape of gas and the pumping of oil into the combustion chamber. The Gill piston ring will adjust itself to oversize or worn cylinders and will still be tight. The feature of this ring is that the joint itself is interlocking, keeping the ring tight at top, bottom and both sides.

Tires at Low Prices.

The Service Auto Equipment Corp., 951 Westover Bldg., Kansas City, Mo., offers high-grade tires at manufacturers' prices. Their stock, which includes no seconds, covers all sizes of tires, non-skid or plain and they offer to ship these tires prepaid on approval.

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The National
Auto Shows

Under Auspices of National Automobile Chamber of Commerce, Inc.

January 5-12
At NEW YORK

Jan. 26---Feb. 2
At CHICAGO

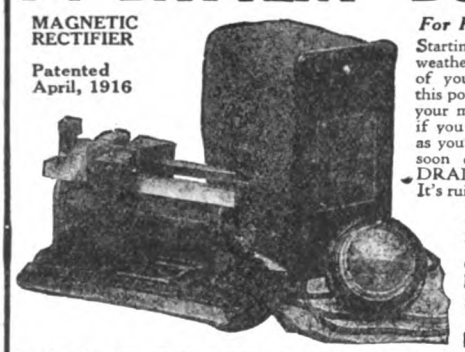
Four Hundred Exhibits of Cars and Accessories

S. A. MILES, Manager **7 East 42nd Street, New York City**

F-F BATTERY BOOSTER

MAGNETIC RECTIFIER

Patented April, 1916



For Public or Private Use

Starting your engine in cold weather pulls the "pep" out of your batteries—don't forget this point! It's just like pulling your money out of the bank—if you don't deposit as rapidly as you withdraw, your bank will soon call a halt. DON'T DRAIN YOUR BATTERY. It's ruinous and soon you'll have to get out the old crank. KEEP YOUR BATTERY FULLY CHARGED by using an F-F Booster.

$18 Complete, and up F. O. B. Cleveland

Prices Advance 1st of Year.

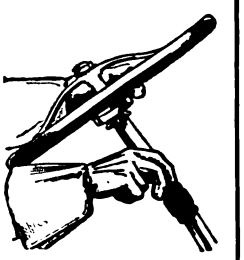
THE FRANCE MANUFACTURING CO., CLEVELAND, OHIO

Ask Your Dealer or Write for Bulletin No. 10

LET FORD TRADE

Increase Your Profits

A brilliant illuminating radiance on low engine speed for country driving when most needed and a variable dimmer for city streets to avoid arrest is the demand of the immense numbers of Ford owners, everywhere.



You can fatten your bank book by supplying this demand with ***Lite-A-Ford,*** an intensifier on low engine speed, variable dimmer giving seven degrees of light and an automatic current regulator. ***Lite-A-Ford*** retails for $2.50.

The remarkable performance of Lite-A-Ford combined with its low cost make it a rapid seller. Write today for terms and territory.

Hastings Mfg. Co., 209 Michigan Ave., Hastings, Michigan

Bittel-Leftwich Co. to Sell Dreadnaught Tires in Middle West.

Five years ago the Bittel-Leftwich Company started a tire service company in a small way at 3569 Lindell boulevard, St. Louis, Mo. In this time the company has grown to be one of the world's great organizations in its line, and now has a business and reputation which are nation-wide. As members of the National Association of Automobile Accessory Jobbers it carries one of the largest stocks of automobile accessories in the Middle West, of which the leader is the Dreadnaught tire. The company now occupies practically the entire ground floor of the Marina building at Grand and Lindell, with three branches in St. Louis and one at Webster Groves. Large branches are also being operated at Decatur and Springfield, Ill., and since taking on the Dreadnaught tire the company's business has increased to such an extent that a new building is being erected for it in Kansas City and a branch office will be opened at Little Rock, Ark. To sell Dreadnaughts and other accessories its traveling men cover Illinois, Missouri, Kansas, Oklahoma and Arkansas. The growth of the Dreadnaught tire business in the United States has been remarkable.

An executive of the company, when asked recently to point out the single factor that in his estimation contributed mostly to the upbuilding of this institution, said: "We think our policy of endeavoring to be not only fair, but over-fair with our customers, has had more to do with our success than any other single circumstance. There have been times when the pursuit of this policy has taxed our patience to a considerable degree, but we are now firmly convinced that it has given us a reputation that we could have attained in no other way."

New Manager for Mitchell.

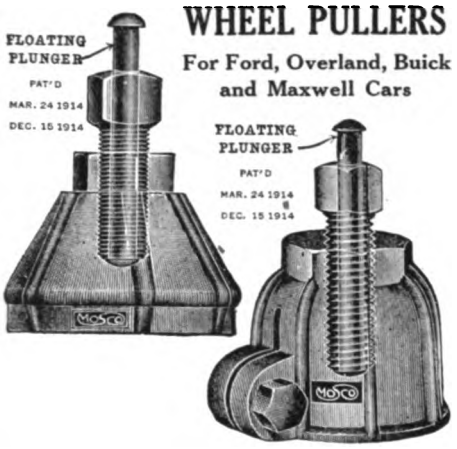
Otis C. Friend, president of the Mitchell Motors Company, has resigned and has been succeeded by D. C. Durland. There has also been another change in the Mitchell organization, R. C. Rueschaw having resigned as a director and sales manager of the Reo Motor Car Company to become vice-president to the Mitchell Motors Company, and he will be associated with Mr. Durland in the general management of the Mitchell organization. Both of the new men in the Mitchell organization have long been favorably known in the trade.

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MOSCO SPECIALTIES MOSCO

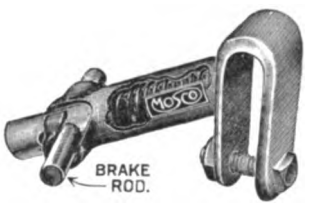
WHEEL PULLERS

For Ford, Overland, Buick and Maxwell Cars



These pullers have an absolutely new feature in the loose plunger which extends through center of screw, affording a means of starting off a wheel which is stuck or frozen to the axle. A sharp blow with a hammer against the end of plunger is a wonderful help.

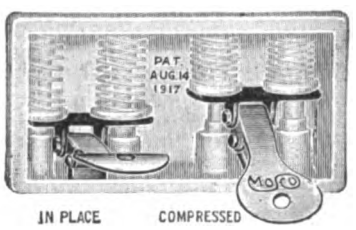
MOSCO Brake Rod Guides For Ford Car



Will positively silence the objectionable rattle of the Ford brake rod, without impeding its full movement. The grease cup prevents wear of the rods and permits easy action. Made of semi-steel and very easily applied.

Price, Plain, 40 Cents Per Pair
Price, with Grease Cup, 60 Cents Per Pair

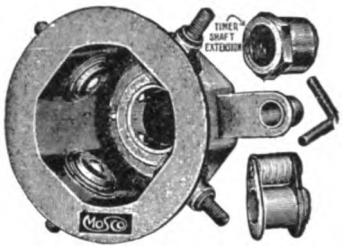
MOSCO Valve Spring Compressor for Ford Car



The use of the MOSCO Valve Spring Compressor eliminates what is usually a troublesome operation, viz., the compressing and replacing of valve springs. By using this simple device, springs can remain in position until grinding of valves is completed. Made of heavy pressed steel.

Price, 50 Each

Improved Bemus Ball Contact Timer for Ford Car



Easier starting. Grease cannot prevent contact. Unbreakable heavy steel shell. Smoother running. Contact is positive. Longer life. No fibre ring to wear humpy.

STARTING—The chief cause of starting trouble in the Ford car is the presence of a body of hardened oil on the flat contact segments of the ordinary type timer, which prevents passage of current from the brush until continued turning has scraped off the grease. In the Bemus the use of balls for contacts eliminates this source of trouble, as but little oil is used, and the balls connot retain more than the slightest film on their surfaces.

Size (in carton), 3¼x3x2. Weight, 9 oz.

Price, $2.25

MOSCO No. 500 Fan Belt Guide for Ford Car



A safeguard against the familiar trouble of belt slipping on greasy fan pulleys. Made of semi-steel. Readily attached to side of timer gear housing without extra hole or bolt.

Price, 25 Each

MOSCO No. 200 Timer for Ford Car



Patented Oct. 31, 1916

The case is made of extra heavy pressed stee., finished in aluminum. Gray bone fibre is used for raceway, with steel inserts dovetailed in and all lathe finished to a polished surface. The threaded terminals are insulated by fibre washers all the way through to contact points, thus removing cause of short circuiting common to this style of timer.

Price, Complete with Brush, Hex Terminals, Pin and Collar, $1.50 Each

MOSCO Anti-Rattling Ball Sockets for Radius Rod of Ford Car



For adjusting tension on ball socket on end of radius rod where it attaches in front of transmission case. Also eliminates rattle.

No. 1, Plain. Price, 30 Cents Each
No. 3, with Grease Cup. Price, 40c Each

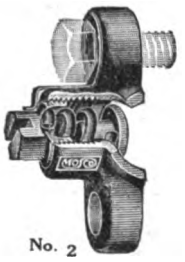
MOSCO Valve Grinder

Patented March 7, 1916



This tool differs radically from others in several respects. It is really more of a machine than a hand tool, as it renders valve grinding an *accurate mechanical operation* rather than a guesswork hand job. **Price, $1.75**

MOSCO Anti-Rattling Ball Socket for Steering Rod of Ford Car



No. 2

AN ENTIRELY NEW DESIGN. For taking up the wear and eliminating the rattle on worn ball sockets on both ends of steering gear connecting rod.

Price, 20 Cents Each (2 in a carton)

MOSCO No. 209 Timer Brush for Regular Type Ford Timer

Patented Oct. 31, 1916



A brush assembly which will fit any Timer using this type. Die cast rotor of white metal alloy, laminated pressed steel arm, spot welded. Roller of phosphor bronze or hardened steel. NOTE the compression spring between roller and rotor, which does away with the breakage common to the expansion form of spring and also ensures even tension all the time.

Price, with Steel Roller, 40 Cents Each

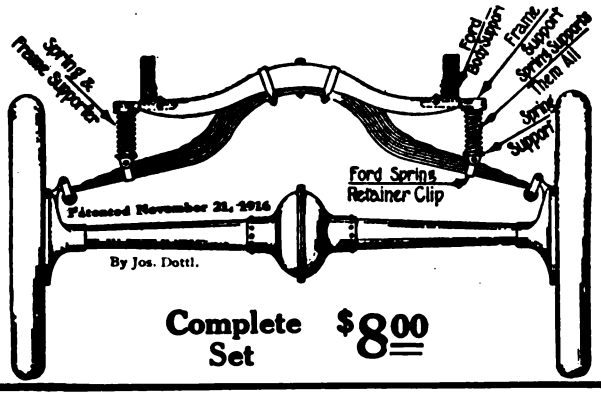
MOTOR SPECIALTIES COMPANY

WALTHAM MANUFACTURERS MASSACHUSETTS

YOUR JOBBER HAS THEM IN STOCK

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Ford Relief Spring *and* Frame Supporter Makes the Ford Perfect



Complete Set $8.00

An Economical, Effective and Valuable Device.

Will double the capacity and prolong life of Ford Cars.

CARRY ONE TON IF NECESSARY

Prevents striking and breaking housing, axle and Fenders, overcomes shearing of center bolt, sagging springs and tilting bodies. Supports frame, improves appearance and riding qualities. Saves the Tires. Acts as an Ideal Shock Absorber.

MADE IN TWO WEIGHTS

No. 1 Pleasure Cars, Carrying up to 800 lbs.
No. 2 Commercial Cars, Carrying up to 2000 lbs.

GUARANTEED, AND MONEY REFUNDED IF FOUND UNSATISFACTORY.

To Strengthen Running Boards and Fenders. Send for Truss Rod Literature.

FORD RELIEF SPRING & FRAME SUPPORTER CO.
5 & 7 East 42nd Street, New York
Telephone Murray Hill 9747

FORD OWNERS NEED NOT BE CRABS—LENGTHEN THEIR ARMS



(Reproduction of Display Easel Furnished)

This tool is the most needed by all owners of Ford Cars, as it will not only accurately measure the Gasoline in the tank but provides the only means of learning whether there is oil in the crank case or not. The pin will prove if the oil cock is stopped up or the oil is used up. No other way is positive, and Oil and Gasoline MUST be there to run The Car.

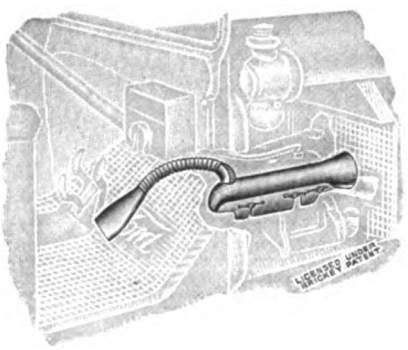
If Your Dealer or Jobber Cannot Supply, Write Us

J. H. FAW, Inc., 43 WARREN STREET, NEW YORK

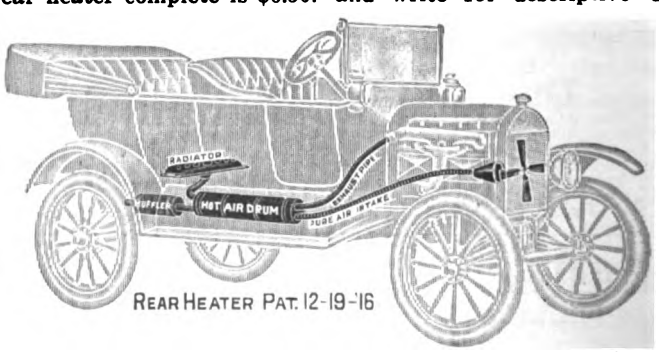
Pure Air Heating System for Ford Cars.

The vast army of Ford owners have long been looking for an efficient and inexpensive heating system. An ideal, simple and effective heater has been patented by a man who has driven a Ford car both winter and summer for the past seven years. Necessity is the mother of invention, and the inventor, R. S. Brickey, has assigned his exclusive manufacturing and sales rights to the Metal Specialties Mfg. Co., 338-352 N. Kedzie avenue, Chicago, Ill., who have perfected this device and are now manufacturing and marketing same in the form shown by the two illustrations herewith. The front heater for the driver's compartment consists of a heavy metal jacket made to fit closely over the manifold of a Ford car, securely fastened and held in place by the exhaust pipe clamps. The fan and the motion of the car drives the air through the heater over the hot manifold and delivers pure, heated air into the car through a flexible tube and fan-shaped radiator thus distributing the air over the front compartment of the car. The Presto front heater retails for $5 complete. The Presto rear heater consists of a cylinder about three feet long, which is placed around the hot exhaust pipe. A metal hose enters the front end of this cylinder which receives its fresh air from the small funnel shaped intake, held in place by one of the bolts on the front side of the engine. The pure air that comes through the radiator is forced by the fan through the funnel and cylinder over the hot exhaust pipe and delivered hot through a flexible metal hose and small register through the sliding damper into the car just in front of the rear seat.

The heat may be shut off either partly or entirely, as desired. The price of the Presto rear heater complete is $6.50.



Presto Heater for Heating Driver's Compartment of Ford Car.



Presto Rear Compartment Heater for Fords.

This system provides a real hot air heating plant that heats the entire car and avoids the possibility of any of the poisonous gases entering the car. The principle of the Presto heating system is exactly the same as a hot air furnace. It is very easily installed, as no new holes are drilled or tapped in the engine and all that is necessary is to cut an inch hole in the front and rear floor boards.

An Electrical Soldering Iron.

The Dover Mfg. Co., Dover, O., whose New York office is located at 30 Church street, is manufacturing an electric soldering iron which is highly thought of wherever it has been used. It can be attached to any electric lighting circuit and in a moment you have your iron hot enough to solder anything you want. There is no waiting for the iron to heat as in the old-fashioned way of doing things.

See announcement on another page and write for descriptive circular and price list. This company makes soldering irons of various sizes, one size being even small enough for the use of jewelers.

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BRUNNER

The Brunner Garage Air Compressor

WILL BE EXHIBITED AT BOTH THE

NEW YORK AND CHICAGO AUTOMOBILE SHOWS

MAKE A NOTE OF THE SPACE NUMBERS



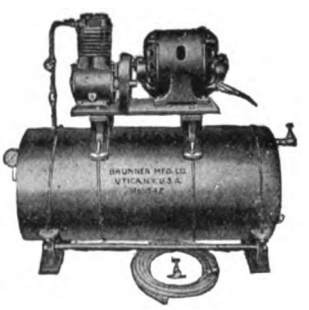


INVESTIGATE THE BRUNNER AIR COMPRESSOR



Every Motorist, Garageman and Jobber attending the New York and Chicago Automobile Shows will find it to his interest to visit the Brunner exhibit and should not fail to grasp the opportunity to become better acquainted with the use of compressed air for tire service.

The motorist interested in the proper care of his tires will find our engineers anxious to give him advice regarding the proper use of compressed air for tire service. The Garageman, whether he is a user of Brunner Equipment or not, will find our engineers ready and willing to assist him in solving his compressed air problems.



The Jobber will find our Sales representatives ready to explain the Brunner Sales Plan for 1918. We extend you a cordial invitation.



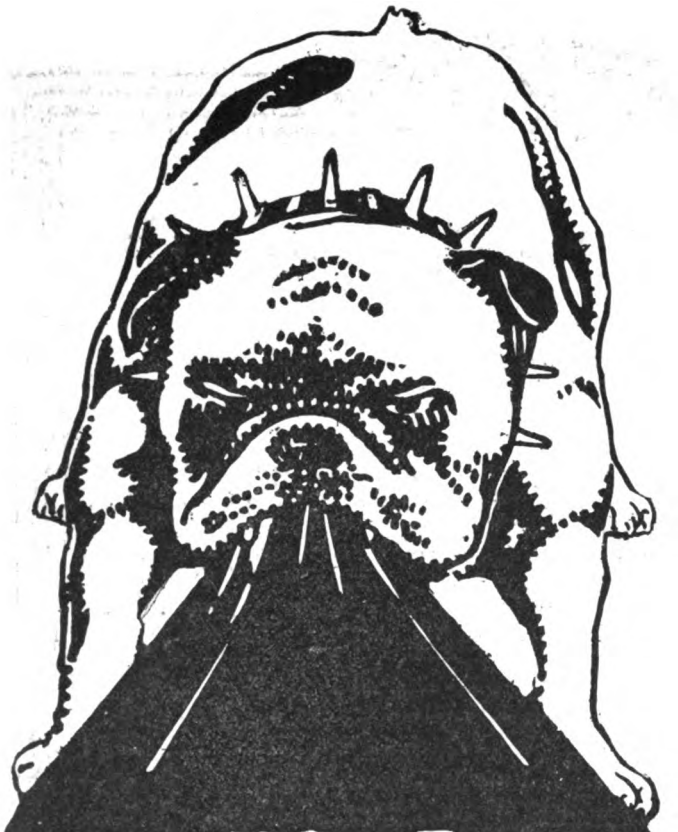
BRUNNER MANUFACTURING CO.



Main Office and Plant:
UTICA,
N. Y.

Cincinnati Branch:
419 First Nat'l Bank Building
CINCINNATI, OHIO

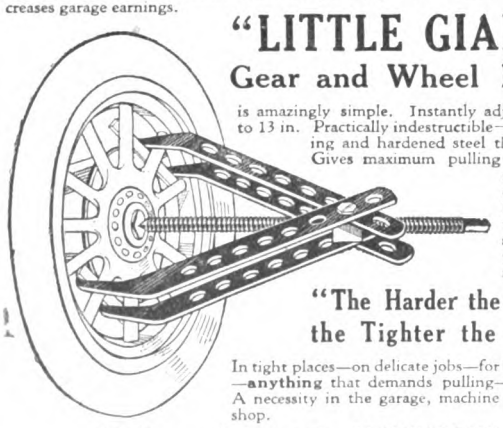
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P-U-L-L
OWERFUL
ERSISTENT

GREATEST improvement ever scored in puller construction. Gives direct —mighty pull that jerks off wheels, bearings, gears, or pulleys—**quick** —**easy**. Does away with need of special pullers—sweeps aside all their multitude of bothers. Pushes work through in jig time. Lessens labor. Increases garage earnings.

"LITTLE GIANT"
Gear and Wheel Puller



is amazingly simple. Instantly adjustable up to 13 in. Practically indestructible—drop forging and hardened steel throughout. Gives maximum pulling power at minimum effort. Never twists or slips. The principle is right—

"The Harder the Pull—the Tighter the Grip"

In tight places—on delicate jobs—for heavy work —**anything** that demands pulling—it's there. A necessity in the garage, machine and repair shop.

Price, $10.00 SATISFACTION GUARANTEED

Exceptionally Liberal Discounts to Dealers. Write for Them—Now

Premier Electric Co., 4033 Ravenswood Ave., Chicago

MOSSBERG TOOLS

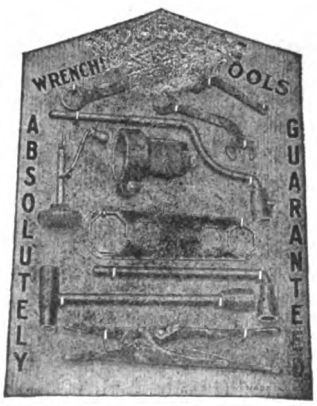
CATCHING OPPORTUNITY WITH THE LID OFF

That's what the Dealers' **Display** Boards mean to the individual purchaser. Nothing covered up—all tools right out before your eyes. Take your pick, Mister——the Dealer's cash register rings again—quick turnover.



This "T" Board, with 23 Small Adjustable Wrenches presents a dandy counter appearance. The board has a natural wood finish, highly polished.

"T" DISPLAY BOARD



"R" DISPLAY BOARD



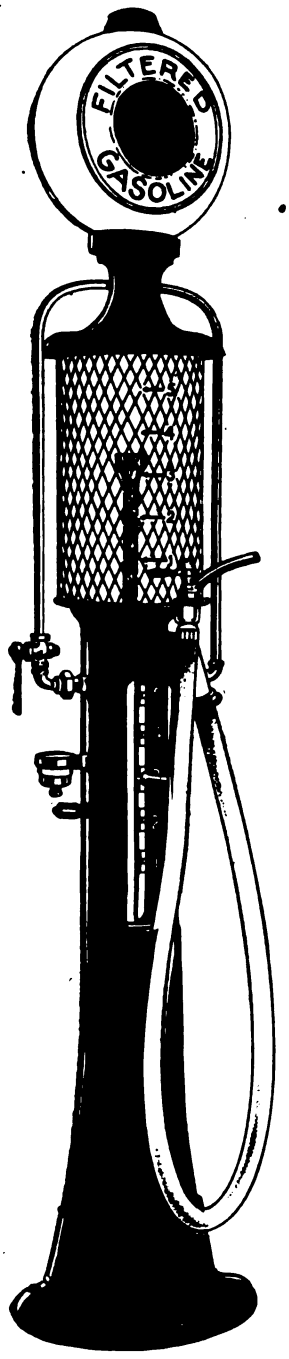
"R" Board for Fords displays 29 Tools for Ford adjustments. Each Tool does a particular job well.

Send for Catalog 191-B

FRANK MOSSBERG CO.
Attleboro, Mass., U. S. A.

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READY TO HANDLE WINTER BUSINESS?



Do you want to avoid loss of time and trade and the expense of making repairs to those old-fashioned gasoline pumps?

You know how frigid temperatures affect the mechanism of the "blind" type, slow-up service and hurt sales.

GUARANTEE VISIBLE PUMPS

No confusion of ratchets, springs and cogs. Simply press a button—the sturdy motor instantly creates a vacuum in the big, clear glass measure.

In one minute your customer has his gas and is on his way. He's satisfied, for he has been served quickly **and he saw what he paid for.**

Some Dealer Territory Open
Write for the Pump Book

Address Dept. 9

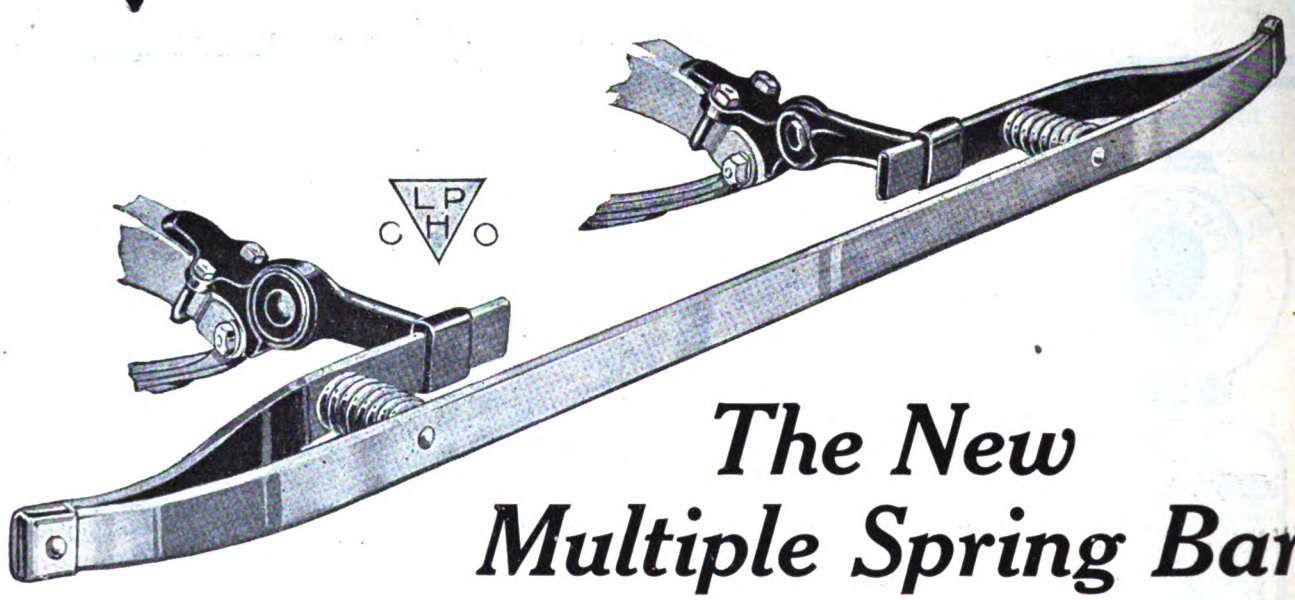
HEPBURN WALKER, Distributor

Guarantee Liquid Measure Company

FARMERS BANK BLDG. PITTSBURGH, PA.

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HALLADAY BUMPERS



The New Multiple Spring Bar

The latest and greatest improvement in bumper construction.

An absolutely new bar construction, comprising a heavy spring steel front bar joined to two supporting bars by means of flexible connections that eliminate breakage.

The final shock-absorbing qualities are attained through heavy buffer springs between the main and support bars.

The result is a bumper with no weak spots, but with the greatest resilience and shock-absorbing qualities ever attained in bumper construction.

We furnish this bar with the fittings shown in the illustration or with any of the Halladay fittings.

HERE IS A WINNER FOR LIVE DEALERS

The experienced car owner instantly recognizes its mechanical qualities and efficiency, and everyone appreciates its thorobred lines and beautiful finish.

Our new catalogue is now ready, every dealer should have one.

Get busy now and get the business of your vicinity; write your jobber or the nearest distributor.

L. P. HALLADAY Company.

DISTRIBUTORS:

ASCH & CO. 16-24 West 61st Street, New York City.
E. L. THOMPSON CO. 817 Boylston Street, Boston, Mass.
GRAY HEATH CO. 1440 Michigan Avenue, Chicago, Ill.
SANFORD BROTHERS, Chattanooga, Tenn., Southern Distributors.
HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

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BIG OPPORTUNITY FOR LIVE DEALERS



TIRES TUBES

We have contracted with the Gordon Tire & Rubber Co. for their entire output of factory blemished tires and tubes.

The demand for blemished tires will be greater this coming year than ever before.

Think what this will mean to YOU:

A Steady Source of Supply
A Tire that Will Bring Repeat Orders
A Tire Originally Made to Be Guaranteed 5000 Miles
Not a Made-Up Second to Sell at a "Price"
A Tire You Can Conscientiously Recommend
An Investment that Will Show Real Profits
Full Co-Operation from an Old, Reliable House

By our "PROTECTED TERRITORY PLAN" you can have exclusive agency.

Write Today for Full Particulars
Supply Limited — Don't Delay

JANDORF AUTOMOBILE CO., Inc.
"World's Largest Dealers"
1763 BROADWAY NEW YORK CITY

Crane TRADE MARK

ENGINE-DRIVEN TIRE PUMP

Does what *no* other tire pump *can do.* Because BUILT as *no* other pump *can* be built.

Piston works *through* a Packing-Ring, reducing wear to the *minimum.*

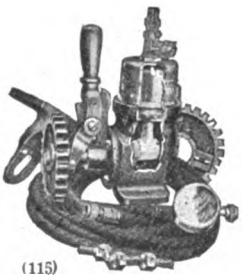
Beveled base of Ring shaves surplus oil off piston at every stroke. Permits ample lubrication, but prevents oil passing Ring.

Ring is endless. No gaps for air to leak out or oil to leak in. Can be instantly adjusted (by turning cylinder) to maintain air-tight, oil-proof fit, and insures 97% efficiency. This high efficiency enables the CRANE to do the work of pumps twice it size, weight and parts.

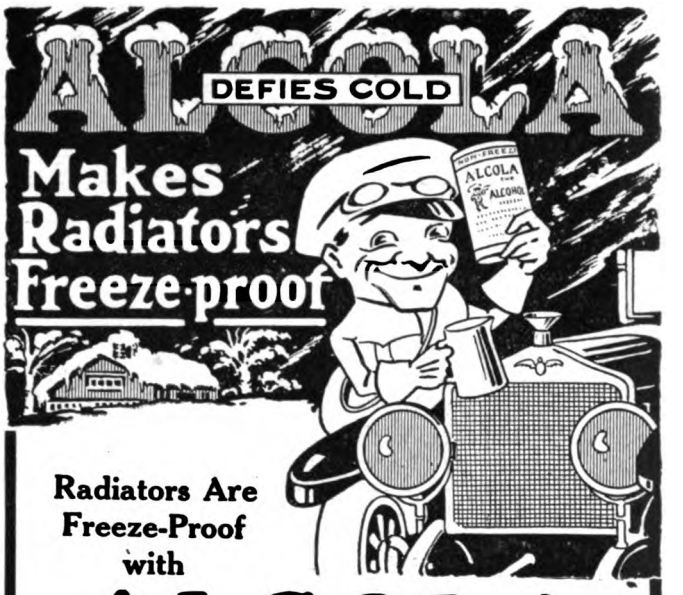
And small size, light weight, few parts and simplicity means low production-cost.

That's why the CRANE sells for $10 complete despite high grade materials and finest workmanship.

The full story of the CRANE and its patented Packing-Ring is told in an interesting little Folder—just off the press. Write for FREE copy to-day.



BAY STATE PUMP COMPANY
100 PURCHASE STREET,
BOSTON, MASS.
Export Dept., 100 Broad St., New York (115)



Radiators Are Freeze-Proof with

ALCOLA

under lowest temperatures

Keeps radiators from freezing at 20 degrees below zero.

Use your car all Winter. Get a full year's service now that the bugbear of freezing water systems has been removed by ALCOLA.

To the owners of light delivery cars and trucks, ALCOLA is worth ten times its cost.

Your car can stand in the coldest temperatures, if you dissolve ALCOLA in the water. Instantly soluble in cold water.

Water Freezes **Alcohol Evaporates**

ALCOLA

Neither Freezes Nor Evaporates

ALCOLA is *chemically neutral.* It will not rust or corrode. One treatment is enough for entire Winter. ALCOLA raises the boiling point of your cooling system to 250 degrees—whereas alcohol boils at 131 degrees and water at 212 degrees—ALCOLA boils at 250 degrees.

Price, in the U. S., $2.00
" in Canada, 2.50

DEALERS: Your winter sales can be greatly increased by instantly stocking in with ALCOLA. There is an enormous demand for this product. Put in a moderate stock at once, to take care of immediate orders.

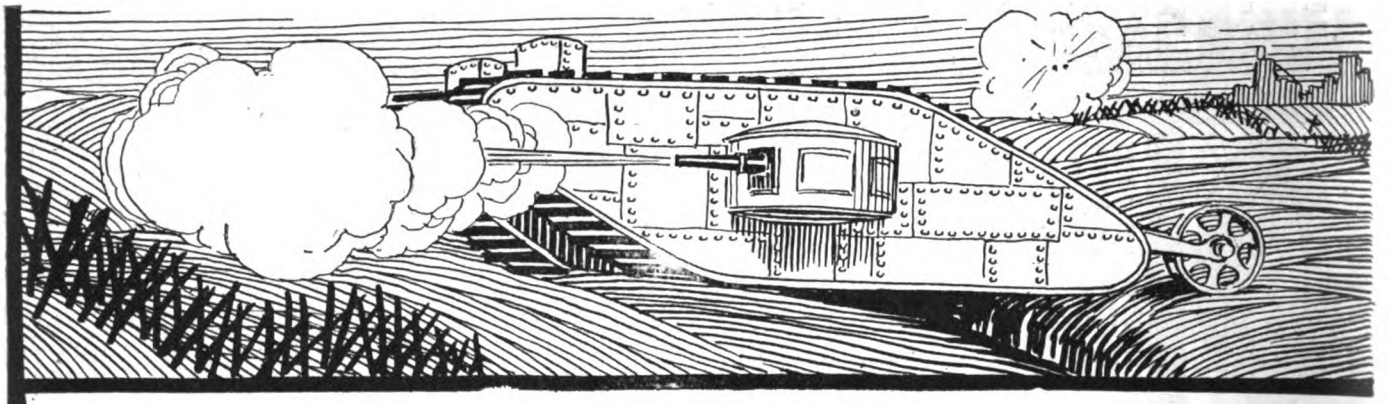
We have no fear but that you will come back with constant repeat orders. A big, liberal proposition should enlist your hearty co-operation.

Alcemo Mfg. Co.
200 Bridge Street
Newark, N. J.

MAIL THIS TODAY
ALCEMO MFG. CO., 200 Bridge St., Newark, N. J.
Ship me 1 dozen ALCOLA at dealer's discount.
Name .....
Address .....

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LIKE THE TANKS IN FRANCE-



Superior PRODUCTS

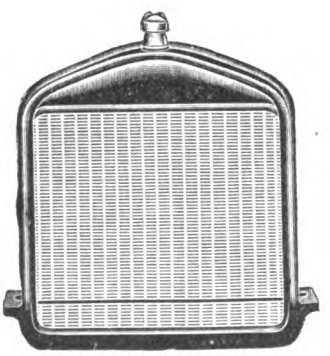
GO OVER THE TOP AND LEAD DEALERS TO SUCCESS!

MR. DEALER: THE BIG 1918 DRIVE IS ON—
SELL THE Superior PRODUCTS LINE OF
PROFIT-PRODUCING-PRODUCTS

The steady and ever increasing demand for the big line of Superior PRODUCTS for Ford and other cars is evidenced by continual repeat orders received from hundreds of satisfied live dealers everywhere.

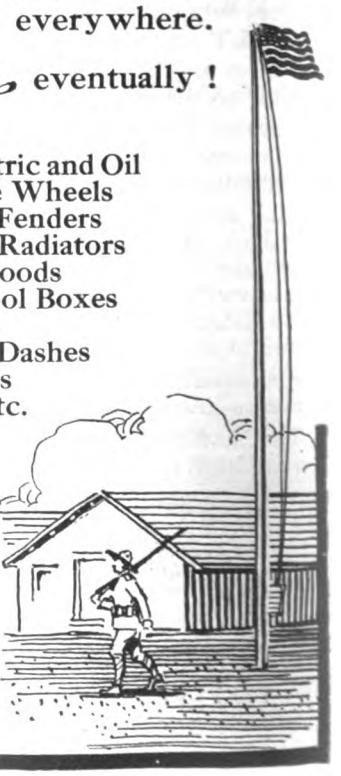
If you're not already one of them—you will buy Superior PRODUCTS eventually!

Tubular Radiators
Crown Fenders
Running Boards
Electric Fittings
Wire Wheels
Windshields
Lamp Brackets
Hand Horns
Lamp Parts
Bumpers, etc.



FOR FORD CARS

Lamps—Electric and Oil
Demountable Wheels
Commercial Fenders
Honeycomb Radiators
Streamline Hoods
Jacks and Tool Boxes
Tire Carriers
Commercial Dashes
Electric Bulbs
Floor Mats, Etc.



"SUPERIOR" AUTOMOBILE PRODUCTS

"When You Buy From Us, You Deal With Headquarters"

UP-TO-THE-MINUTE DEALERS CAN HAVE CATALOG FOR THE ASKING! WRITE TODAY—YOU'LL NEED IT!

Superior Lamp Mfg. Company

(Wholesale Accessory Division)

136-140 West 52nd Street New York, U. S. A.

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Sign of a Satisfied Dealer

WHERE you see a Firestone Sign you find a contented dealer. His customers are happy. His business is booming. He is receiving thorough-going selling co-operation. Firestone Tires satisfy dealers because they satisfy customers. Cord or Fabric, they meet the most severe conditions successfully. The dealer knows this; no one better. He knows, too, that sales helps are at his call at any time. Whatever his local conditions, there's a Firestone selling plan to meet them.

Attractive advertisements, booklets, folders and magazine "Milestones," carrying the dealer's own advertising; these selling aids establish a business firmly.

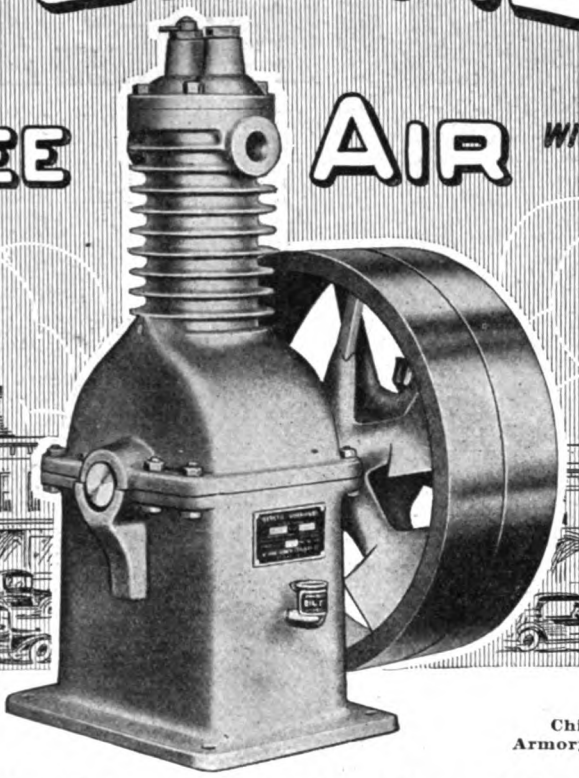
DEALERS: If you do not know the Firestone proposition, write for it. Good for your customers. Good for you.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere

Firestone

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DEPENDABLE FREE AIR WITHOUT OIL



New York Show Exhibit
Spaces D-171-172

Chicago Show Exhibit
Armory Balcony Spaces 23-24

Better Service Brings You More Trade

Auto owners have awakened to the fact that all "Free Air" service is not alike. They are demanding PURE AIR for their tires because they have learned that oil rots tires and that AIR FREE FROM OIL means less blowouts, fewer punctures, greater tire mileage, less repairs and a great saving in up-keep every month. Cater to the demands of the auto owners—give them what they want. Make your place the most popular in town by furnishing

CURTIS AIR
FREE FROM OIL







Curtis Compressors are the result of 25 years experience in the manufacture of high grade pneumatic machinery. They are reliable, dependable, require practically no attention, are economical to operate, guaranteed to stand up under the severest strains of hard usage and furnish a continuous supply of cool, pure, clean air. While otners claim to furnish air free from oil, Curtis is the only Garage Air Compressor with the controlled splash oil system—**our own exclusive patented device** which prevents flooding the cylinder with more oil than it needs or can use—and eliminates all danger of forcing oil into the air line. Curtis Air is pure air—free from impurities—free from oil—the kind of air that makes tires last longer and pleases every patron.

Curtis Compressors Pay For Themselves

They build business—hold your old trade—bring new patrons to your door—and by the superiority of your Free Air Service, create a feeling of confidence in the quality and reliability of your entire stock. And more than that—a Curtis Compressor will save you big money by supplying air for air hoists, painting, cleaning, vulcanizing, blowing dust and drillings from tools and serving you in many other ways.

5 Sizes—125 Combinations

There is a Curtis Compressor to meet the requirements of your business in every way—just the size, arrangement and price to please you. It will pay you to investigate. Ask your jobber—or cut out and mail us the attached coupon TODAY.

Curtis Pneumatic Machinery Co.
1530 Kienlen Ave.
St. Louis, Mo.

Curtis Pneumatic Mach. Co.

1530 Kienlen Ave., St. Louis, Mo.

Branch Office
530-E Hudson Terminal,
New York, City

Gentlemen: Please send me full details on Curtis Air Compressors —your proposition and low prices.

Name .....

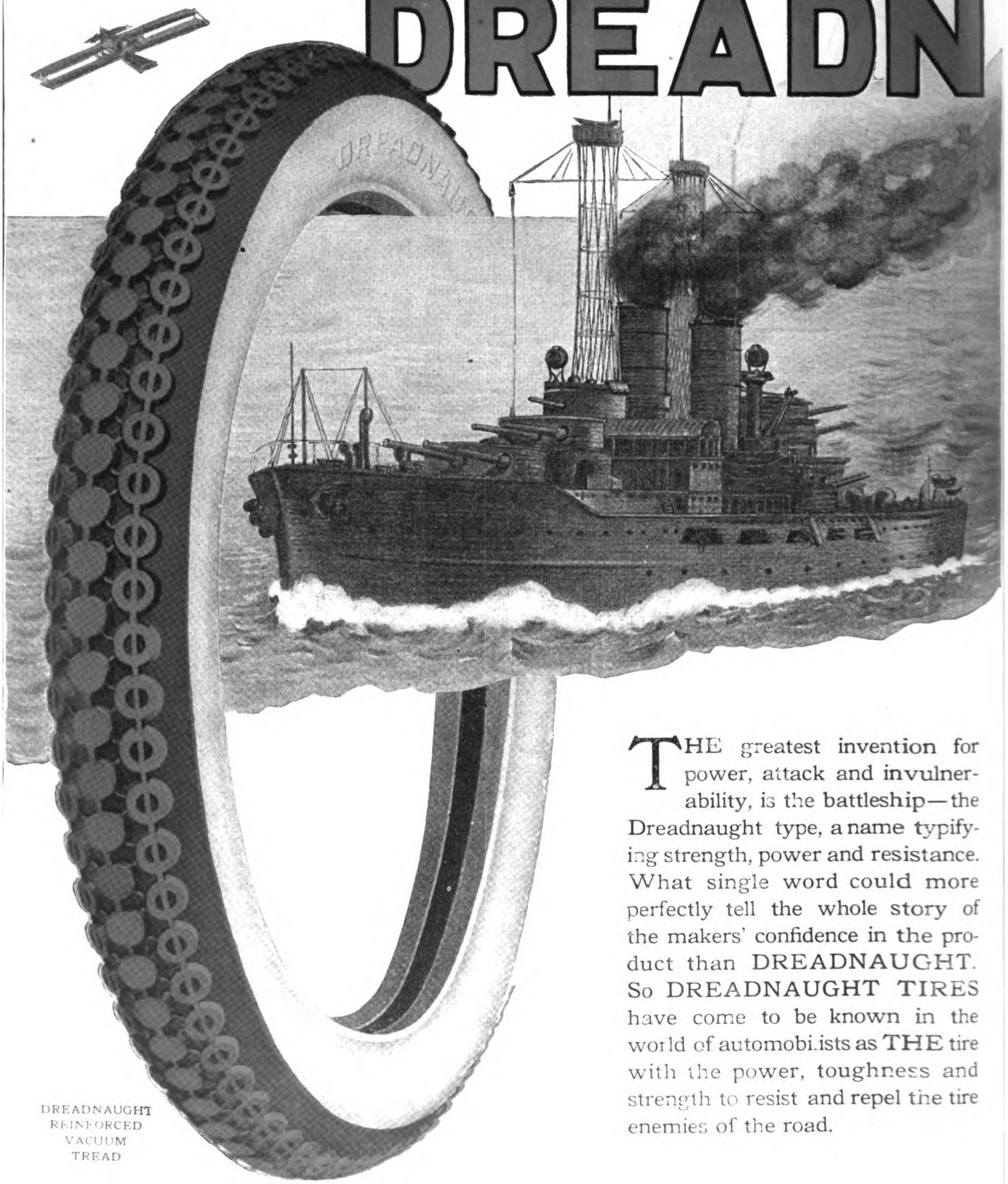
Address .....

Jobber's Name .....

Address .....

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DREADN

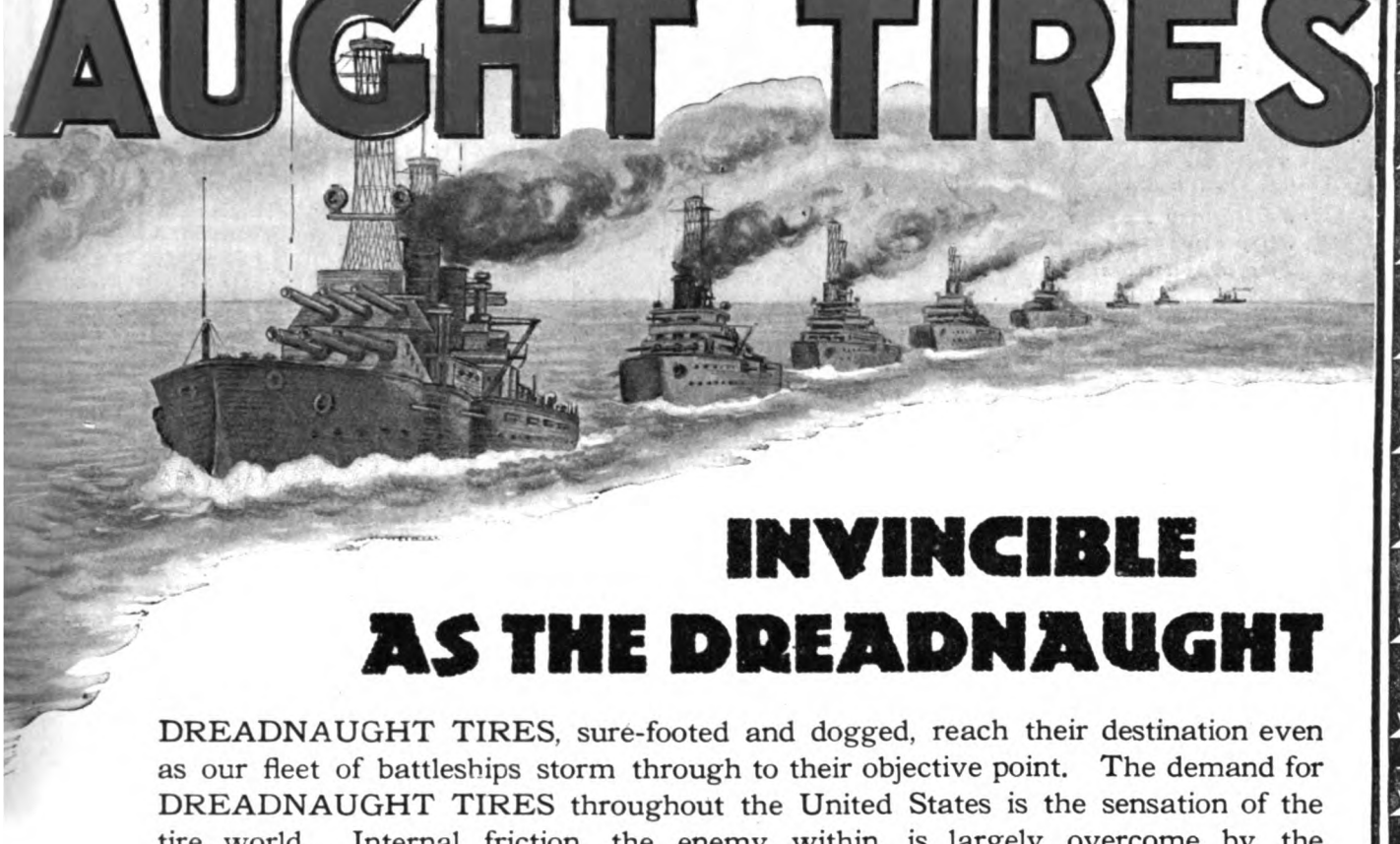


DREADNAUGHT
REINFORCED
VACUUM
TREAD

THE greatest invention for power, attack and invulnerability, is the battleship—the Dreadnaught type, a name typifying strength, power and resistance. What single word could more perfectly tell the whole story of the makers' confidence in the product than DREADNAUGHT. So DREADNAUGHT TIRES have come to be known in the world of automobilists as THE tire with the power, toughness and strength to resist and repel the tire enemies of the road.

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AUGHT TIRES



INVINCIBLE AS THE DREADNAUGHT

DREADNAUGHT TIRES, sure-footed and dogged, reach their destination even as our fleet of battleships storm through to their objective point. The demand for DREADNAUGHT TIRES throughout the United States is the sensation of the tire world. Internal friction, the enemy within, is largely overcome by the DREADNAUGHT process of frictioning the fabric and by the use of a very heavy skim coat between the plies.

5,000 MILES GUARANTEED

DREADNAUGHT TIRES are made in two treads—the DREADNAUGHT reinforced Vacuum which has solved the skid problem and the DREADNAUGHT Ribbed Tread which supplants the old-time plain tread and is universally the front wheel favorite.

SUPER-DREADNAUGHT RED INNER TUBES retain their elasticity and velvety softness to the last mile. They are generously thick. When used in conjunction with the DREADNAUGHT casing they make the perfect tire.

MANUFACTURED BY

The Dreadnaught Tire and Rubber Company

BALTIMORE, MARYLAND

We have an exceptional proposition for dealers and assure excellent service and territorial protection with intensive co-operation from our organization. Write or wire, Department "I."

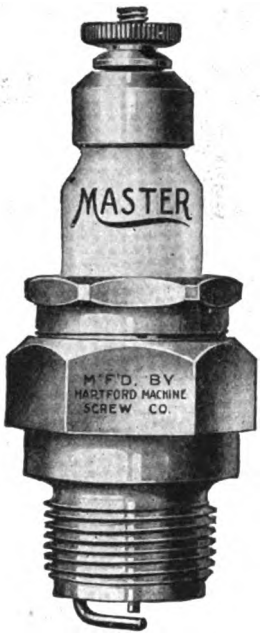
CHAS. F. U. KELLY, Inc., *Sales Department*, 1834 Broadway, New York

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MASTER

THE PROPER PLUG FOR

Passenger Cars
Motor Trucks
Tractors
Marine Engines
Stationary Engines
Airplanes
Fire Apparatus



ONE OF THE BIG ESSENTIALS

— toward speeding up the transportation of the country is— Uninterrupted operation of all motor vehicles.

MASTER

Calorite Spark Plugs

— in every detail of the materials entering into the construction,
— in the high quality of workmanship,
— in the individual test of each plug under actual conditions of pressure and electrical voltage it may encounter in actual service and—in their scientific design Master Plugs answer every requirement indicated for a spark plug of exceptional stamina, long life and freedom from troubles characteristic of plugs not so well known nor of the quality of Masters.

A combination of—self evident value, liberal margin for both jobber and dealer and a guarantee broad in its scope, makes the distribution of Master Calorite Spark Plugs an attractive and extremely desirable concession.

We shall exhibit at the New York Show—Grand Central Palace—Space D 57.

There are many good reasons why Master Calorite Spark Plugs should be your selection.

Their design is in accord with the best automobile engineering demand and practices.

They are sturdily constructed of the finest materials obtainable.

They are tested under rigid inspection rules.

They are generously guaranteed.

And in their resale you derive a margin of profit which justifies your whole hearted recommendation of these plugs to your customers.

There is a Master Calorite Spark Plug for every variety of service.

And the retail price is amply justified by their efficiency and durability.

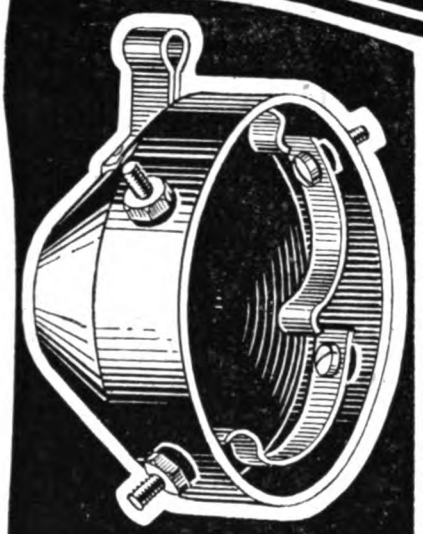
$1.00 and $1.25 retail
Depending upon the size.

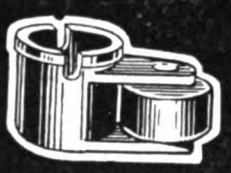
HARTFORD MACHINE SCREW COMPANY
514 Capitol Avenue HARTFORD, CONN.

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TRADE APCO MARK

TIMER FOR FORDS





$1.00 LIST

I AM a brand new idea in Timers for Ford cars and I will give your Ford such ignition as it could not get, except with a high tension magneto.

I WILL serve you longer and with less trouble than any other Timer, at any price, because I am not an ordinary Timer, made cheap, but an extraordinary Timer built well and sold at a low price.

I AM not dressed up in gold plate, enamel or even aluminum paint; but man, how I can work!

I COME of good stock; my springs are clock springs; my roller is high grade hardened steel, running on a hardened steel bushing held in a die casting; my insulation is the finest quality bone fibre.

I WILL give you more power, more speed, a quicker getaway, an easier start, smoother running, no short circuits, longer life to your platinum points, more miles to the gallon of gasoline; and take it from me, when I go to work for you, you can forget your Timer troubles.

I HAVE no fibre ring to swell and give trouble and I have no delicate spring to hold the roller against the contacts. Instead of this, my contacts are heavy springs and my roller is on solid arms attached to the cam shaft.

I CAN work hard, and if I wear out my springs, they only cost twenty cents a set and you can replace them in a few minutes on the road. If your car lasts long enough to wear out a roller, a new one cost thirty cents complete, and as for my body, it never wears out.

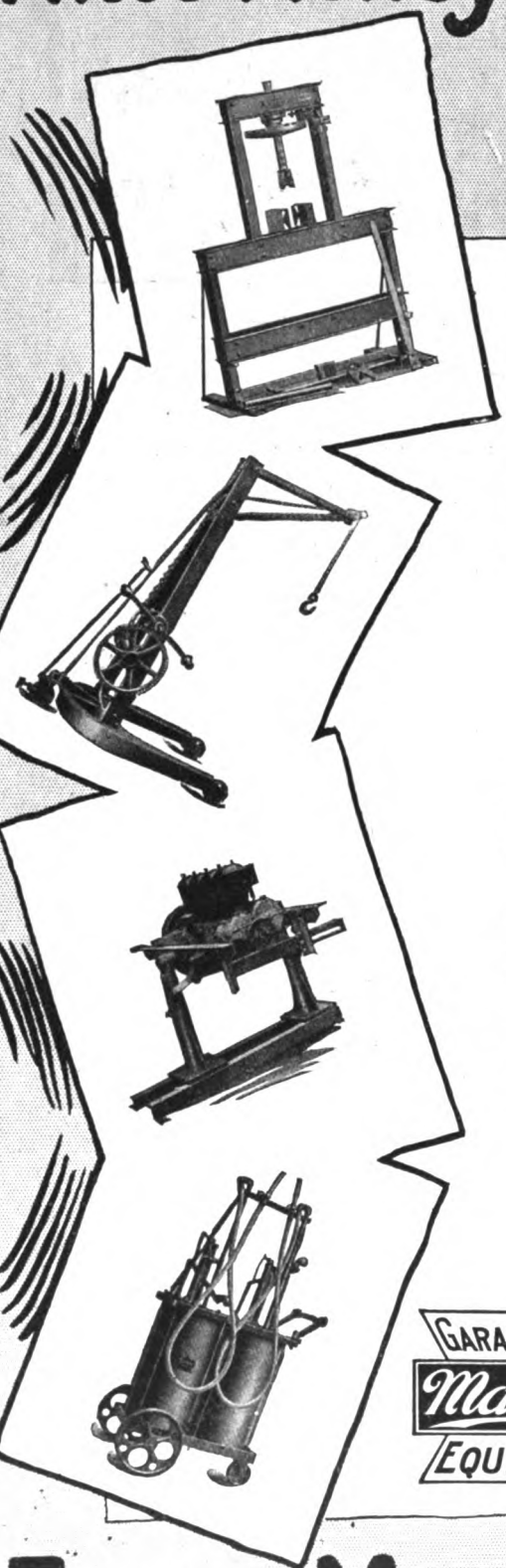
I COME in a heavy cardboard box and the Apco on the outside is all the reference you need.

I WILL work for you as long as I live and the "good die young" phrase does not apply to me.

APCO MANUFACTURING CO.
PROVIDENCE, RHODE ISLAND

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These Money Makers For Prizes at the Auto Shows



EVERY garage man visiting our exhibit at either the New York or Chicago Show will be given an opportunity to get some of the famous Manley Garage Machines **free.**

We will conduct a contest at both Shows and will give away four of our most popular machines as prizes to the winners. These prizes will be:

One Manley 22-ton Press
One Manley 1-ton Portable Crane
One Manley 2-tank Oil Service
One Manley Engine Stand

The contest at either Show will be distinct from the contest held at the other. Every visitor can have a chance on all four machines given away at the Show which he attends.

Manley equipment is designed and built especially for garage service and conditions. These specialties have been proven great time and labor savers for garage work in all parts of the country. You should be interested in seeing this line and learning how it will enable you to make money in your business.

OUR EXHIBIT WILL BE LOCATED AS FOLLOWS:

Chicago Show, Space 10D Coliseum Basement.
New York Show, Space D198, Fourth Floor Grand Central Palace.

Look us up and remember you may be lucky enough to win the very machine you like best. Don't forget the contest will be on at both Shows.

GARAGE & SHOP Manley EQUIPMENT

United Engine & Mfg. Co.
HANOVER, PENNA.

Four Manley Machines To Winners at Each Show

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H-M

Adjustable Metal Radiator Cover for All Model Ford Cars

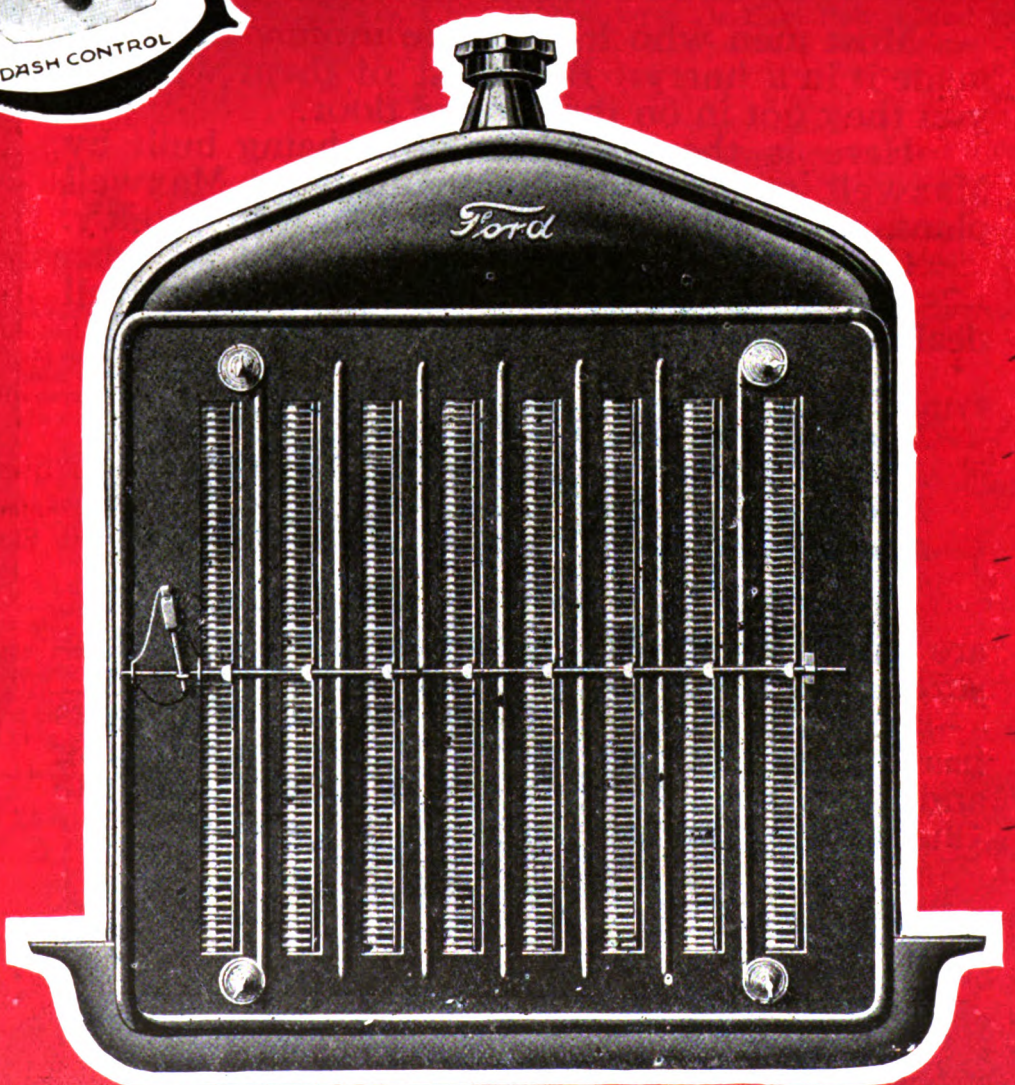
A thoroughly practical Adjustable METAL Radiator Cover. Made of sheet metal, lasts for years and pays for itself in one winter's saving in fuel. Operates from foot-board or dash of car—no need to leave seat. Will keep radiator warm for hours in coldest weather. Attached by anyone in few minutes.

Price $5.00



Dealers—Write at once for our proposition showing how to turn your winter months into profits. H-M Adjustable **Metal** Radiator Covers are selling by the thousand. Get your share of these quick, sure profits by acting **at once.** Write today—it means money in your pocket.

H-M MANUFACTURING COMPANY
Department 28 122 So. Michigan Avenue, Chicago



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This is the Getting-in-on-the-Ground-Floor Day in Chalmers

Most men who have made money have not made it in a hurry. But most of them will tell you they got in on the ground floor.

Here is the Chalmers now being built by Maxwell men, now being guided by Maxwell plans, now being financed by Maxwell money.

Ground floor time? Yes.

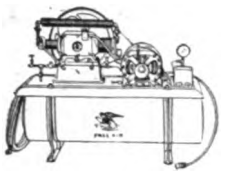
For those plans that have made Maxwell dealers prosperous as these figures show:

Maxwell dealers MADE *in 1913-1914 over* $2,500,000
Maxwell dealers MADE *in 1914-1915 over* $4,700,000
Maxwell dealers MADE *in 1915-1916 over* $8,000,000
Maxwell dealers MADE *in 1916-1917 over* $12,000,000

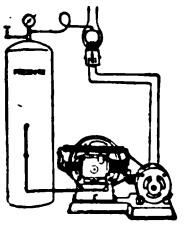
are going to win for Chalmers dealers, just as sure as the sun is going to rise tomorrow.

Already the movement towards Chalmers has begun. You may wake up some fine morning and find your strongest competitor has the Chalmers account.

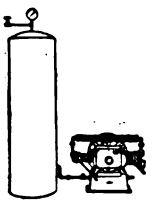
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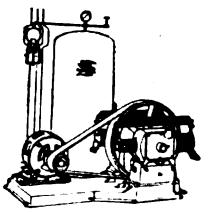
De Luxe Two-Stage Complete Automatic Unit
Capacity, four cubic feet per minute. Self-contained. Runs from lamp socket.



Two-Stage Units with Tight and Loose Pulley
for line shaft drive. Equipment 31-T — capacity, four cubic feet per minute. Equipment 41-T — capacity, ten cubic feet per minute.



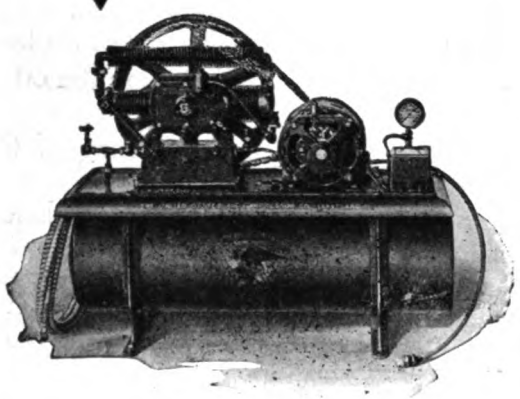
Complete Two-Stage Automatic Unit
Equipment 34—capacity, four cubic feet per minute. Equipment 44—capacity, ten cubic feet per minute.



Two-Stage Duplex Automatic Air Plant
Equipment 48 -capacity, twenty cubic feet per minute.



Portable Two-Stage Compressor
Equipment 35—capacity, four cubic per minute.



The U. S. Two-Stage De Luxe Automatic Air Unit

This is a garage and free air station compressor De Luxe, incorporating more improvements and refinements than any unit ever produced.

It exactly meets the demands of a large majority of garages as proved by the fact that more of this number are sold than all our other compressors combined.

The De Luxe is uneqalled in all 'round features. It maintains high pressure in great volume, is extremely quiet in operation, handsome in appearance, entirely automatic in operation, self-oiling, and requires only a minimum of attention.

To buy a De Luxe compressor means to obtain the best and be assured of long continued satisfaction. This outfit has been tried for you and found not wanting by thousands of garagemen thruout the country and by several corporations of international prominence who have found them so superior as to be adopted as standard equipment for all their installations.

The Leader of a Complete and Remarkably Successful Line

THE Two-Stage principle of operation as utilized in United States Air Compressors has been proven absolutely unequalled and the perfected compressor combined with various tank equipments until the line is now as complete as can be desired, incorporating units for every requirement.

The leading number of the United States line is described at length on this page and several of the other units referred to briefly. The De Luxe Unit is ideal for a majority of requirements; Equipment 48 Duplex suited for garages having unusual conditions, while Equipment 31-T or 41-T are of interest to those who wish to use line shaft drive. Several other units are manufactured and compressors without any equipment whatever may be purchased if desired.

In addition to U. S. Two-Stage Compressors a complete line of Single-Stage Compressors is manufactured as briefly described below. These are as efficient and highly refined as it is possible to produce under the Single-Stage principle.

Send for Our New 32-Page Catalog
Just off the Press

See Us at the Auto Shows

NEW YORK—Space D-15, Fourth Floor, Grand Central Palace, January 5th–12th.
CHICAGO—Space 3, Coliseum Basement, January 26th–February 22nd.
BOSTON—Space 518, Mechanics Bldg, March 2nd–9th.

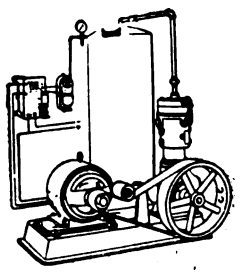
The United States Air Compressor Co.
Cleveland, Ohio

Gentlemen:
Please send us your Catalog as advertised in The Automobile Dealer and Repairer.

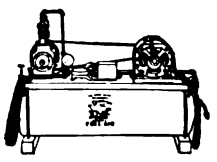
NAME .....
ADDRESS ..... CITY.....
DATE..... .....

The United States Air Compressor Co.

6542 Carnegie Ave., Cleveland, Ohio



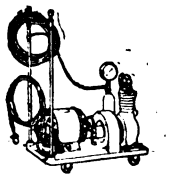
Single-Stage Water Cooled Complete Automatic Air Plant
Equipment G-15—capacity, twenty-one cubic feet per minute.



Single-Stage Air Unit
Equipment G-11—capacity, one and one-half cubic feet per minute.

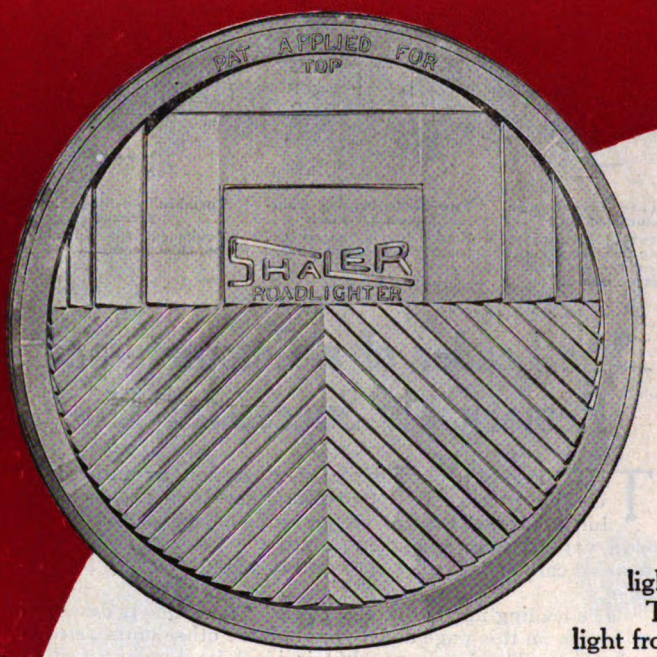


Single-Stage Portable Direct Inflation Air Unit
Equipment G-12—capacity, one and one-half cubic feet per minute.



Single-Stage Complete Automatic Air Unit
Equipment D-22—capacity, two and one-half cubic feet per minute.

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Front View of the SHALER Roadlighter

Makes Night Driving Safe

The SHALER Roadlighter is not a dimmer—it is a lighter—yet it conforms to all no-glare laws.

The country is flooded with lenses of all kinds and descriptions. You know that most of them are merely made to sell. They simply diffuse the light so as to get by the law.

That is all right for the fellow in the other car. But how about you?

It simply means that the efficiency of the lights on your car has been lessened.

The motoring public has been waiting for a headlight front that performs two distinct functions:

1.—To prevent a glare from the lights on your own car.

2.—To get a *strong* driving light—so strong that no matter how intense the glare of the approaching car you will not be blinded, but can see the edge of the road clearly and pass safely without slowing down.

SHALER

It Shoots the Light Far Ahead

The prisms take the light which with an ordinary lens is spread and wasted along the sides of the road too far ahead of the car to be of any practical value and bend it, concentrating it as extra light on the road-bed.

Result: At a distance of say 200 feet ahead of the car the light on the road is approximately twice the intensity of that from a bulb of the same candle power projected through a clear glass headlight.

Pierces the Glare of Approaching Headlights

The light is so intense that it will pierce the glare from an approaching car and give a clear view of the side of the road when passing. This exclusive feature of the SHALER Roadlighter is of prime importance.

The light which ordinarily shoots up into the air and is lost is bent down and toward both sides by the inner portion of the diagonal prisms so that the most concentrated part of the light is converted into an intense beam effect along the sides of the road, such as could only be obtained by using a spot-light on each side of the car. This highly intensified light counteracts the glare from an approaching headlight and enables one to keep a clear view of the edge of the road and pass in perfect safety without slowing down.

Rays Penetrate Fog and Dust

With any lens which permits the light to come above the level of the headlight, the rays strike the fog or dust particles and form a curtain of back-glare between the driver's eyes and the road. With the SHALER Roadlighter all the light is held down below the level of the headlight, doing away with the back-glare so that the driver is enabled to see ahead to the full length of the rays. Discoloring the glass and thereby dimming the light for driving under ordinary conditions is eliminated by the efficient design.

Tested—Proved—Guaranteed

The reports of our own experts—the official tests made in various cities and states—the photometer and illuminometer tests made by Mr. F. A. Vaughn, Chairman of the Headlight Committee of the Society of Illuminating Engineers, have demonstrated beyond the shadow of a doubt that the SHALER Roadlighter is infinitely superior in every way, and that it is the only lens that makes night driving as safe as by daylight. *Every SHALER Roadlighter is sold under a positive guarantee of absolute satisfaction.*

C. A. Shaler Co.
Waupun,

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Lights The Whole Road

You can now drive at night—with just as much safety—and just as fast as in daytime—without the delay and danger of slowing down and dimming your lights to allow another car to pass.

The new SHALER Roadlighter lights the entire road, from fence to fence, with a bright, white, evenly distributed light.

It has no glare—absolutely none—and the light beams are never more than 42 inches above the ground—at any distance from your car.

All of the light is evenly distributed on the road where you need it, giving brighter, safer night roads than you have ever seen before. It is approved by city, state and police officials everywhere and endorsed by leading accident insurance companies.



Unretouched Midnight Photograph

ROADLIGHTER

It Illuminates the Ditches

The outer portion of diagonal prisms bends some of the light down and toward both sides, giving a wide-spreading fan of light that illuminates the ditches clear to the fences.

It Is Easy to Keep Clean

The outer surface of the SHALER Roadlighter is perfectly smooth. There are no projections whatsoever on the outside to catch and hold snow, rain or dirt.

It Is Easy to Install

Since the outer surface of the SHALER Roadlighter is perfectly smooth; there are no projections against the rim of the headlight door to prevent proper seating. Therefore it is not necessary to know the diameter of the opening in the face of the lamp door.

Accurate Focusing Unnecessary

The prisms, which are at different angles with the smooth surface of the SHALER Roadlighter, deflect the rays so that there are no dark spots even if the bulb is not exactly focused.

It Is Legal Everywhere

The rays passing through the upper half of the lens are projected below the horizontal by the reflector itself and hence none of them are more than 42" above the surface of the road. The rays passing through the lower half of the lens are bent down below the horizontal by the diagonal prisms and hence are not projected more than 42" above the surface of the road—thus no light is wasted in glare and the SHALER Roadlighter complies with all no-glare ordinances.

Regular retail prices of the SHALER Roadlighter are $2.75 per pair for Ford size and smaller; $3.50 for larger sizes. Packed ten in a carton.

Limited Offer to Dealers Only

We want every automobile accessory dealer in the United States to try out a pair of SHALER Roadlighters on his own car—AT OUR EXPENSE.

Mail the coupon for full particulars regarding this big offer There is no obligation—don't put it off—clip and mail coupon *now*.

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Wisconsin

Dealers' Offer Coupon

C. A. SHALER CO., 9800 Fourth St., Waupun, Wis.

Gentlemen: Send me full particulars about your offer to let dealers try out a pair of SHALER Roadlighters at your expense. This obligates me in no way.

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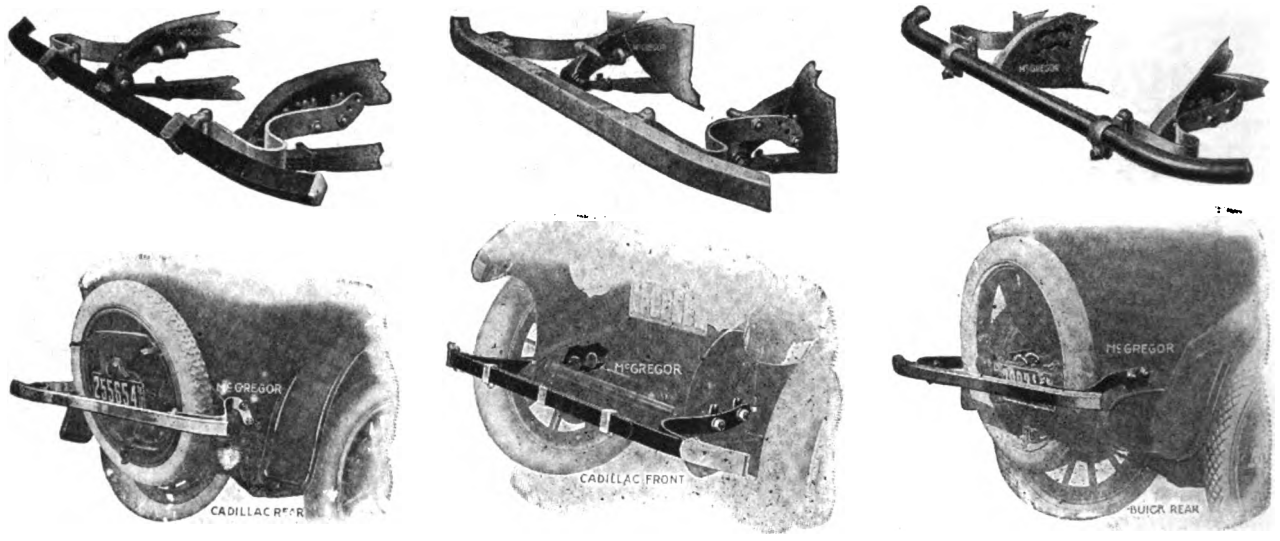
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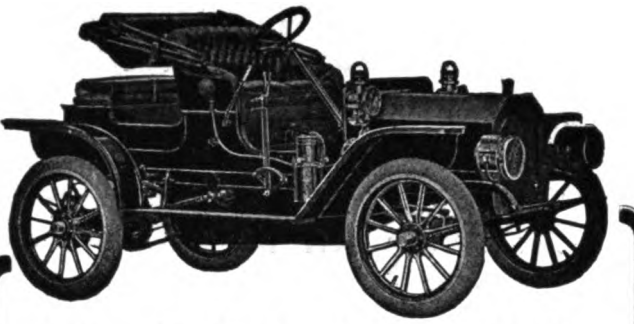
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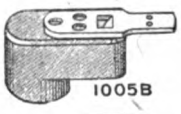
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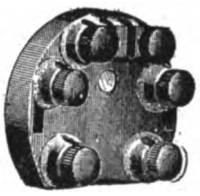


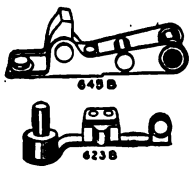
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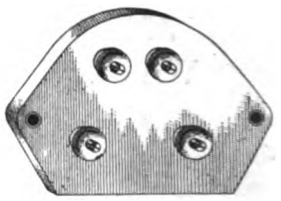












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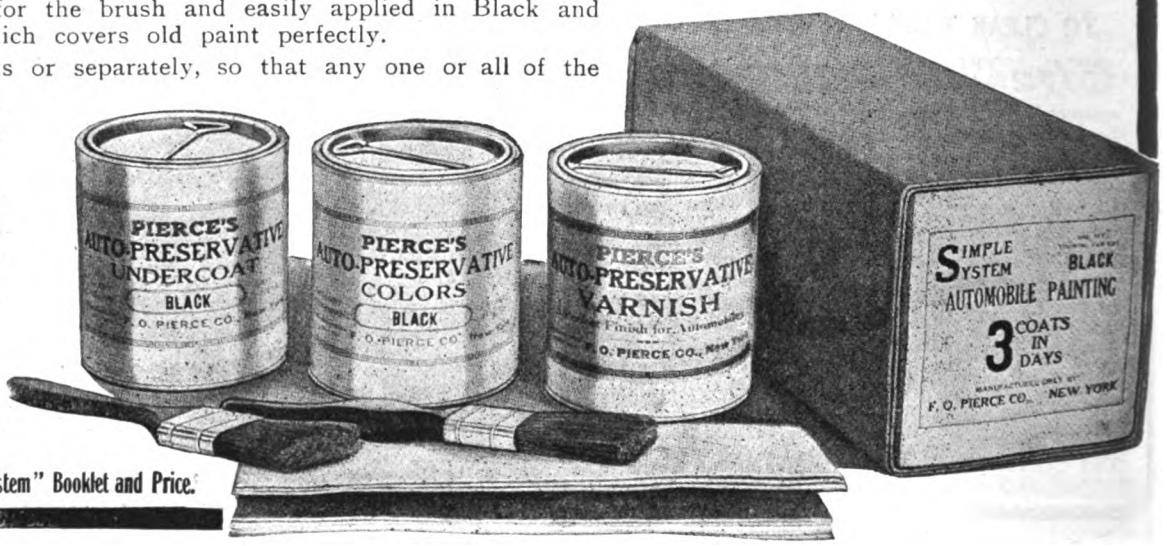
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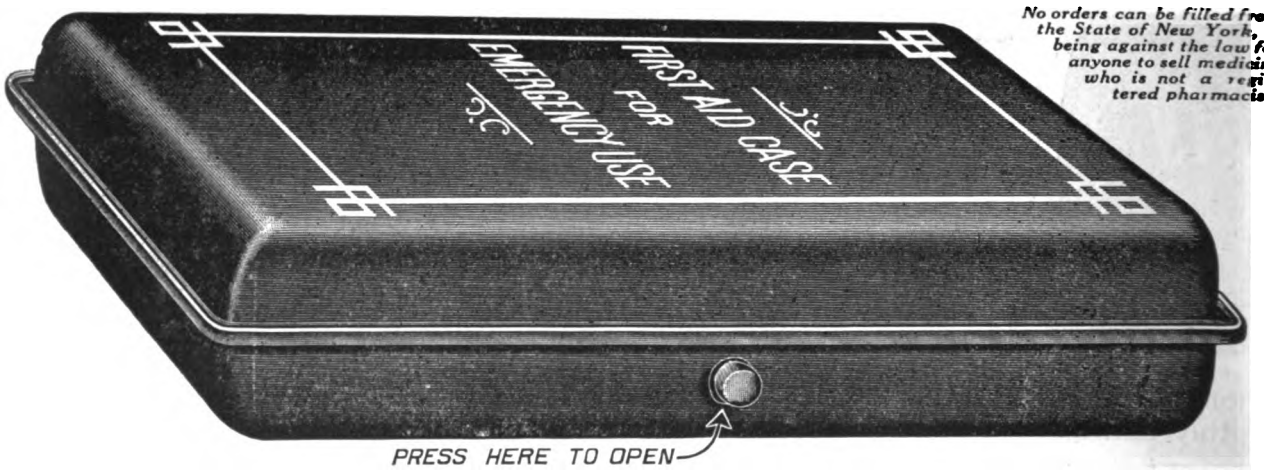


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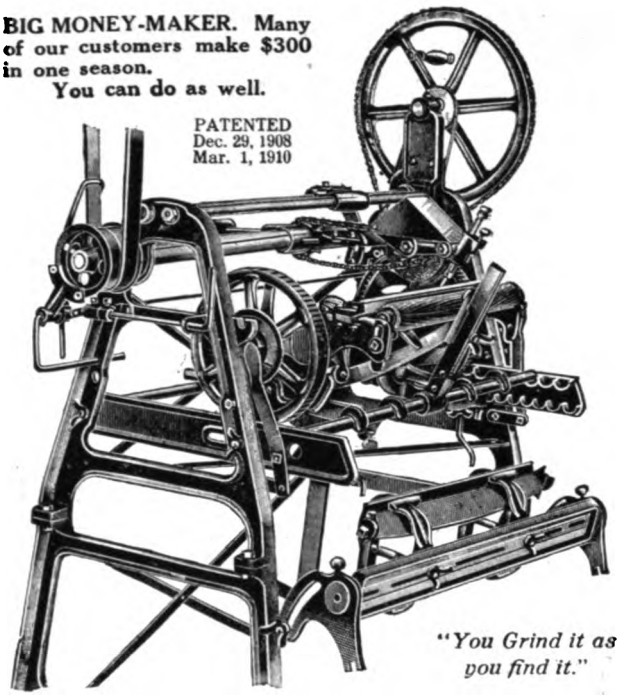
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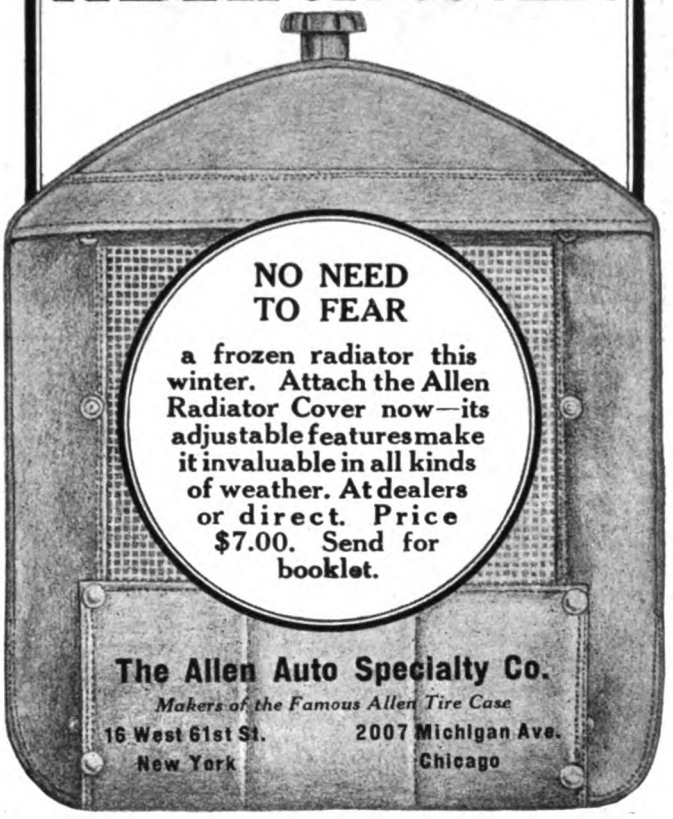
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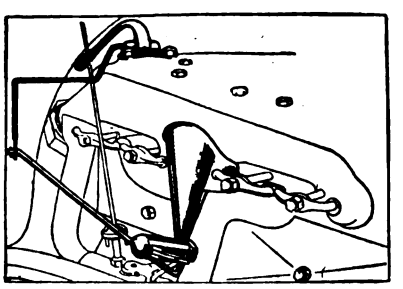
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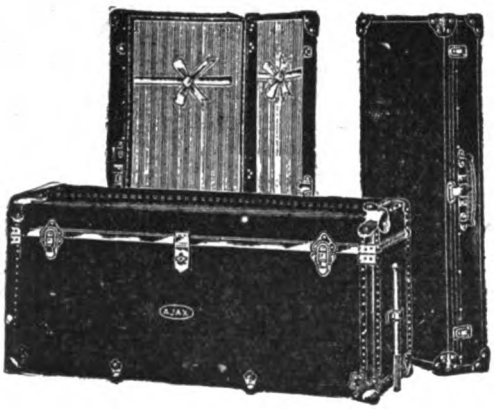
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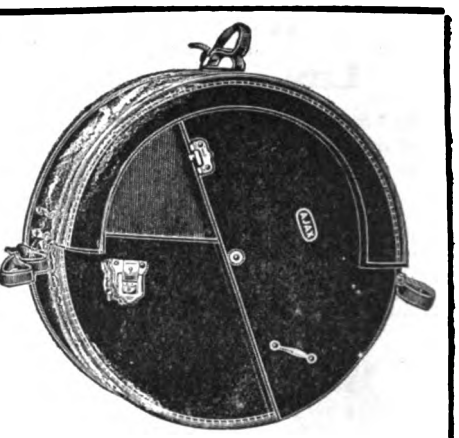
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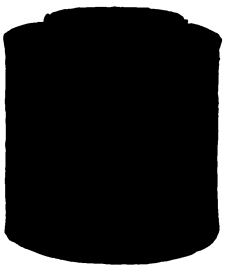
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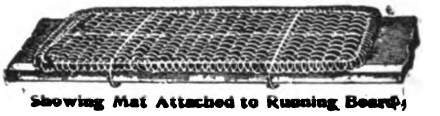
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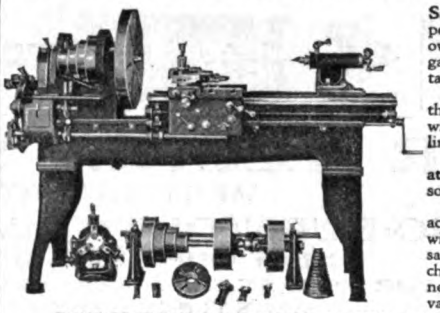
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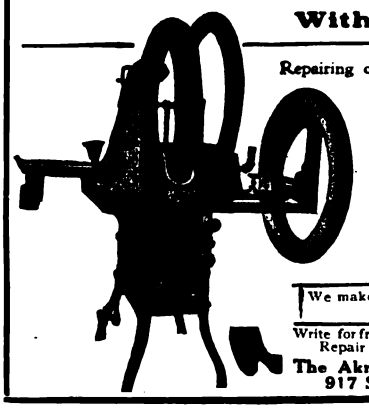
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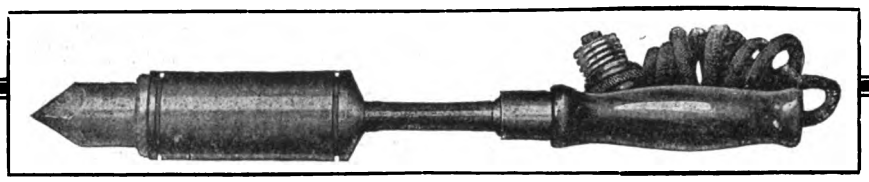
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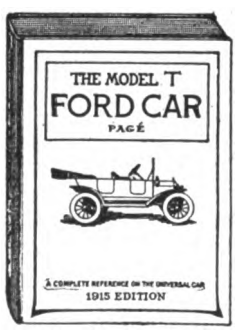
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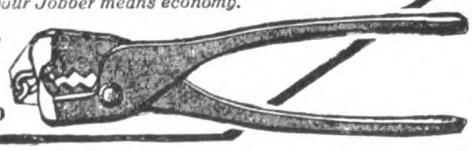
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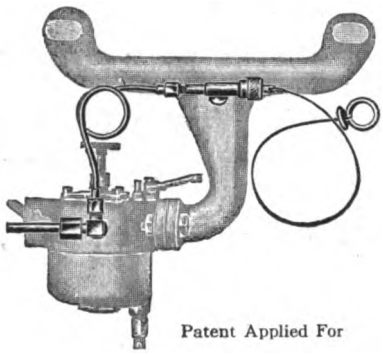
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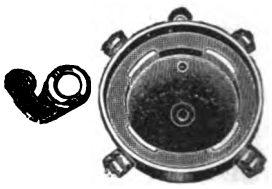


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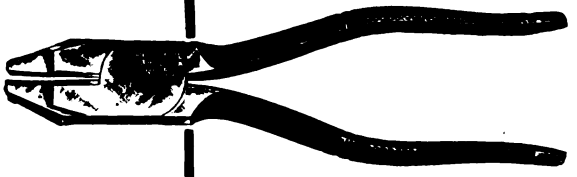
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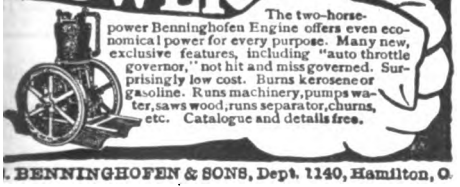
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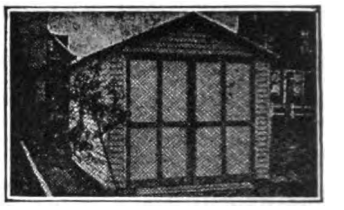
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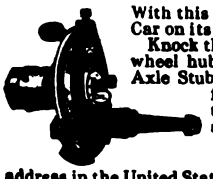
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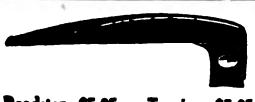
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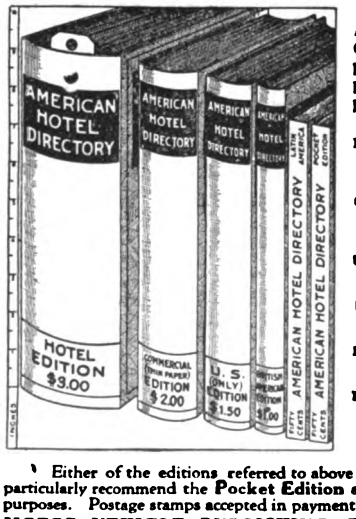
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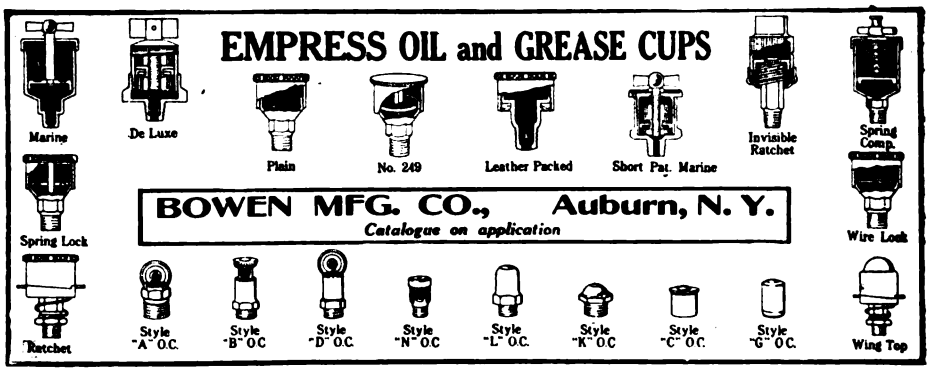
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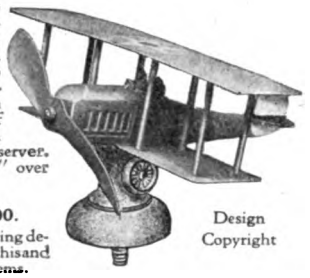


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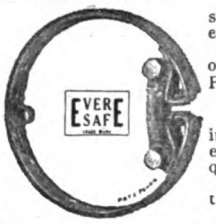
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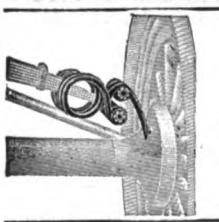
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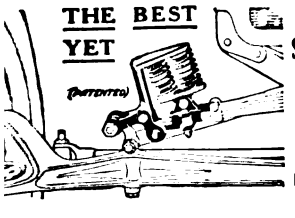
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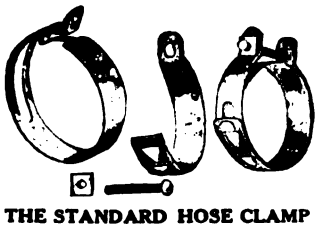
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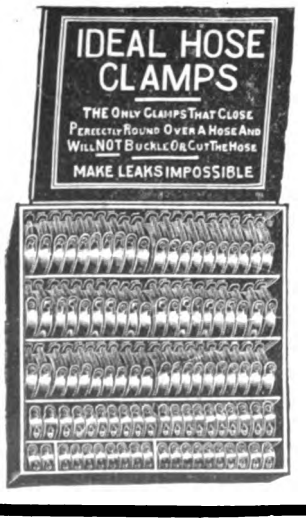
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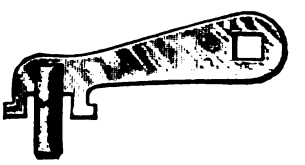
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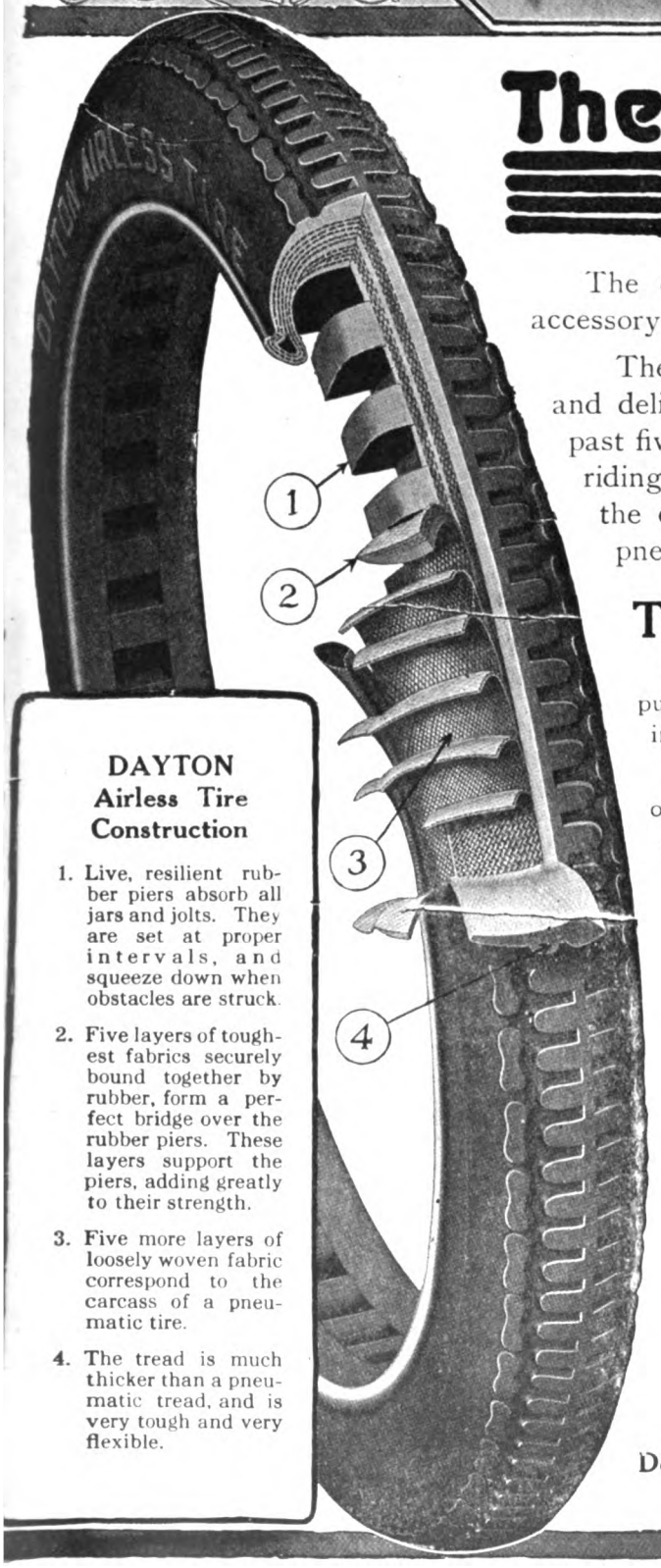


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Unlock the spark plug's extra profits

The Silvex Company announces the completion of the preliminary stage of a scientific study of ignition looking to—



—the lessening of Ignition difficulties;
—the more complete realization of the Motor's Power;
—the more thorough conservation of Gasoline, and
—the more exact designing of Spark Plugs for American and European motors.

UNLOCKING THE MOTOR'S HIDDEN POWER

HOW many times have you felt that you weren't getting from your motor ALL the power its designer BUILT into it? How many times have you felt that there was a HIDDEN store of power you weren't reaching? Banish it to yourself possible—on your lack of skill in "warming" the motor. Blamed it perhaps on the ignition—not on the quality of gasoline in your tank.

But have you ever found the answer? Have you ever reached that hidden store of power that means the motor's full efficiency both in performance and in economy of fuel?

Science and study lend a hand

TO FIND that very answer—to "unlock the motor's hidden power"—has been one of the basic purposes of The Silvex Company in setting on foot and financing a scientific study of ignition which includes the motors of the leading cars of America and Europe and that purposes, on perhaps a larger scale than has ever before been undertaken, a thorough, scientific study of the role that spark plugs play in helping the motor give up its FULL power with the most economical use of fuel.

There is too little EXACT knowledge of ignition—of what goes on inside the firing chamber. There is very little knowledge of the ignition compared with what is known of the other phases of a motor's operation. No car engineer, no manufacturer has ever been able to say: "This is the EXACT plug for that motor." It can't be and today. But the initial stages of The Silvex Company's studies have been completed—and we can come very close to saying it—much closer than ever before. And we sincerely believe that when this scientific study is completed, we will have the knowledge to design plugs that will come closer to reaching the motor-designers' ideals than even they have hoped.

Why you don't get the Power the engineer Built into your motor

ALREADY that preliminary study has had its results. In place of the old, haphazard way of buying plugs, science has substituted a new and EXACT way.

This new way, however, is only the common sense way. Its only difference is that it is ACCURATE. Look at it in this light.

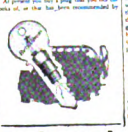
At present you buy a plug that you like the looks of, or that has been recommended by friends or a man at your garage, and so on. And you have it placed in your motor. But now, let's consider that motor. The engineer who designed it had in mind, let us say, a maximum of 80 horse-power at 2,500 revolutions per minute. He figured every detail of his design to produce that 80 h. p. He BUILT 80 h. p. into it. But you don't get it! Why?

The reason is this: The engineer counted on reasonably complete ignition—but on 100% ignition, for no motor has that yet—but on having, with very slight allowance, every charge of gas that is drawn into the cylinders, and ALL of EVERY charge, exploded and harnessed into energy.

In a motor there are EIGHT conditions that greatly influence a spark plug's operation. (See the eight conditions illustrated at bottom of following page.) These are variable. They change with the type and design of motor. And unless the plug happens by good fortune to fit all of these conditions in your motor, the plug cannot give you full efficiency. It may run your car—but not without wear through mis-firing, poor ignition, incomplete ignition, and the loss of part of the power you have a right to.

Why Plugs that fit by measure frequently fail to "measure up"

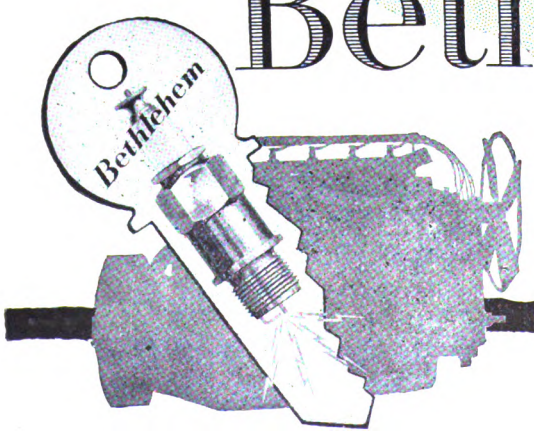
PICTURE those EIGHT conditions. If you will, as the manufacturer of a lock which open only to one key that FITS those all. That key is your spark plug. Only when your plug fits the EIGHT conditions as they exist in your





This is a photo-reduction of the two full pages in Collier's, Jan. 5th issue, that will place the Silvex message of a new and scientific method of spark plug selection before motorists at Show Time.

Bethlehem



Unlock the

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—in presenting the Silvex Consumer Advertising Campaign for 1918, we wish

to emphasize the important service rendered the car owner by the Bethl'em-Index — not only as it affects his selection of the proper size and style of spark plug, but as it influences his motor's performance *through the selection of a spark plug designed, built and basically right for the TYPE of motor he drives.*

This, we believe, is the first time that any manufacturer has developed a *definite* method of spark plug selection, based on a scientific study of the varying conditions within each type of gasoline motor as a substitute for the present, almost universal, haphazard way of buying any plug that fits the hole in the top of cylinder.

With the advances in the design, manufacture and marketing of Bethlehem Spark Plugs to be discussed later in these pages, the trade will find open to them new avenues of profit.

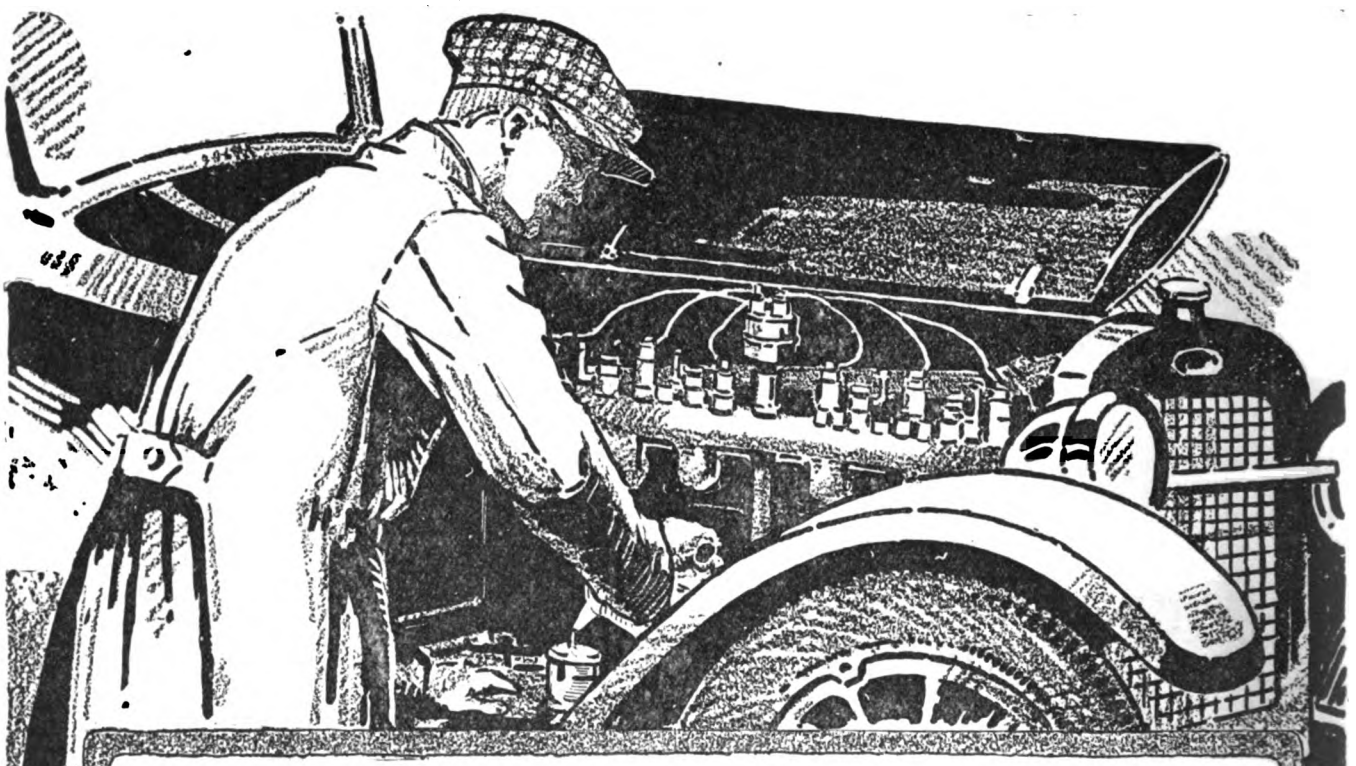
President

The Silvex Company
Bethlehem Products
Bethlehem, Pa.

Spark Plugs

Motor's Hidden Power

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When You Fill the Crank Case

Often a car owner who is a stickler for proper carburetor adjustments, who uses scrupulous care in the purchase of tires, seems to throw caution to the winds when it comes to buying and using motor oil. As a result his car develops faults far more serious and permanent in nature than could ever be caused by the faulty adjustment of the carburetor or the purchase of a poor set of tires.

When you pour motor oil into the crank case be sure that it is an oil of the highest quality—an oil that will do properly the work you expect it to do. Such an oil is

TEXACO MOTOR OIL

When you use Texaco you are freed from those motor troubles developed by faulty lubrication.

Texaco Motor Oil, kept at the proper level in the crank case, will lubricate perfectly at all times and under all conditions.

Due to certain basic qualities in the crude from which it is refined Texaco Motor Oil cannot form a *hard* carbon crust. As a result scoring of pistons and cylinder walls never takes place when it is used.

Texaco Motor Oil affords a perfect seal between cylinder walls and pistons. Leakage of gasoline into the crank case is impossible.

Texaco Motor Oil maintains its original lubricating qualities after long usage. It does not deteriorate when subjected to high heat and thus become practically a non-lubricant.

When you buy motor oil buy Texaco. The safest way, the best way, is in one or five gallon cans. The clear, clean color of Texaco will help you to recognize it.

THE TEXAS COMPANY
New York Chicago Houston
DISTRIBUTING OFFICES IN MOST CITIES

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—The Quality Mark of Good LEATHER

The HLB mark on leather is the equivalent to "Sterling" on silver, or "Tiffany" on jewelry. The HLB mark is your assurance that the goods are the *best* at the price. Truly, HLB is the quality mark of good leather. It is your protection, and your customer's protection—for this company resolutely stands back of every price of its merchandise, and guarantees it unreservedly.

HLB leather goods are *not* being cut in quality to meet the acute leather situation. Quality is being upheld—that HLB jobbers and dealers will not destroy the faith that customers have in them.



HLB Wetprufe

Flat Fan Belting

Every auto supply dealer has daily demand for a high quality flat fan belting. **Wetprufe** is filling that demand for thousands of live dealers. **Wetprufe**, made of specially tanned oak leather, is heat, oil and water proof. In 50 ft. rolls, from ½ in. to 1¼ in. widths. You can recommend **Wetprufe** to *any* customer.



Vee Sol

Fan Belting

Vee Sol Belting is a "V" shaped solid leather belt designed for "V" pulleys. Made in any thickness, carefully and solidly cemented, and either bradded or sewed thru center with heavy linen thread. Guaranteed not to crack. 25, 50 and 100 ft. spools, in ½ in., ⅝ in. and ¾ in.



Cut Lacing

HLB Rawhide Cut Laces are made from carefully selected stock. By actual tests they have proved strong and tough. Uniform in thickness, width and tensile strength. Ideal for lacing radiators and tire boots. Put up in 100 ft. bundles of lengths convenient for automobile use. The following sizes are offered: ¼ in., 6-16 in., ⅜ in., 7-16 in., ½ in., 9-16 in., ⅝ in., and ¾ in.



HLB Wetprufe

Wetprufe Ford Fan Belts are made in same high quality as **Wetprufe** Flat Belting; laps are carefully cemented, and stitched with heavily waxed linen thread—a perfect joint. This is the best Ford belt on the market. A quick seller that creates and holds customers. Made endless, with quick attachable, or clipper fasteners.



HLB VEE FLEX

A Laminated "V" Fan Belting, for grooved pulleys. Each lamination both underlaps and overlaps the other, and is securely riveted. Practically noiseless in operation—a giant for strength. 50 and 100 ft. spools, in ½ in., ⅝ in. and ¾ in.



Leathertex

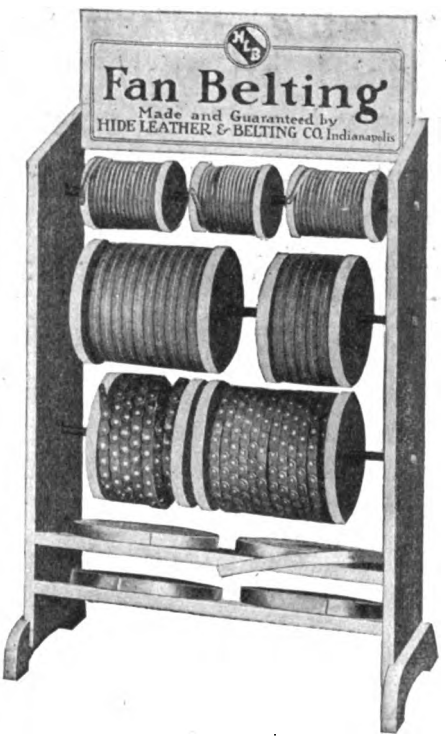
Cone Clutch Facings

Leathertex is a combination of carefully selected, specially tanned leather and textile—really merged into one element under 3,000 pounds hydraulic pressure—with a leather face for the clutch, and a textile backing next to the cone.

More durable than solid leather—more resilient than solid leather—retains its shape longer and better than solid leather. It is absolutely uniform in tensile strength and thickness. Made for all makes and models of cars.

A Better Display Rack
To Help You Make More Sales

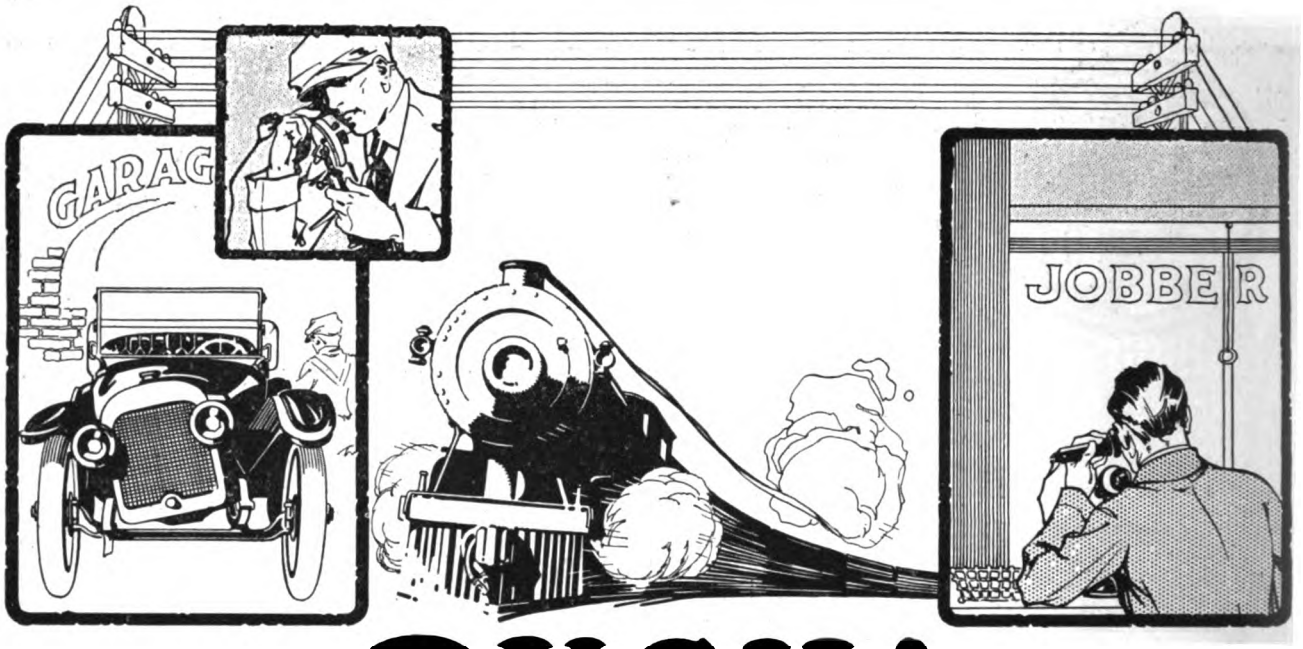
You'll make more belting sales if your stock is well displayed. Our special rack (illustrated) is furnished free to dealers ordering a general assortment of HLB belting. With this rack your belting stock is in one compact form, easily handled, and convenient to display to customers. Rack is 3 feet high, 2 feet wide, and 1 foot deep. Made of wood, surmounted by steel sign lithographed in colors. Let us know what belting you desire, and we'll make up assortment to suit.



Write Today! Jobbers and Dealers who want to handle the BEST line of leather belts and parts should send at once for complete information on our entire HLB Line. If you're especially interested in some particular article, don't hesitate to ask about it. Inquiries answered promptly. Jobbers desiring to install the HLB Line should write at once for catalog cuts, and particulars about our belting display rack.

HIDE LEATHER & BELTING COMPANY
225 So. Meridian Street, Indianapolis, U. S. A.

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RUSH!

When the hurry-up order comes—when

an excited customer rushes in and wants a new spring *at once*—when every minute counts—when you are placed on your mettle by a demand that seems almost out of reason— How will you meet it?

Will you simply hold up your hands and say "It can't be done?" Or will you

Get The Nearest Harvey Jobber On The Wire—

tell him your needs, and send the customer away pleased at the knowledge that his car will be on the road again, in better shape than ever before, within a few hours?

Make use of Harvey Service. It is designed to help you in emergencies.



There's a Harvey Jobber Near You

Drop us a card and we will send you his name and our catalog giving measurements, weights and sizes of over 900 different styles of Springs and other valuable information that you should have. Write today — you may need Harvey Help tomorrow.

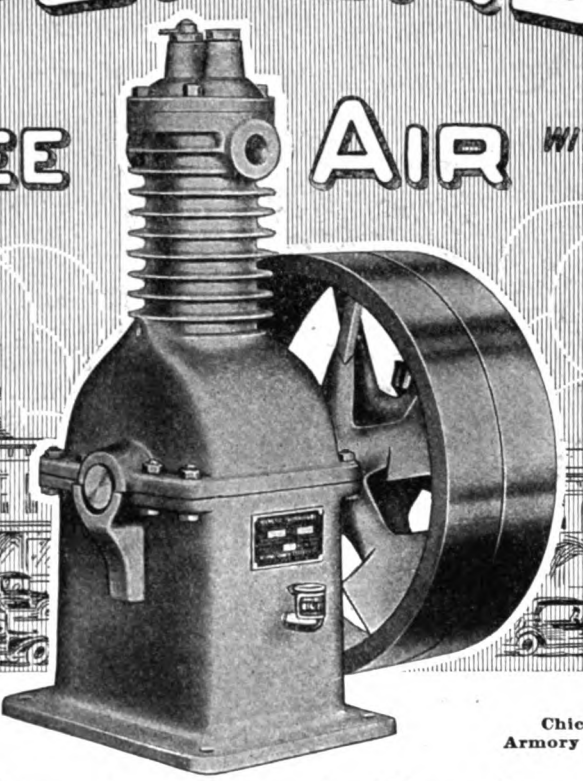
Harvey Spring & Forging Co.

921 - 17th St. **Racine, Wis.**

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DEPENDABLE

FREE AIR WITHOUT OIL



Chicago Show Exhibit
Armory Balcony Spaces 23-24

Better Service Brings You More Trade

Auto owners have awakened to the fact that all Free Air Service is not alike. They are demanding PURE AIR for their tires because they have learned that oil rots tires and that AIR FREE FROM OIL means less blowouts, fewer punctures, greater tire mileage, less repairs and a great saving in up-keep every month. Cater to the demands of auto owners —give them what they want. Make your place the most popular in town by furnishing

CURTIS AIR
FREE FROM OIL







Curtis Compressors are the result of 25 years experience in the manufacture of high grade pneumatic machinery. They are reliable, dependable, require practically no attention, are economical to operate, guaranteed to stand up under the severest strains of hard usage and furnish a continuous supply of cool, pure, clean air. While others claim to furnish air free from oil, Curtis is the only Garage Air Compressor with the controlled splash oil system—**our own exclusive patented device** which prevents flooding the cylinder with more oil than it needs or can use—and eliminates all danger of forcing oil into the air line. Curtis Air is pure air—free from impurities—free from oil—the kind of air that makes tires last longer and pleases every patron.

Curtis Compressors Pay For Themselves

They build business—hold your old trade—bring new patrons to your door—and by the superiority of your Free Air Service, create a feeling of confidence in the quality and reliability of your entire stock. And more than that—a Curtis Compressor will save you big money by supplying air for air hoists, painting, cleaning, vulcanizing, blowing dust and drillings from tools and serving you in many other ways.

5 Sizes—125 Combinations

There is a Curtis Compressor to meet the requirements of your business in every way—just the size, arrangement and price to please you. It will pay you to investigate. Ask your jobber—or cut out and mail us the attached coupon TODAY.

Curtis Pneumatic Machinery Co.
1530 Kienlen Ave.
St. Louis, Mo.

Gentlemen: Please send me full details on Curtis Air Compressors —your proposition and low prices.

Name.....

Address.....

Jobber's Name.....

Address.....

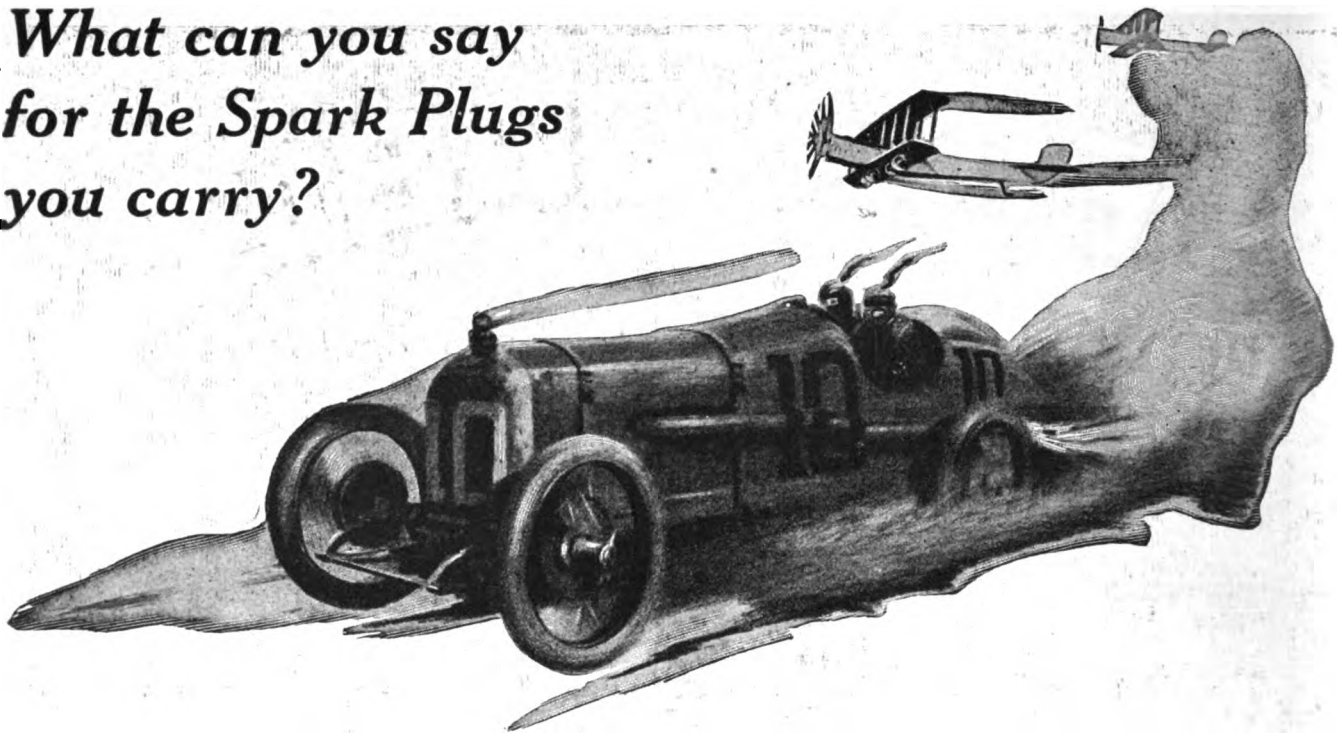
Curtis Pneumatic Mach. Co.

1530 Kienlen Ave., St. Louis, Mo.

Branch Office
530-E Hudson Terminal,
New York, City

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What can you say for the Spark Plugs you carry?



"That they seem to give satisfaction? That you have heard no complaints? That certain car manufacturers equip with them exclusively?"

Such statements prove nothing. Any plug will spark an engine. What the car owner wants is power, responsiveness, quick pick-up, low fuel consumption—the kind of service that is unfailingly delivered by Rajah Plugs.

Are these mere claims? Ask the drivers of racing cars. Look over the equipment of the winning cars for the past 16 years.

Rajah Plugs have stood the gruelling tests of racing motors, airplanes and speed boats for years.

Their record is your sales argument and your guarantee of satisfaction to all who equip with Rajah Plugs.

Stock Rajahs and Rajah Terminals and build up a real plug business.

RAJAH *SPARK PLUGS*

RAJAH TERMINALS AND ADAPTERS

are furnished so that Rajah Plugs can be used on any car not equipped with the Rajah type of Clip Terminal. Any size exchanged if desired



Rajah Regular Clip Terminal
Adjustable to any cable. With the extra collar supplied fits any make of plug.



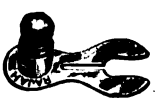
Rajah Thumb Nut Terminal
Adapter for Dodge, Ford, Hup. Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



Rajah Ferrule Clip Terminal
With any size ferrule required. Fits any make of plug with the extra collar supplied.



Rajah Packard Terminal
Adapter for Packard 4 and 6 cylinder.



Rajah Stud Terminal
Adapter for Buick, Chevrolet, Oldsmobile.



Rajah Ball Terminal
Adapter for Franklin.
Special type for Willys-Knight.



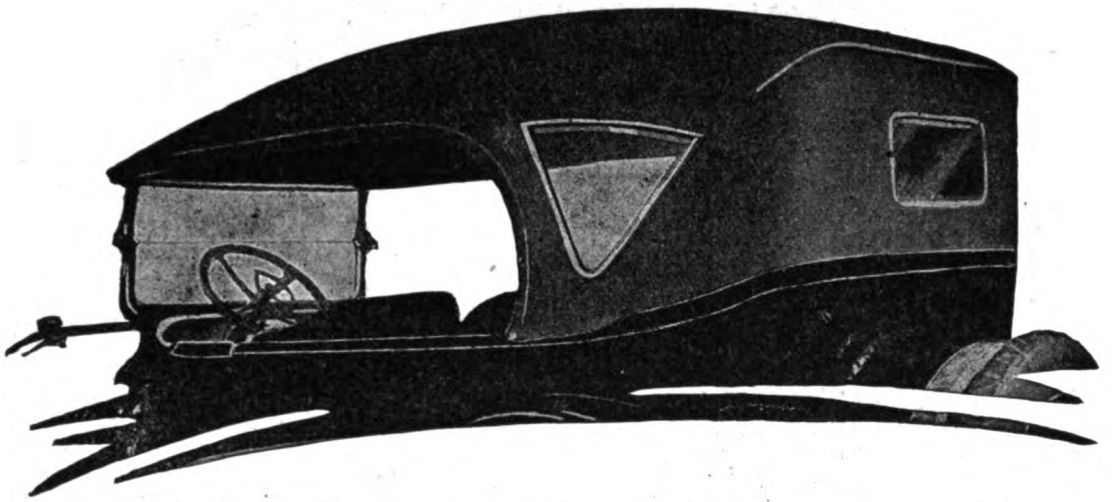
Rajah Pressure Plug

Manufactured by THE RAJAH AUTO SUPPLY COMPANY, Bloomfield, N. J.
Sales Department, EDWARD A. CASSIDY COMPANY, INC., Madison Avenue at 40th Street, New York City

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DU PONT AMERICAN INDUSTRIES



RAYNTITE--The Top That Stays New

A gray, dingy, faded top will make any car look passé. Don't sell your car because the top looks shabby. Get a new top—a top that stays new.

DU PONT FABRIKOID RAYNTITE

never fades. It is water, grease, stain and dust proof—and as cleanable as glass. When soiled by travel, plain water will restore its beauty. It is guaranteed not to leak, crack nor peel for one year but built to last the life of your car.

Any good top maker can re-top your car with Rayntite.

Check Rayntite in the coupon and send for samples, booklet—and list of cars on which Rayntite is furnished as regular equipment.

Mail This Coupon
marking X before subject that interests you.

	Rayntite Top Material		Fairfield Rubber Cloth
	Motor Fabrikoid		Industrial Dynamites
	Craftsman Fabrikoid		Blasting Powder
	Truck Special Fabrikoid		Blasting Supplies
	Marine Special (U.S.Stand)		Farm Explosives
	Book Finish Fabrikoid		Hunting
	Fabrikoid Sheeting		Trapshooting
	Py-ra-lin Toilet Goods		Anesthesia Ether
	Challenge Collars		Leather Solutions
	Novelty Sheeting		Soluble Cotton
	Transparent Sheeting		Metal Lacquers
	Py-ra-lin Rods and Tubes		Wood Lacquers
	Py-ra-lin Pipe Bits		Mantel Dips
	Py-ra-lin Specialties		Bronzing Liquids
	Sanitary Wall Finish		Pyroxylin Solvents
	Town and Country Paint		Refined Fusel Oil
	Vitrolac Varnish		Commercial Acids
	Vitrolac Satin Fnish		Alums
	Flowkote Enamel		Saltpetre
	LiquidLight for Mills		Wood Pulp
	Antoxide Iron Paint		Pigment Bases
	Shingle Stain		Tar Distillates
	Auto Enamel		Dyes and Bases

Name _____

Address _____

City _____ State _____

Du Pont Fabrikoid Company

World's Largest Makers of Leather Substitutes

Wilmington - - - - Delaware

Works at Newburgh, N. Y. and Fairfield, Conn.

Canadian Office and Factory, New Toronto, Ont.

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Du Pont Fabrikoid Company, Wilmington, Delaware . . . . Leather Substitutes
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DU PONT

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Send for Catalog No. 100
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WALDEN-WORCESTER
INCORPORATED
WORCESTER, MASS.

SPECIALISTS IN MOTOR CAR WRENCHES

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Dearborn Two-Ton Unit attached to Packard Chassis



Dearborn Two-Ton Unit attached to Buick Chassis

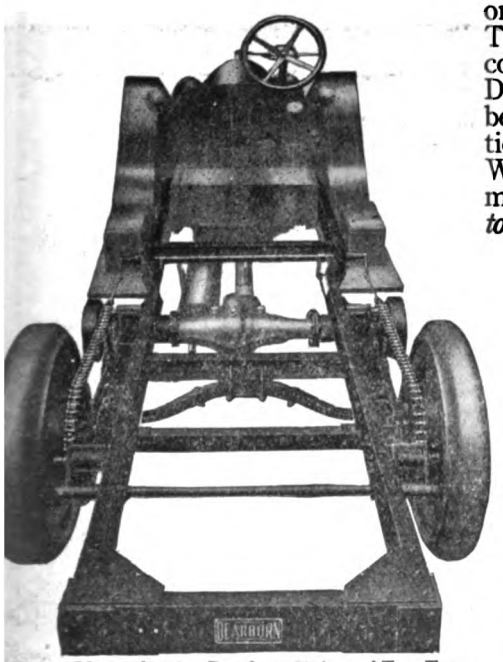


Dearborn Two-Ton Unit attached to Hudson Chassis

DEARBORN TRUCK UNITS can be attached to any make of car

Dearborn One and Two-Ton Truck Units have proven their strength, efficiency and practicability on all makes of cars. Thousands of these Units have been in use during the past year under every possible condition of the most trying service. In every instance they have given exceptional satisfaction.

Dearborn Universal Truck Units are manufactured in our own plant—by a sound and successful company whose reputation for honest quality has never been questioned.



Rear View, showing Dearborn Universal Two-Ton Truck Unit attached to Mitchell Chassis

Now is the time for dealers to take on this exclusive line of Truck Units. The demand for trucks during the coming season will be enormous. Dearborn Units will have the call because of their superior construction and all-'round dependability. With them you can convert any make of car. *You are not confined to the Ford.*

Do not fail to see the Dearborn Truck Units while at the New York and Chicago Shows. See for yourself "how and why" the Dearborn is superior, or write at once for full particulars and specifications.

DEARBORN TRUCK CO.
1252 S. Campbell Ave.
Chicago, Ill.

$350 and a Ford Car makes a Dearborn One-Ton Truck.
$400 and Any Car makes a Dearborn Universal 1-Ton Truck.
$450 and a Ford Car makes a Dearborn Two-Ton Truck.
$500 and Any Car makes a Dearborn Universal 2-Ton Truck.



Dearborn One-Ton Unit attached to Overland Chassis



Dearborn Two-Ton Unit attached to Cole Chassis



Dearborn Two-Ton Unit attached to Buick Chassis



Dearborn Two-Ton Unit attached to Glide Chassis



Dearborn Two-Ton Unit attached to Chalmers Chassis



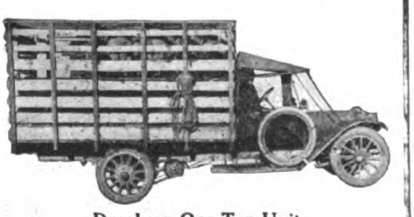
Dearborn Two-Ton Unit attached to Mitchell Chassis



Dearborn Two-Ton Unit attached to Cadillac Chassis



Dearborn One-Ton Unit attached to Maxwell Chassis



Dearborn One-Ton Unit attached to Buick Chassis

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Everyone Can Afford These Low Prices for

KIMBALL TIRES

These tires are sold without a guarantee. Write and ask us how we do it. They are positively not seconds, but first class fresh casings.



Kimball Tires	Non-Skid
30x3	$ 7.55
30x3½	9.85
32x3½	11.55
32x4	14.75
33x4	15.75
34x4	16.35

Tubes	
30x3	$1.90
30x3½	2.15
32x3½	2.25
32x4	3.05
33x4	3.10
34x4	3.20

Do you want Clincher or Straight Side?

Prices on Other Sizes in Proportion

DEALERS Must Act At Once!

Territory Is Going Fast

The necessity for saving money makes KIMBALL Tires the most popular buy on the market. Because they are one of the season's big sellers, territory is going like hot cakes. Make your reservation now. Write for complete details. Send your order, large or small, for immediate attention. **KIMBALL Tires Sell.**



All Orders Must Be Accompanied by Deposit of at Least 25%. Cashier's Draft or Money Order Accompanying Order Insures Quickest Delivery

NOTE:

Prices will positively be advanced in a short while. Place your order NOW.

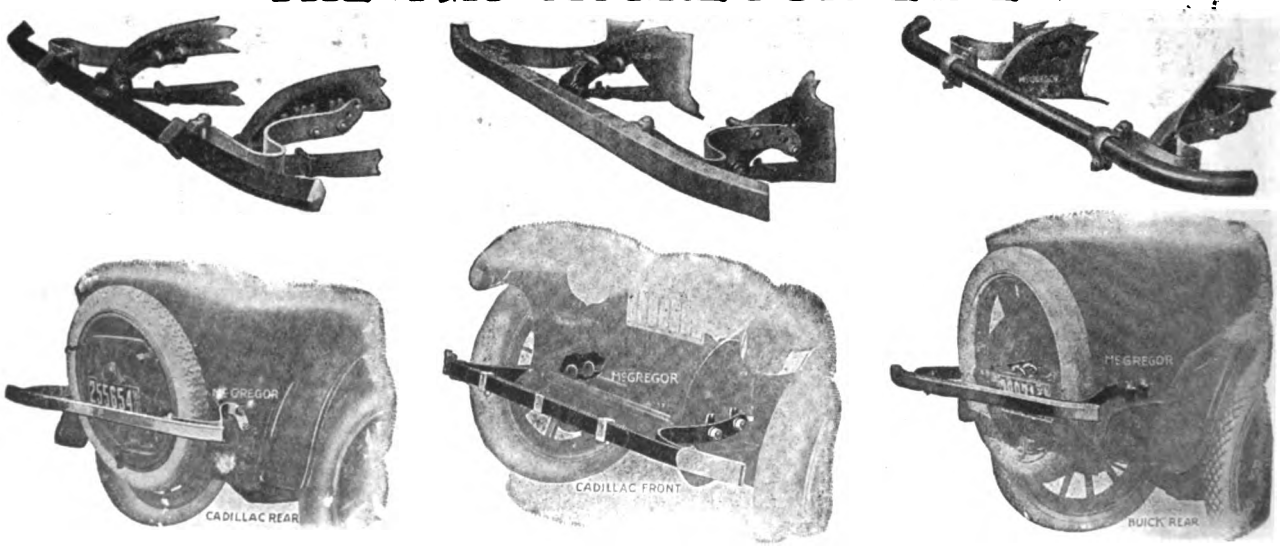
The Kimball TIRE & RUBBER CO.

KIMBALL CORD TYPE

Dept. 21, 1469 Michigan Avenue, CHICAGO

"Straight-Side" Type, as pictured Made also in Clincher Type.

THE 1918 McGREGOR LINE



The NEW McGREGOR COMBINATION SPRING BUMPER

Is All That Its Name Implies—The Very Latest and Best Bumper Made

Our different types of bars are made of High Carbon Steel. The Spring members, or arms, are made of High Carbon Spring Steel, and are fitted with universal adjustable brackets, applicable to any make of car, with extended frame, either front or rear.

This new bumper does away with the necessity of stocking a number of special front end bumpers, to fit Packards, Cadillacs, Dodges, and other cars with interfering mud or splash aprons. We make rear end bumpers with special designed arms, applicable to 99% of cars manufactured.

We have eliminated the Malleable Iron Arm, and now make an all Spring Steel Arm, insuring the greatest resilience and Shock-Absorbing qualities obtainable in a bumper.

Catalogues Furnished Upon Request

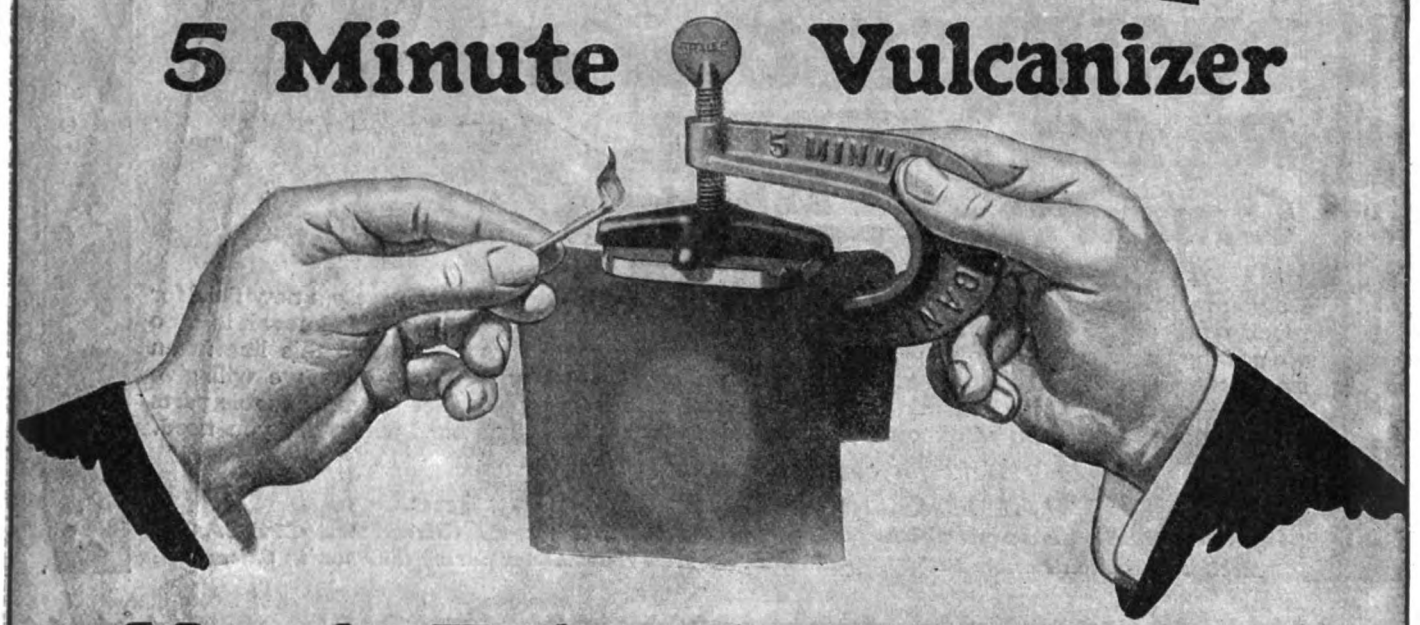
Get in Touch with Your Jobber in Reference to Our Line

U. S. AUTO BUMPER CO., 115 EAST 30th ST., CHICAGO, Ill.

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SHALER

5 Minute Vulcanizer



Mends Tubes in 5 Minutes

Easy to Use—Easy to Sell

Every buyer of a SHALER 5-Minute Vulcanizer becomes a booster! Every motorist who buys one shows it to his friends—gives them a demonstration—because it is such a wonderful thing.

This means big sales for you. As soon as you start selling the SHALER 5-Minute Vulcanizer, your customers will spread the news. You will quickly notice new faces in your store—new customers passing their money across your counters.

Complete Outfit

The dozen patches and combustible discs that go with the vulcanizer are soon used up—and the motorist comes back to you for more. He pays you 75 cents for every dozen of these units. You make a good profit.

With 6 Round and 6 Oblong Patch Units— $1.50

Can you realize what a big repeat business this means for you? Can't you see how it will bring car owners into your place for additional "ammunition"—who will also buy other goods? And that is what you need to build up your business.

Place Your Order With Your Jobber NOW!

Don't delay! The enormous demand for SHALER 5-Minute Vulcanizers has exceeded our factory capacity to make deliveries. We are building a large 3-story addition to our plant. But—to make sure of prompt shipments—place your order with your jobber now—specifying date of shipment desired.

Complete catalog of full line of SHALER Vulcanizers for Motorists, Garages and Repair Shops mailed on request.

C. A. Shaler Company, 800 Fourth Street, Waupun, Wis.

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NIEHOFF SERVICE STATION OF CONTACT PARTS

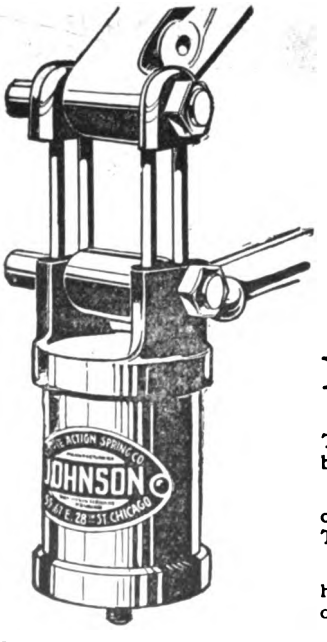


DEALERS!!! This "Cash Register" of Contact Parts FREE-

Do you realize that the Contact and Brush Replacement business is comparatively a new field for repair work, and that it is proving to be a most profitable kind of business? We know it is. So we got the business down to a system where garage men and dealers can handle this line in an intelligent way. If you open up a Service Station of our Contact and Brush Parts, we will give you free the above "Cash Register," which you need, as it enables you to keep these valuable parts systematized so that you will know at a glance just what you have on hand and what you need.

Write for contract in your territory at once.

PAUL G. NIEHOFF & CO., Inc.,
Metallurgical Laboratories **232-242 E. Ohio St., CHICAGO**
Meet us in Exhibit Parlors B22-24-26-28 in the Congress Hotel Annex during the Show in Chicago



Temme SPRINGS FOR ALL CARS

DO all the lame cars drive to *your* door for Temme Springs and other things?

In most good towns, Temme Springs and Temme's Triple Action Service are known to be *as good as gold.*

Hundreds of repairers, who have "banked" on Temme and never lost, are putting up Temme highway signs today.

These signs *will* bring in business. Temme has tried them, so he *knows.* And now he offers *you* what won for him.

Temme Springs *"for all cars"* means just what it says—for all cars *since 1902.* Test us by naming the spring you need. Temme Triple Action Service will have it on the way to you the same day.

"For all cars" means *designed* for all cars to factory specifications. And so good are Temme Springs—so prompt the service—so fair the prices—that dealers in *all* cars now buy from Temme *in preference* to the car maker.

You need these springs, this service, these signs. They will make you money, bring new business, help you build the good reputation you are after.

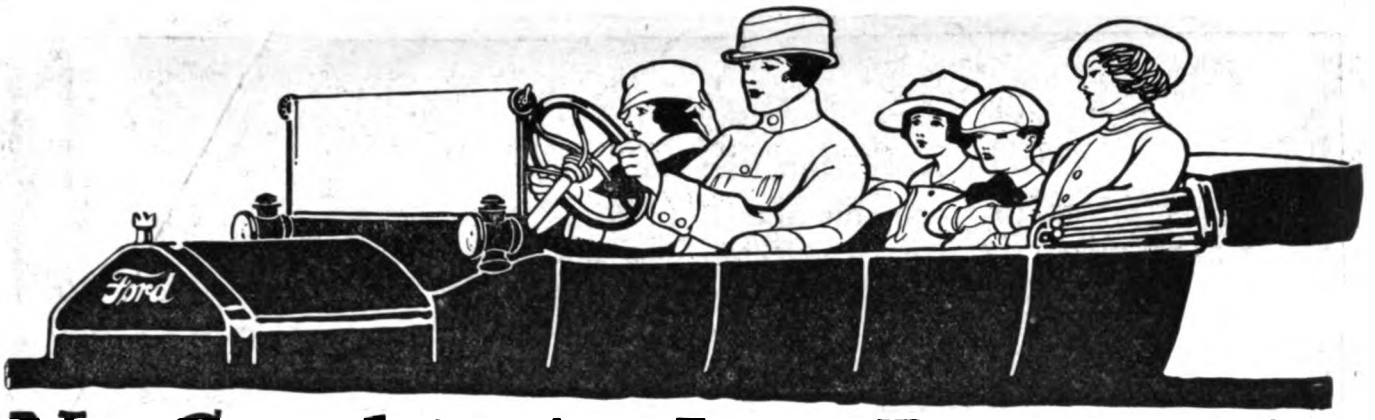
If you delay you may lose this exclusive proposition. Write or wire us now, saying: "Send Temme Spring Service Station proposition at once."

JOHNSON Shock Absorber

This is to remind you of the new model of the famous Johnson Shock Absorber—made by us. The only cure for a hard riding car is a pair of Johnsons. Temme Spring Service Stations make good money on them. Write now for our new proposition.

TRIPLE ACTION SPRING CO., 79 East 28th Street, CHICAGO

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No Cranking—Just Riding!

Motoring loses its lure when a woman has to perform the hard labor of cranking.

Where the powerful, invisible, obedient sinews of electricity attend to the cranking, the joys of motoring are multiplied and driving becomes all pleasure.

Electric-cranking of Ford cars attains its highest perfection in the new, but already famous,

A-B-C
STARTING & LIGHTING SYSTEM FOR FORD CARS
TWO UNIT SIX VOLT

Experienced Ford dealers no longer experiment with incompetent Ford starters. They concede, and thousands of A. B. C. owners concede, that this greatest of all Ford accessories conforms more closely to Ford engineering and construction than any other starter in the field.

All over the world, in all weathers and all climates, the A. B. C. starts any Ford and lights any road at pressure of button.

Simple, compact, easiest to install, longest lived. Puts Ford starting in the same class with the highest priced cars.

Weight evenly distributed on both sides of engine by units. No drag or strain on motor from starting or generating. Noiseless in operation. A fibre, leather, and metal belt, moving in a V-type pulley, gives the highest pulling contact. Guaranteed efficient and mechanically correct.

Ford dealers, who have not yet brought to their customers the overwhelming advantages of the A. B. C., should at once fill out and mail the attached coupon, and learn the terms of our generous 1917-1918 dealer proposition. Once an A. B. C. dealer, always one.

A. B. C. Starter Co., Detroit, Mich.

A. B. C. STARTER CO., Dept. H, Detroit, Mich.
Gentlemen:

☐ * Please send me complete details of your terms to dealers.

☐ * Please send me A. B. C. booklets for Ford owners.

* Please check the request you wish us to fill.

Name.....
Address.....
City.....
State.....

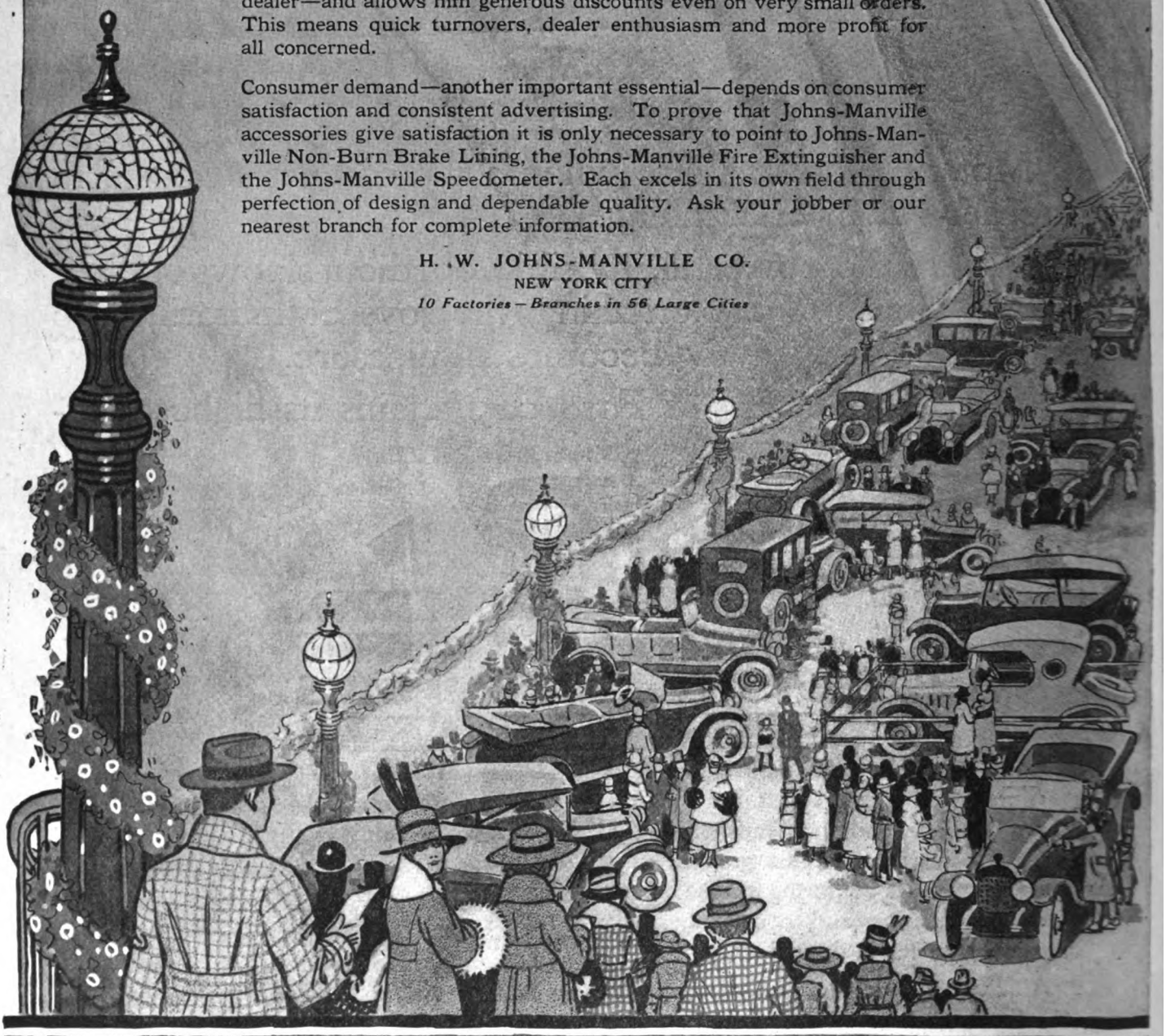
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Trade protection and consumer satisfaction distinguish this accessory line

BECAUSE the commercial success of any accessory depends on proper distribution, we believe protection to the trade is essential. We sell only to the legitimate jobber who in turn stocks the retail dealer—and allows him generous discounts even on very small orders. This means quick turnovers, dealer enthusiasm and more profit for all concerned.

Consumer demand—another important essential—depends on consumer satisfaction and consistent advertising. To prove that Johns-Manville accessories give satisfaction it is only necessary to point to Johns-Manville Non-Burn Brake Lining, the Johns-Manville Fire Extinguisher and the Johns-Manville Speedometer. Each excels in its own field through perfection of design and dependable quality. Ask your jobber or our nearest branch for complete information.

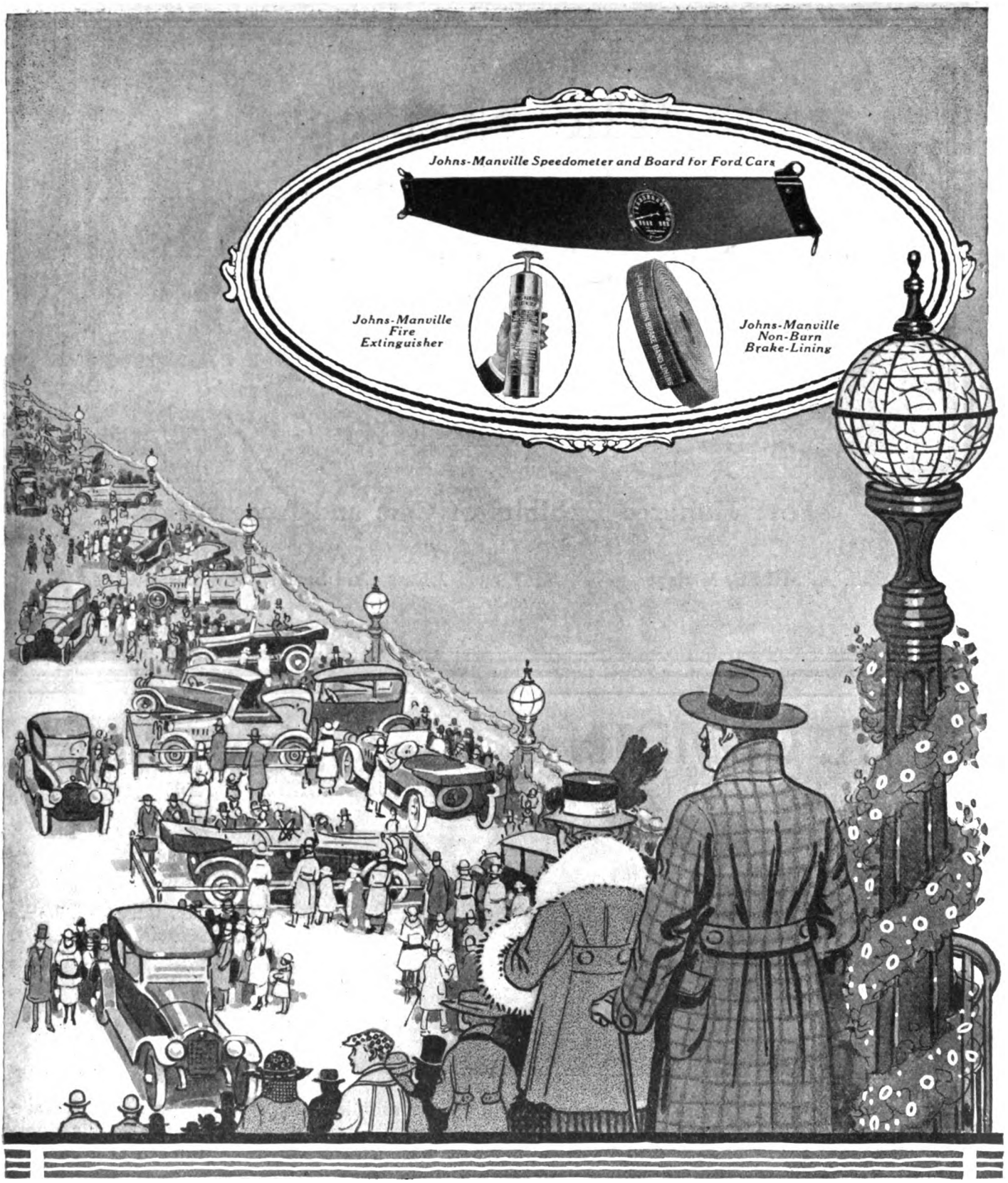
H. W. JOHNS-MANVILLE CO.
NEW YORK CITY
10 Factories—Branches in 56 Large Cities



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The National
Auto Show

Under Auspices of National Automobile Chamber of Commerce, Inc.

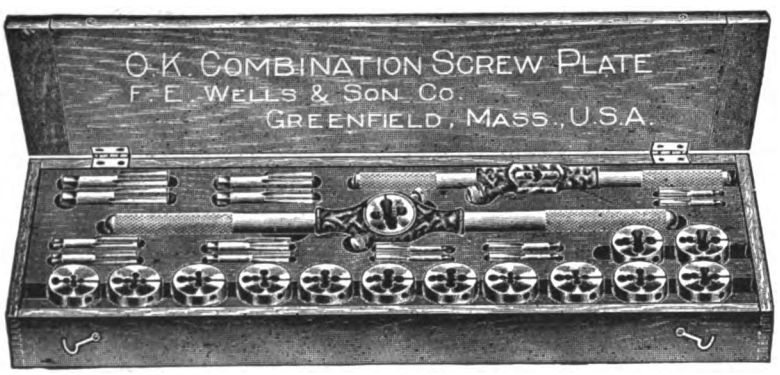
Jan. 26—Feb. 2
At CHICAGO

Four Hundred Exhibits of Cars and Accessories

S. A. MILES, Manager — **7 East 42nd Street, New York City**

O. K. COMBINATION Screw Plates

DESIGNED ESPECIALLY FOR THE AUTOMOBILE TRADE



SET NO. 531-T

CUTTING

$1/4^{20}$, $5/16^{18}$, $3/8^{16}$, $7/16^{14}$, $1/2^{13}$, $5/8^{11}$, $3/4^{10}$,
U. S. Standard

$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $7/16^{20}$, $1/2^{20}$, $5/8^{18}$, $3/4^{16}$,
S. A. E. Standard

This Screw Plate is very popular among Automobile Accessory Jobbers and Garage Men. It is designed to meet the requirements of the Repair Shop and it does to perfect satisfaction. The O. K. Hammered Dies in this set actually cut easier and much cleaner threads made than with the old style dies. This is entirely due to the extra chip clearance and oiling space provided.

Catalog 8-B tells the whole story.

F. E. Wells & Son Company Division

Greenfield Tap and Die Corporation
Greenfield, Massachusetts

GTD

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NATIONAL PRESTIGE

of National Rubber Tire Filler was won through exceptional performance in forever eliminating the bugaboo of auto pleasure—punctures and blowouts.

Made of Pure Rubber, cut in small particles treated, moulded and vulcanized by our special steam process. Fits all the different size casings. No inner tube and air used, eliminating the cause of all tire trouble. Stops the expense of buying, repairing and replacing the inner tubes. Doubles the life of the casing—reducing the cost one-half. Can be transferred and re-transferred as often as is necessary. Has been sold throughout the U. S. and many of the Foreign countries for six years. Has years of actual service record back of it. It has all the easy riding qualities of the air-filled tire, with none of its faults and uncertainties. No waiting to use your car; it is always ready whenever you need it. Let us send you small sample and tell you more about it.



NATIONAL RUBBER FILLER CO.
208 College Street **MIDLOTHIAN, TEXAS**

TO ALL DEALERS

AND OWNERS OF CARS NEEDING PAINTING

Right now, with the Winter months coming, there is a mighty good opportunity for you to materially increase your profits if a dealer and save money if a consumer—

SIMPLE SYSTEM——three coat work——AUTOMOBILE PAINTING

ANYBODY CAN PAINT A CAR IN 3 DAYS

and completely obliterate the marks of the Summer's usage with a hard, wearing, beautiful surface on all parts.

THE THREE COATS PUT UP IN SETS COMPRISING:

1 CAN AUTO PRESERVATIVE UNDERCOAT FOR FIRST COAT.
1 CAN OF AUTO PRESERVATIVE COLOR COAT FOR SECOND COAT.
1 CAN OF AUTO PRESERVATIVE VARNISH FOR THIRD COAT.
1 BRUSH FOR FIRST AND SECOND COATS.
1 VARNISH BRUSH FOR FINISHING COAT.
2 SHEETS No. 1 SANDPAPER FOR CLEANING CAR.
1 SHEET No. 0 SANDPAPER FOR SANDING LIGHTLY AFTER FIRST COAT IS APPLIED.

All ready for the brush and easily applied in Black and 12 colors, which covers old paint perfectly.

Sold in sets or separately, so that any one or all of the three coats may be had as needed.

Fifty years of experience behind every can. Quality guaranteed.



Manufactured Only By
F. O. PIERCE COMPANY,
12 WEST BROADWAY, N.Y.

Write for "Simple System" Booklet and Price.

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25¢ each

CONSIDER THE TERMINAL

Why should motorists demand an efficient ignition system and reliable plugs—and disregard the source of most ignition troubles and annoyances—loose connections?

Vibration and jar won't loosen the connections—in fact the contact gets firmer if that connection is made by a

HANDY TERMINAL

GRIPS LIKE A VISE

—and you can make a good profit educating motorists to the fact.

The jaws of the HANDY are threaded on the inside and engage the thread of the plug center bolt. Drawing up on the ring with the first and second fingers (see illustration) compresses the steel spring; the jaws spread—and the plug is released. Reversing the action clamps it again. No nuts to tighten or loosen. No tools required.

The magneto cable is made fast by a ferrule—an integral part of the terminal. The stripped wire is firmly held by a brass clip. It can't work loose. Made in three sizes to fit every make of plug.

Here is an accessory without competition, moderately priced, nationally advertised, a necessity to the motorist if he expects no-trouble ignition. You can sell one for each cylinder. It's a good winter seller, too. If your jobber can't supply you, send us his name. Your requirements will be taken care of promptly.

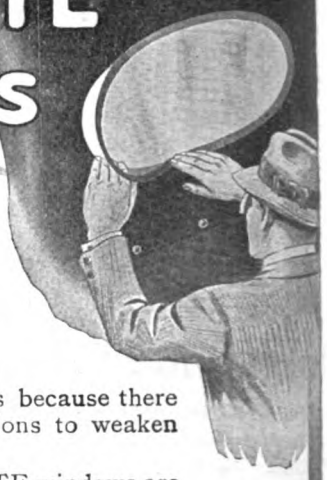
THE FRANCIS-RAND CO.

Manufacturers of

HANDY PRODUCTS

400 Erie Building Cleveland, U. S. A.

STiK-TiTE Windows



are attached to any back curtain in ten minutes, by anyone.

They stick to the curtain as long as the curtain sticks to the car. They are even stronger than the original windows because there are no stitching perforations to weaken the celluloid.

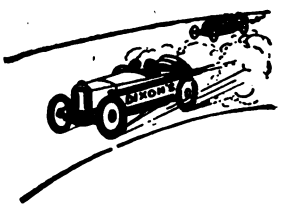
These patent STiK-TiTE windows are made in sizes and shapes for all of the more popular cars. Price 60c to $2.50.

DEALERS See the STiK-TiTE Exhibit on the mezzanine floor Hotel La Salle during the Chicago Auto Show. We have a unique and practical souvenir for every visiting dealer. If you don't visit the show write to the

CINCINNATI AUTO SPECIALTY CO.

Sole manufacturers of "Frost King Asbestos Insulated Radiator and Engine Covers," Auto Top and Seat Cover Specialists.

Elm Street Cincinnati, Ohio, U. S. A.



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and hold customers for the farsighted dealer who sells the lubricants that deliver 100% service.

DIXON'S GRAPHITE Automobile LUBRICANTS

will increase your customers' confidence in you.

Write to us for Dixon's Dealer's Deal No. 184G.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

ESTABLISHED 1827

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"FIRST MONTH'S PROFITS PAID FOR THE PLANT"

THAT'S WHAT ONE MAN WRITES

No Experience Necessary—We Teach You How!

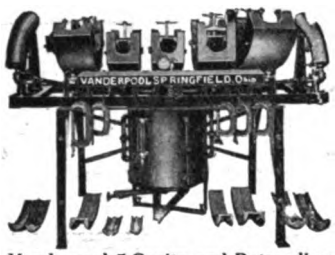
THE VANDERPOOL VULCANIZER

will get you your share of the big Winter and Spring tire repairing. Order a Vanderpool Vulcanizer today—**don't put it off—you lose money every day you delay.**

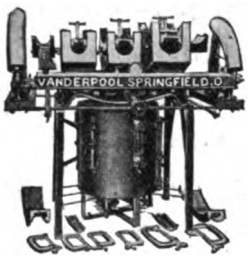
Get into this big profit-making business while work is plentiful—prices are good and everybody has more than they can do. Vanderpool Vulcanizers do the best—yes, the very best work, and that's the kind of work that satisfies customers and builds your success.

Operators of Vanderpool Vulcanizers are selling these machines for us right along—all the time. Ask for our list of users in the U. S. A., Canada, Cuba and South America. Write for price list today and send this "ad" in with your letter. (A.D.&R.)

RETREADS, DOUBLE TREADS, SECTION REPAIRS, INSIDE AND OUTSIDE, CURES AND REPAIRS TUBES



Vanderpool 5-Cavity and Retreading Molds with Bead Molds



Vanderpool 3-Cavity

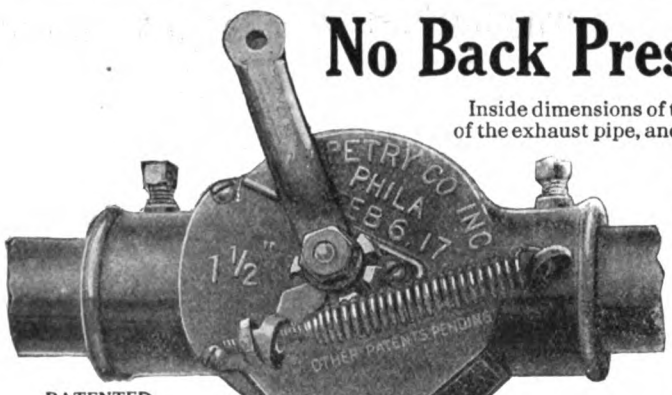


Vanderpool 2-Cavity

Start in Right Now—Don't Put it off a Minute Longer—Send for Catalog

VANDERPOOL COMPANY - SPRINGFIELD, OHIO

No Back Pressure with the Petry Cut-Out



PATENTED

SIZES 1½ in. to 3¼ in.

PRICES $4.00 to $6.00

Inside dimensions of the cut-out at every point are larger than the inside dimension of the exhaust pipe, and no air pockets can be formed that might cause back pressure.

Quickly and easily installed, having eight points of adjustment—and once applied, its position is permanent.

Gas-tight joints. Adjustable spring cannot anneal, being well away from all heat. No fluttering of valve. No strain on exhaust pipe. Gases are discharged through a flaring opening which intensifies sound, facilitating tuning up of motor.

Easy to operate—no complicated parts to get out of order. A size perfectly suited to every car.

The Petry Universal Pedal Pat. Pending

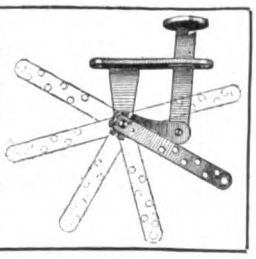
Six different positions.

Adjustable to pull or push; for any use for which a pedal is required.

Muffler cut-outs; any style, kind or size.

Accelerator. Exhaust Whistle or horn. Heater valve.

The only pedal on the market that will meet all requirements. Made of high grade steel with special processed GUN-BARREL FINISH, not plated.



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DISTRIBUTORS: Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Hughson & Merton, Inc., 77 O'Farrell St., San Francisco, Cal.; 1203 Marsh Strong Bldg., Los Angeles, Cal.; 421 Oregon Bldg., Portland, Ore.

PETRY CUT OUT

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"NORMA" BALL BEARINGS

(Patented)

The "best" car—the "best" truck—the "best" engine—they may all be condemned, may be rendered useless, by ignition or lighting apparatus which fails to measure up to their standards of quality. A good car, a good truck, must be consistently good—good in every minute detail, serviceable in every feature which makes for serviceability.

The standardization of all high-grade magnetos and lighting generators on "NORMA" Ball Bearings is an example of engineering consistency. The makers of these accessories, seeking maximum serviceability in their product, have availed themselves of the proved "NORMA" serviceability.

Be Sure—See that Your Electrical Accessories are "NORMA" Equipped

THE NORMA COMPANY OF AMERICA

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Ball, Roller, Thrust and Combination Bearings.





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Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

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Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

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Kansas City :: Missouri



Pyramid Starting and Lighting Brushes

ARE STANDARD EQUIPMENT On the Majority of Cars

There are more than two million cars which sooner or later will require new brushes for their starting and lighting outfits.

Are you prepared to get your share of this business by being able to supply Pyramid Starting and Lighting Brushes when called upon? These brushes are standard equipment on a large majority of the cars.

It is easy to get this business when you have our automobile specification list at hand to tell you just the right brush for every starting and lighting system in use on any car.

Send for this List Today.

NATIONAL CARBON COMPANY, Inc.

CLEVELAND, OHIO

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The "TURNOVER" is there!

IN SALES —as well as in mechanism

HEINZE SPRINGFIELD

cranking & lighting system for FORD cars



LEADS IN SALES

Comparative statements from 453 Ford dealers prove that more dealers are handling Heinze-Springfield than any other one make of starter, *and that dealers handling the Heinze-Springfield with other makes sell far more Heinze-Springfields than any other kind.* Comparison also quickly *proves the Heinze-Springfield System the greatest value in its field.* It is the *only* system for Fords selling for $85, complete with Ammeter, Dash Light, Tail Light, Dimmers and Lock.

The Heinze-Springfield dealer arrangement is based on our conviction that the desirable dealer should realize worth while profits.

The John O. Heinze Co.
Springfield, Ohio, U. S. A.

Real Points About the Heinze-Springfield System

1. A Two Unit, Six Volt, Single Wire Cranking and Lighting System Bendix Drive.
2. Nothing visible with hood closed.
3. No interference with engine accessibility.
4. Installed complete in four hours.
5. No power drain on motor.
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7. Highest *quality,* most *compact,* most *convenient* combination Dash Switch, Ammeter, and Dash Lamp.

Leave Your Tube in the Vulcanizer
AND WAIT ON YOUR CUSTOMERS
Why Not?

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Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

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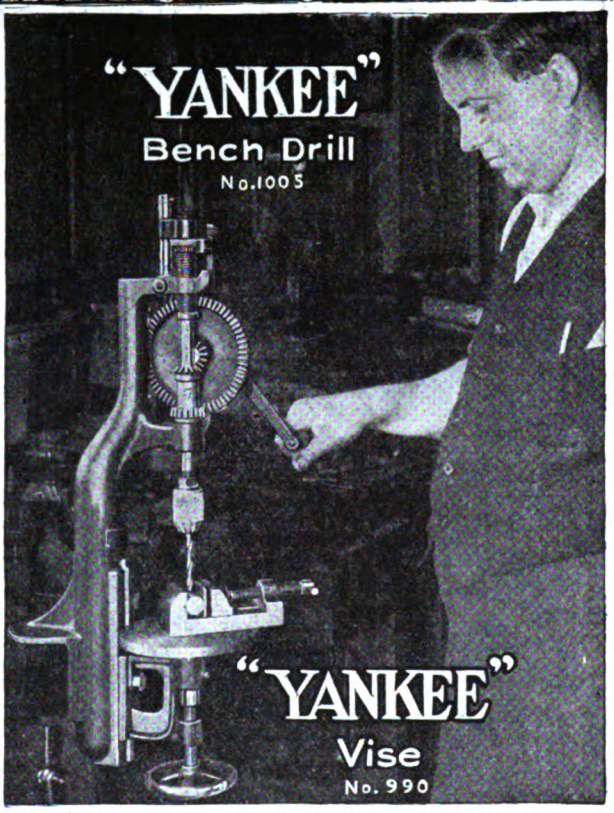
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Speed Up The Job

With labor scarce, you must look to **multiplying man's power.** You need tools that require less skill, less hand adjustment, less labor, that produce greater results—tools that **any** workman can operate with speed and efficiency.

This "YANKEE" Bench Drill takes over the "thinking" required in the operation of ordinary tools. It takes care of itself! The "Yankee"

Automatic Friction and Ratchet Feed

does away with uncertain hand feeding. Maintains just the right feed throughout, whether in hard or soft metals, large or small holes. Accident-proof! Saves drills; gears can't jam or strip; feed is automatically thrown off (at extreme top and bottom), letting spindle run free. Quick, accurate and 50% more work assured!

"YANKEE" Bench Drill

No. 1003—One speed. Height 10¾ in. 3-jaw chuck holds round shanks up to ¼ in. diameter. Price at factory, **$10.00.**

No. 1005—Two speeds. Height 28 in. 3-jaw chuck holds round shanks up to ½ in. diameter. Price at factory, **$16.50.**

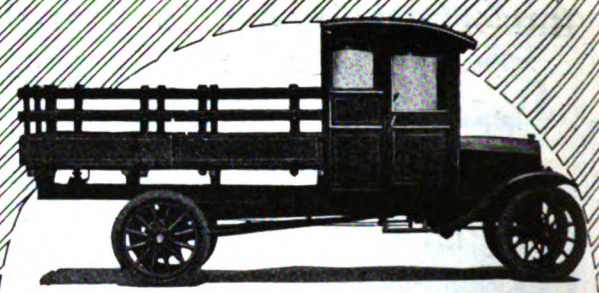
"Yankee" Vise No. 990—For use with Bench Drill. Sets level on bottom, end or sides. V-groove holds round pieces tight and parallel. Swivel jaw for taper work. Jaws open 3 in. Price **$2.20.**

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Write for free "'Yankee' Tool Book," showing garagemen's time- and labor-saving boring, drilling and screw-driving tools.

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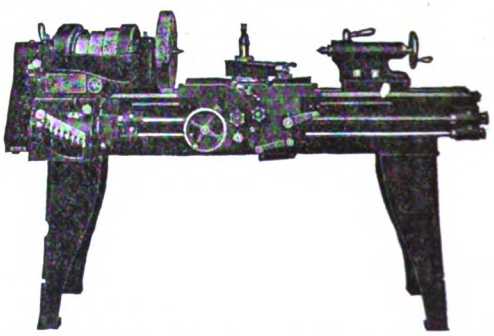
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Make Better Mechanics



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14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices

THE MONARCH MACHINE TOOL CO.
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TIRE TROUBLE

TIE UP TO

BRAENDER TIRES

BRAENDER Tires made an unequalled record for tire endurance in the first Official Smith Trophy Coast to Coast Run over the Lincoln Highway. Raoul F. LeMat, accompanied by Miss Margaret Gale and Stanley James, left New York Jan. 5, 1915, in a Stutz and a National equipped with Braender Tires. On April 5, 1915, they finished the 5,286-mile run at Los Angeles *without a tire change.*

No harder test of tire quality, no stronger proof of sound construction could be conceived; and yet, the Stutz turned right around and covered the return journey on the same set of Braenders—*without a tire change.*

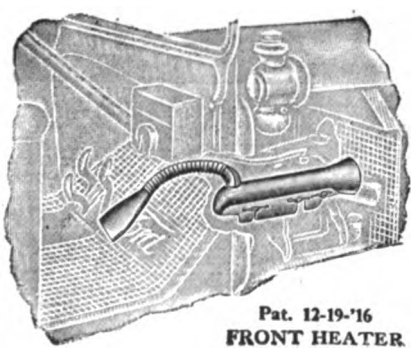
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Braender Rubber & Tire Co. *Trade* BRAENDER *Mark*

Rutherford, N. J.

New York Philadelphia - Chicago

The Meaning of *Presto*



Pat. 12-19-'16
FRONT HEATER

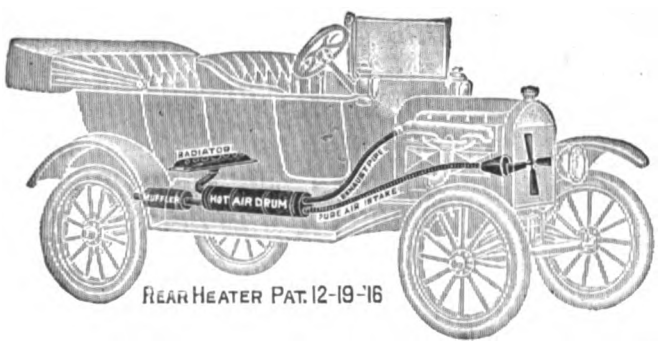
When you think of Presto, think of bigger business and profits. That is what Presto accessories mean to you.

The Dealer and Jobber that handles the Presto line builds up a good and profitable business.

The Presto heating system for Ford cars makes cold weather driving as pleasant as in the springtime. No fuel expense to bother about. Original cost is the only expenditure. An attachment worth while.

The Presto engine heater does away with the expense of heating the entire garage. The new swivel hook makes it possible to place the heater anywhere under the hood, and deliver heat where most needed. Does away completely with starting difficulties on cold mornings.

Learn more of these fast-moving accessories. Write for complete catalog of over 100 Presto accessories.





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EASTERN BRANCH
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WESTERN BRANCH
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Eliminate All Risk By Using Free From Acid KANTFREEZE



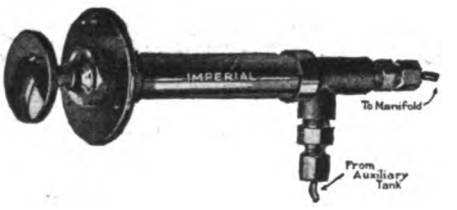
Every motorist has been on the lookout for an anti-freeze preparation that not only is better and more economical to use than alcohol, but that positively will insure the "Safety-Always" kind of winter protection to radiators.

Here it is—**Imperial Kantfreeze Radiator Compound**, the fully-tested, high quality product of a manufacturer with a national reputation for perfecting devices and preparations that make winter-time motoring more of a pleasure and less of an expense.

At one-third the cost of alcohol you can use Kantfreeze and know absolutely that all winter long you will be free from a radiator freeze-up. Moreover, alcohol is vital to victory now. You should not use it.

Don't depend on an unknown anti-freeze preparation to give good results. Rely on Kantfreeze, which is 99% pure.

Imperial Kantfreeze Compound is absolutely free from acid. It cannot cause corrosion or injure the rubber hose or other parts of the cooling system. When used according to directions you will be assured of a factor of safety far greater than with any other compound or liquid on the market. One application is sufficient for the whole winter if properly applied.



Motorists everywhere know of the Imperial Primer—the marvelous device which **Starts Your Motor Instantly in Cold Weather.** Simple to operate and fits on every make of car. Price for complete outfit, including Auxiliary Tank, is **$6.00.**

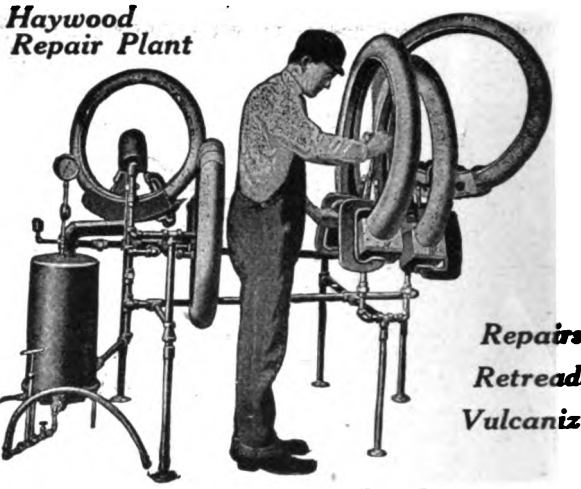
DEALERS:

Imperial Kantfreeze Radiator Compound and the Imperial Primer are a strong combination for swelling winter-time profits. Write today for details of our proposition.

Imperial Brass Mfg. Co.

320 S. Racine Avenue CHICAGO

The Haywood Tire Repair Plant



Repairs
Retreads
Vulcanizes

Give Haywood Service

HERE'S a standardized method of Tire Repairing—a method Nationally Advertised and known to motorists. Big money can be made either as side line to your present business or as a business by itself. **Equip your garage or store with a Haywood Plant.** Let it earn extra profits, or open a Haywood shop in your locality. **It's a rich opportunity.**

Write For Attractive Offer

ALL you need is one machine, a little training and you are ready to make money. A letter or post card brings all details. Interesting catalog explains **New Scientific Method** and gives particulars of our Co-operative Business Building plans. Write today.

Haywood Tire & Equipment Co.

965 N. Capitol Ave. Indianapolis, Ind.

Guaranteed for 10,000 Miles



EVERY Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser.

"Absolutely Puncture Proof"

Brictson Tires are puncture proof, and proof against blowouts, skidding, rut wear, rim cuts, and can't be damaged by oil or gasoline. Wonderful resiliency, easy riding and economy commend them to every car owner.

The Big One-fourth Retread Feature

Should the tread surface wear out after 10,000 miles of service you can get a new retread for one-fourth the original cost of the tire, instead of buying a new tire, and you keep the remaining three-fourths in your pocket. With ordinary service the Brictson Tire should run enough beyond the 10,000 miles to require one or two extra retreads. The more retreads you use the cheaper your service.

FREE TRIAL OFFER

To convince you the Brictson Tire will give satisfaction TRY THEM ON YOUR CAR AT OUR EXPENSE. Write today for this Free Trial Offer, a copy of our guarantee and full information about Brictson Tires.

BRICTSON MFG. COMPANY
Dept. 118
1015-24 Woodmen of the World Building
OMAHA, NEBRASKA

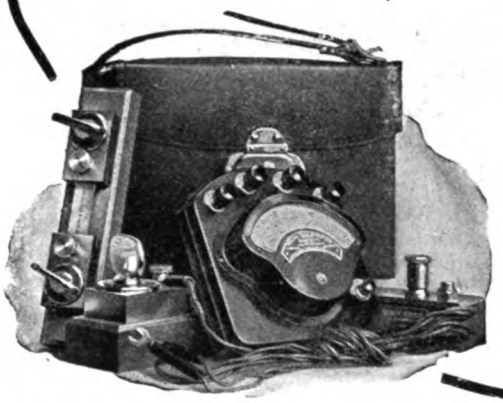
Brictson Pneumatic Tires

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Will Somebody Else Get Your Share?

If you can repair and adjust Electrical Equipment, you will get the cream of the garage business and make more money. With the increasing demand for service of this sort, you must equip to handle the business, or lose it to your more enterprising competitor.



Weston

Model 280

GARAGE TESTING INSTRUMENT

is your one great and urgent necessity, to enable you to locate electrical troubles quickly and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electrical equipment you can install.

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.

WESTON ELECTRICAL INSTRUMENT CO., 2 Weston Ave., Newark, N. J.

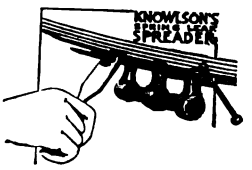
23 Branch Offices in the Larger Cities

KNOWLSON'S

100% EASIER RIDING

BOTH GUARANTEED.

Either or both delivered upon receipt of price.



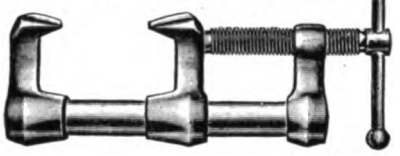
Spring Spreaders

SQUEAKING STOPPED

Your money back if you want it.

This one Drop Forged, nickel plated and polished.

Price - - - $1.50



Fit any Spring. Easily operated. Strong and durable.

Don't ruin your Springs by neglecting them.

There is but one effective way to take care of them.

GET A KNOWLSON SPREADER.

At your Dealer's or sent direct.

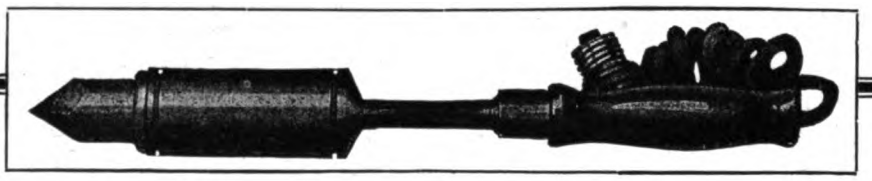
This one Drop Forged; Yoke, gun metal finish. Screw and handle nickel.

Price - - - - $1.00



SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., ANN ARBOR, MICH.

One jolt of a rusty, squeaky spring may cost you ten times the price of a sure preventive.



DOVER ELECTRIC SOLDERING IRONS

ARE MADE WITH THE FAMOUS

"NO-BURN OUT" VEA HEATING ELEMENT

HEAT QUICKEST—RETAIN HEAT LONGEST

WRITE FOR DESCRIPTIVE CIRCULAR AND PRICE LIST

—— MADE BY ——

DOVER MANUFACTURING CO., Main Office and Factory, Dover, Ohio
NEW YORK OFFICE, 30 CHURCH ST.

VULCAN QUALITY

AUTOMOBILE SPRINGS

SPRINGS IN STOCK FOR ALL CARS

90,000 Springs. 588 Types.

6—FACTORY BRANCHES—6

St. Louis, Mo. 1402 Chestnut St. Minneapolis, Minn. 1024 Hennepin Ave.
Reading, Pa. 538 Franklin St. Ft. Worth, Tex. 708 Commerce St.
Sumter, S. C. 29 Caldwell St. Richmond, Ind. Colonial Bldg.

FACTORY RICHMOND, IND.

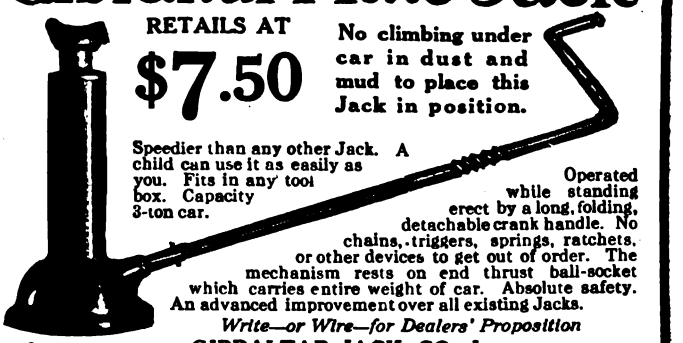
JENKINS VULCAN SPRING CO.

Gibraltar Auto Jack

RETAILS AT

$7.50

No climbing under car in dust and mud to place this Jack in position.



Speedier than any other Jack. A child can use it as easily as you. Fits in any tool box. Capacity 3-ton car.

Operated while standing erect by a long, folding, detachable crank handle. No chains, triggers, springs, ratchets, or other devices to get out of order. The mechanism rests on end thrust ball-socket which carries entire weight of car. Absolute safety. An advanced improvement over all existing Jacks.

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GIBRALTAR JACK CO., Inc.

1902 Broadway New York City

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A Giant's Might in Fighting Friction

New Departure Ball Bearings are designed and built for *big* and little jobs—for the *heavy* as well as light duties of industry.

These bearings are delicate only in their extreme precision. In service they are giants of strength and conquerors of friction.

The secret of their power is also in the design of the raceways—so that the balls are supported on definite areas—and because the steel is both tough and resilient, absorbing terrific shocks without becoming abnormally distorted.

New Departure Ball Bearings are worthy parts of the heaviest and most powerful trucks and motors.

"Engineering Bulletins"—125 data sheets with binder free to designers, builders and buyers of motor vehicles.

THE NEW DEPARTURE MANUFACTURING CO., BRISTOL, CONN.
Conrad Patent Licensee.

NEW DEPARTURE BALL BEARINGS



$60 Complete with tripple gear attachment (as shown).

$50 Less tripple gear attachments.

WILSON'S
Ford Transmission Bushing Reaming Machine

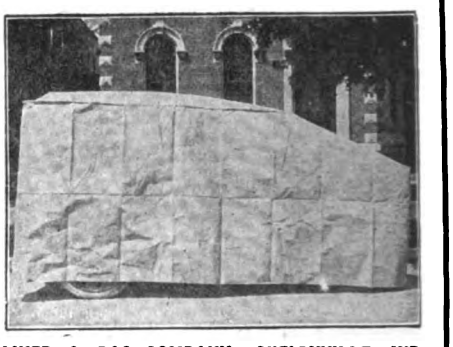
The only machine or tool made that will ream bushings in all three drums, and tripple gears. Absolutely true, perfect fit and alignment.
2 minutes labor required to set up and ream one bushing. 25 minutes to completely overhaul a transmission. Every job uniform. Saves 75% of labor costs. Send for special circular of other labor-saving tools.
K. R. WILSON, 1018 MAIN STREET, BUFFALO, N. Y.

KENNEDY AUTO STORAGE COVERS

will protect your car in storage during the winter season from dirt, dust and moisture. They are made of heavy durable paper in standard sizes and will fit any cars.

7 Passenger
5 Passenger
Ford Special
Electric

ORDER NOW



THE KENNEDY CAR LINER & BAG COMPANY, SHELBYVILLE, IND.

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For Sale By Supply Houses

IRON CEMENTS Nos. 1 and 3
For Permanent Repairs on Automobile Motors and Parts

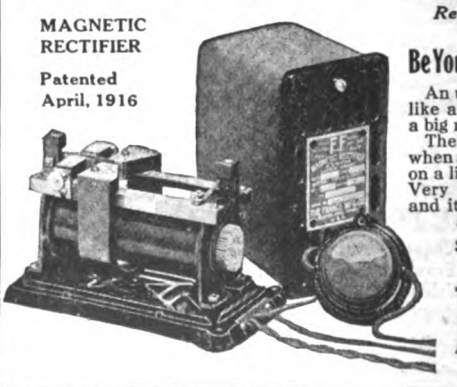
Repairs leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight. Expands and contracts with the metal to which it is applied and not affected by heat, cold, water, gasoline or oil.

Complete Repair Package contains one 1-lb. can SMOOTH-ON Iron Cement No. 1, one 1-lb. can SMOOTH-ON Elastic Cement No. 3, one roll Tape, one 144 page Instruction Book. . . $2.00

Smooth-On Mfg. Co., Jersey City, N. J.
Chicago, 221 N. Jefferson Street
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F-F BATTERY BOOSTER

MAGNETIC RECTIFIER
Patented April, 1916



Rectifies Alternating Currents

Be Your Own Service Station

An undercharged battery is like a small boy trying to do a big man's job.
The Booster is ready to work when attached to lamp socket on a lighting or power circuit. Very efficient in operation and its performance is guaranteed.

$24 Complete, and up
F. O. B. Cleveland

The France Mfg. Co.
Cleveland, Ohio

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"WHITNEY" KEYS

FOR THE
WOODRUFF SYSTEM

For the benefit of dealers, garages, and repair men, we are prepared to furnish our keys put up in two assortments. Every garage and repair man should keep these on hand. They may be purchased from the leading jobbers or ordered direct from the factory.

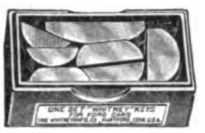


Regular Assortment

One hundred keys of the sizes most likely to be required for repair work.

Ford Assortment

One set of keys for the Ford car. These keys are of the special material and special treatment specified by the Ford Motor Company.



THE WHITNEY MFG. CO.

HARTFORD, CONN.

Chains Keys Hand Milling Machines

AKRON-WILLIAMS

Tire Repair Equipment



Developed by the Leading Tire Companies

DO TIRE REPAIRING

the approved way, with Akron-Williams equipment—the same outfits that have been designed with the aid of the World's largest tire manufacturers.

More than 60 leading tire companies use Akron-Williams equipment in their factories, and recommend and sell them to their agents and dealers all over the world.

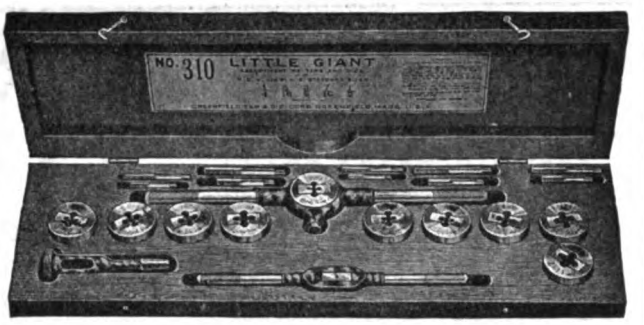


Get our new catalog "Everything for the Tire Repairman."

THE WILLIAMS FOUNDRY & MACHINE CO.

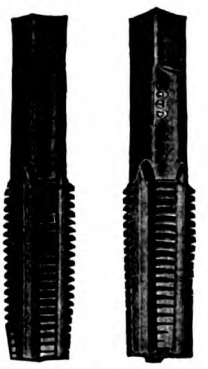
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Exclusive Distributors for California: THE WATERHOUSE & LESTER CO., San Francisco.



Little Giant Screw Plate

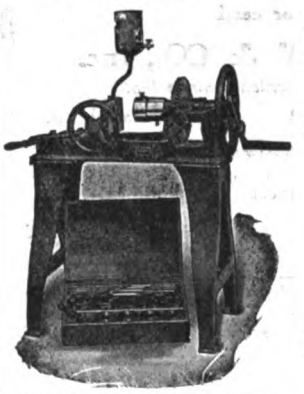
THE COMPLETE LINE OF THREADING TOOLS



Hand Taps



Little Giant Die



G. T. D. Threading Machine

Whatever your requirements in the screw cutting line may be, we can meet them, as our line is the most complete in the world. Bear in mind that our service in the threading tool line is unexcelled.

Ask for a copy of our No. 37 General Catalog which contains besides the products listed below, many tables of valuable information for garage repairmen, etc.

Below is a partial list of products shown in the catalog:

Taps—All kinds, for hand and machine use, in all thread standards.

Dies—Several styles, for hand and machine use, in all thread standards.

Screw Plates—Many styles for bolts, nuts and pipe, with Automobile (S. A. E.), or U. S. S. threads, combination assortments with both U. S. S. and S. A. E. thread taps and dies.

Reamers—Hand and machine, bit brace and straight shanks, all types.



G. T. D. Burring Reamer

GTD

Greenfield Tap & Die Corp'n

Greenfield, Mass.

New York, 28 Warren Street
Chicago, 13 South Clinton Street
London, 149 Queen Victoria Street
Canadian Factory, Wells Brothers Company of Canada, Ltd., Galt, Ont.

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THE Fisher PATENTED "RIM-GRIP" SUB-CASING

MORE MILES PER TIRE LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

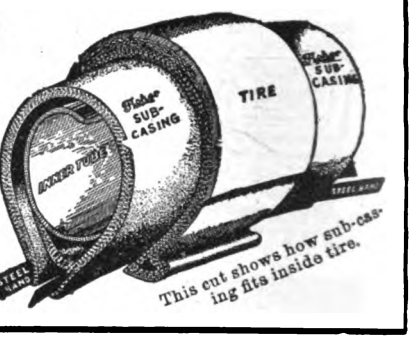
A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

RIM-GRIP SUB-CASINGS reinforce the fabric of the tire at all points from bead to bead. They make a partially worn tire stronger than it ever was. It can be worn out completely and the sub-casing used in another tire. As the cost of equipping a car with new tires is much greater than last year, it will pay you to investigate Rim-Grip Sub-Casings. *Write for particulars.*

FISHER MANUFACTURING CO.

1706 PAYNE AVENUE, :: :: CLEVELAND, OHIO



This cut shows how sub-casing fits inside tire.

DON'T dislike the old car just because it looks its age. Give it new life with

"F-S" "Evernew" Auto-Body Enamel

It will give a bright, attractive finish that is hard and durable. Easily applied and doesn't show brush marks. Eight standard colors—special shades to order.

Send for color card

FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 North Fourth Street - Philadelphia

"Evernew" Auto-Body Dressing revives and waterproofs old tops, yet leaves them pliable.

6



SEE THAT GROOVE CONTROLLING THE OIL?

LOOK!



The groove full of oil forms a dam. Gas cannot get down, surplus oil cannot get up. That's why motor has more power, no carbon.

ISN'T THAT A REASON?



"NO-LEAK-O" RINGS GUARANTEED SATISFACTORY, OR MONEY BACK

Don't rebore cylinders.

"NO-LEAK-O" restores power when others fail.

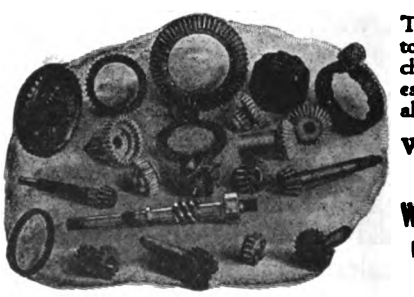
Write for booklet A2. Ford size or under, 50c. Discount to the trade.

AUTOMOBILE ACCESSORIES CO.,
(Sole Mfrs.) 816 W. North Ave., Baltimore, Md.

Represented by: H. G. Para, 1414 S. Michigan Blvd., Chicago; J. W. Van De Grift, 627 Charles Building, Denver, Colo.; J. E. Chumbley & Company, 1008 Stahlman Building, Nashville, Tenn.; A. W. Hall, 253 Lennox Building, Cleveland, Ohio; Manufacturers' Agency Co., 420 Wainwright Building, St. Louis, Mo. Carried in stock by W. E. Pruden Hdwe. Co., 864 Eighth Ave., N. Y. C. Gavin Williams Company, 1300 Fifth Street, San Diego, Cal.

IF YOU WANT THE DEPENDABLE KIND OF

DIFFERENTIAL AND TRANSMISSION GEARS AND SPROCKETS



That can be relied upon to be accurately machined, and of the highest grade material, to fit all makes of cars,

Write for prices and terms to

William Ganschow Co.
Morgan and Washington Blvd.
CHICAGO, ILLINOIS

COMPRESSED AIR TANKS—

SCAIFE COPPER-BRAZED TANKS are used to the exclusion of all others by the leading builders of Air Compressors.

We positively guarantee them to hold air indefinitely without loss of pressure.

Send for Catalogue

WM. B. SCAIFE & SONS CO., **PITTSBURGH, PA.**
New York Office: 26 CORTLANDT STREET

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WITHERBEE STORAGE BATTERIES

For

STARTING — LIGHTING — IGNITION



WITHERBEE BATTERIES are of correct size, shape, voltage and capacity for every make and model of car, and for starting and lighting systems of any manufacture in general use.

MODERN—carefully constructed batteries—they possess high starting ability; the plates are specially processed to prevent buckling, and the jars are made of the finest rubber; the wood cases of acid-proofed hard wood.

Recognized standards since 1903.

Complete information, prices and illustrated catalog mailed promptly upon request.

WITHERBEE STORAGE BATTERY CO., Inc.

1904 Broadway; Factory, 643-9 West 43rd St.

NEW YORK

BUNTING BRONZE

CORED BARS

Bunting Bearing Metal is overwhelmingly favored—because we have steadfastly adhered to an ideal which subordinates everything to the prime question of quality.

Beyond the shadow of a doubt, we can suit you to a "T"—for our Cored Bars are made of the world's best—yes—very best phosphor bronze. Over 300 of the largest manufacturers of machinery, engines and motors have adopted it for use in their products and they are more than satisfied.

If you, too, wish to use Bunting Bronze, the wise practical expedient way would be to write us a letter today—why not—it's for your own good.

Write for Pamphlet "X"

STOCK SIZES

PIECE No.	Outside Diameter	Inside Diameter	Length	Approximate Weight
A	1	½	12	2
B	1¼	½	12	3½
C	1½	¾	12	5
D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15½
K	3½	2½	12	17
L	4	3	12	21
M	4¼	3¼	12	20



The Bunting Brass & Bronze Co.

740 Spencer Street Toledo, Ohio

A Fit That's Neat For Every Seat



(Patent Applied For)

THE 3-piece or "Sectional Overlap Lazyback" construction of Gordon Seat Covers has made them the choice of *new thousands* of car owners.

They fit perfectly. The overlap feature cares for any variation in the upholstery.

They ride easy. The overlap forms a corner that yields to the movement of the cushions.

There are no seams to rip, and the overlap relieves all strain on fabrics and fastenings.

GORDON Seat Covers
TAILORED TO FIT

Other Gordon Profit Makers

Easy-On Tire Covers

Top Recoverings

Radiator and Engine Robes

Top Slip Covers Kick Pads

Many Fabric Specialties for Ford Cars

Are an economy that every car owner can enjoy. They help to save the car but mean no sacrifice in looks, use or comfort. While they protect the upholstery of a new car and restore the attractiveness of worn and shabby cushions they give a car a "dressed up" look that is envied by everybody.

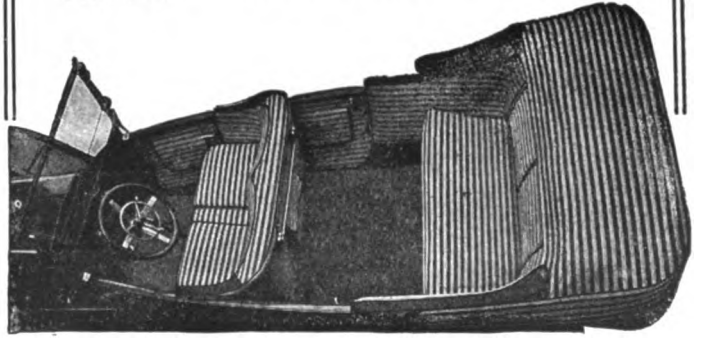
They give a used car the clean, inviting appearance that create "looks" and make it desirable.

Gordon Seat Covers are made for more than a thousand models of cars in a variety of materials, suitable for closed and open cars. 24 materials from which to choose.

Send for our special dealers' catalog showing samples of materials.

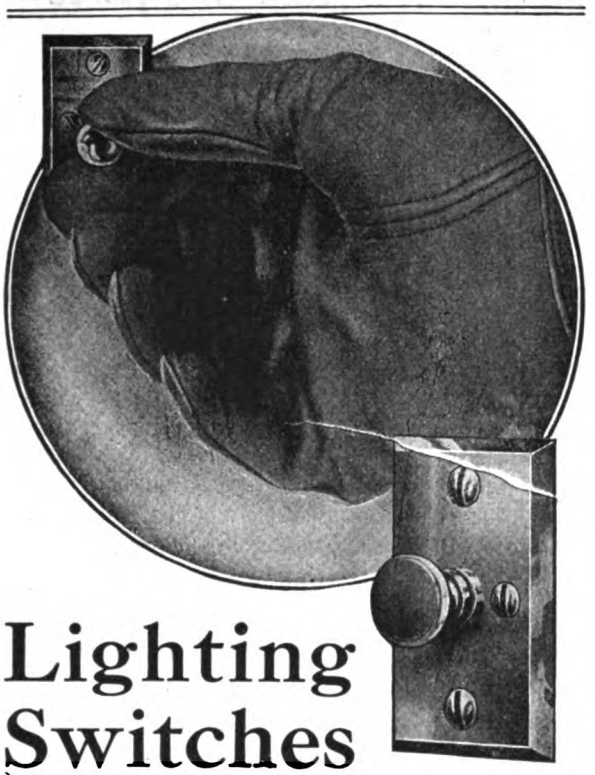
THE J. P. GORDON CO.

306 N. Fourth St. COLUMBUS, OHIO



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CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

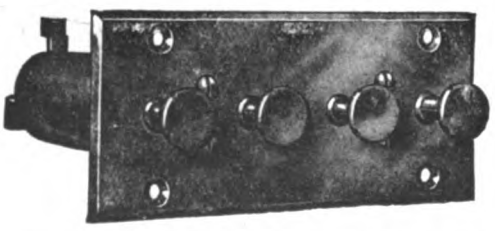
One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP
Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.



SPARK PLUGS
THAT
GO *AND* MAKE GO

The spark plugs you sell must not only make cars GO; they must themselves GO—must sell easily.



REFLEX SPARK PLUGS



GIANT REFLEX Spark Plugs are standard equipment on the thousands of White Trucks now in the war zones. The scene above, taken "somewhere near Verdun," shows an example of the service these REFLEX equipped Whites are called upon to deliver.

because they are individually made to make good. They not only GO—but they stay sold. More than that, they bring the customer back for more.

Every extra cent we put into super-strength porcelain and non-pit electrodes, means profits for dealers handling them.

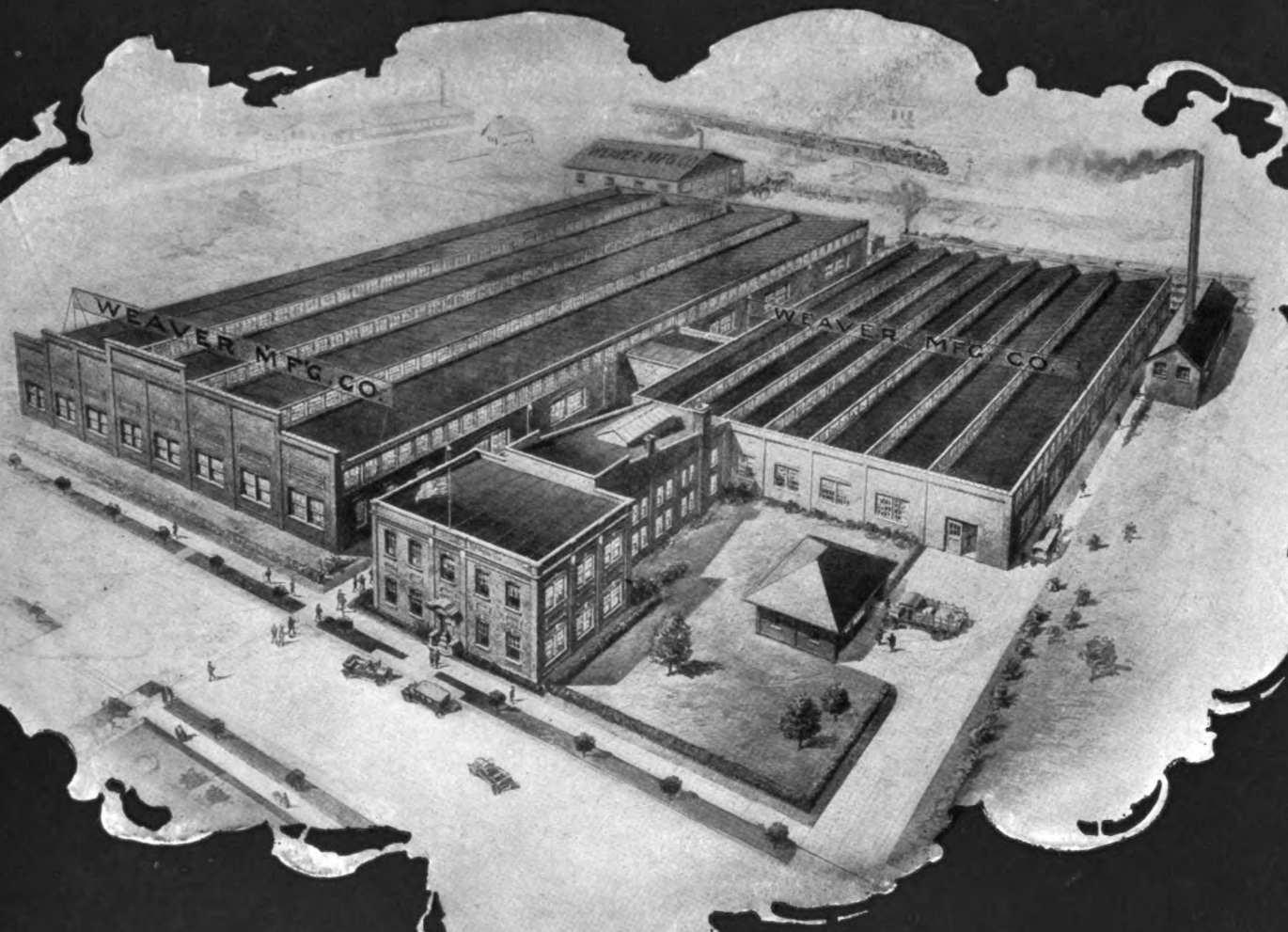
REFLEX Spark Plugs are built for endurance regardless of how rough the usage. As standard equipment, they are helping make possible the gruelling service thousands of White Trucks are now giving in the war zones.

REFLEX dealers can supply every demand because there is a Reflex for every requirement; automobiles, trucks, tractors, motorcycles, motorboats, etc.

Write for dealer proposition that tells why REFLEX Spark Plugs GO.

THE REFLEX IGNITION CO.
1711 PAYNE AVE. CLEVELAND, U. S. A.

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ALADDIN

with all his MYTHICAL magic never performed a miracle that could surpass the REAL and marvelous development of the WEAVER AUTO TWIN-JACK from it's small beginning, into the present full and complete line of

WEAVER
GARAGE EQUIPMEN

In a few short years the Weaver Factory has developed into the largest institution in the world devoted exclusively to the manufacture of equipment for the garage.

The reason is THIS:

We have spared no expense to make our products RIGHT in every detail, and we have adhered strictly to a real business policy which we feel is fair and equitable to all

WEAVER MFG., CO.

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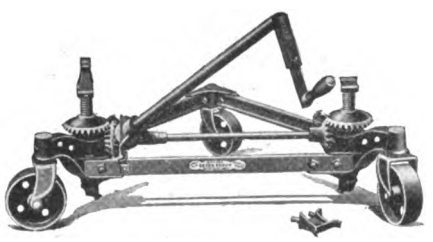


AUTO TWIN-JACK, Regular

Every Item in the Line Is A Real Necessity.

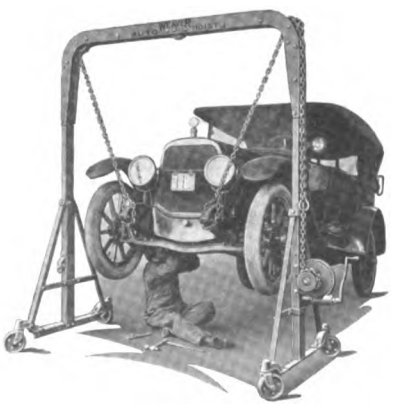
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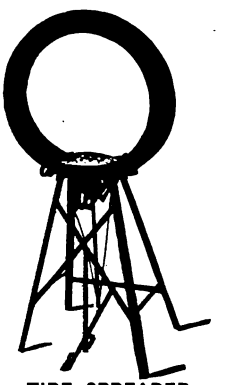


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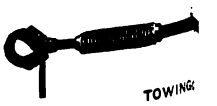
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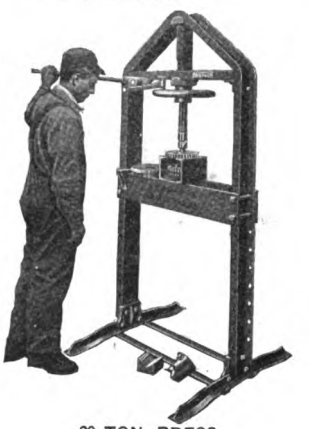
Competition in garage and repair service is becoming keener every day—therefore the shop which is prepared to give the most prompt and satisfactory service is the one that will draw the most satisfactory class of patronage.

Then another point—

The shortage of help—due to the War—is going to make it necessary for the live garageman to install every available labor saving device,—that means a FULL LINE of Weaver Garage Equipment.



BODY EXTENSION FOR EX. H. JACKS



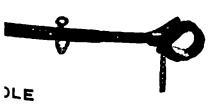
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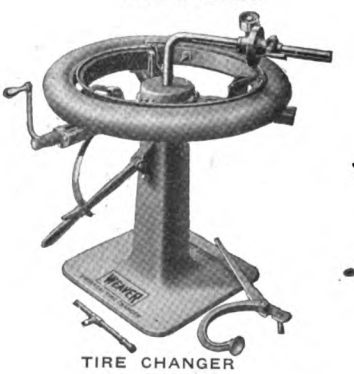
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Facts Worth Knowing

Concerning the "Weaver Line"

ONE VERY SIGNIFICANT FACT IS THAT EVERY ARTICLE IN THE WEAVER LINE IS CONCEIVED AND PATENTED BY MR. WEAVER—THE PRESIDENT OF THE COMPANY. Consequently, each article precisely fills the requirements of some phase of the automobile repair industry which our researches showed needed relief.

Also, by the patentee of our products being a member of the firm, we are not compelled to pay out tens of thousands of dollars in the purchase of miscellaneous patents, as would otherwise be true. Therefore, we are able to give greater value for the money in both materials and workmanship, in addition to superiority in design.

WE ARE SPECIALISTS IN THE DESIGN AND MANUFACTURE OF EQUIPMENT FOR THE GARAGE, WE MAKE NOTHING ELSE. For this reason Weaver products represent more of real value to the garageman than could be true were we endeavoring to market a few promiscuous articles as a "side line."

BY HAVING A LINE OF A DOZEN DIFFERENT ARTICLES ALL OF WHICH ARE APPLICABLE TO EVERY GARAGE, WE ARE NATURALLY VITALLY INTERESTED THAT EACH PURCHASER OF ONE OF OUR ARTICLES RECEIVE THE GREATEST POSSIBLE DEGREE OF SATISFACTION. This frequently is not the case with concerns marketing a few diversified articles with no "second sale" possibilities.

OUR LINE IS CARRIED BY PRACTICALLY EVERY LARGE JOBBER OF AUTOMOBILE ACCESSORIES FROM COAST TO COAST. This means that you have a supply of our goods near at hand for prompt delivery no matter where you may be located.

We were the first to come to the relief of the garageman with a line of equipment especially designed to overcome HIS peculiar difficulties. Today we are the largest institution of this kind in the world —which is positive proof that Weaver Quality is appreciated.

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Automobile Dealer AND Repairer

A JOURNAL OF PRACTICAL MOTORING

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Expert Advises Against Usual Practice of Waiting Until Spring to Overhaul the Car

Predicts Scarcity of Skilled Mechanics Owing to War and Demands of Government—Says Owners Should Have All Work Done this Winter

BY CLIFTON EGERT

If you are one of those automobile owners who store their cars during the winter months and make it a practice to await the arrival of spring before giving a thought to the repair and overhaul of your machine, you are due to be disappointed, for the war is going to change the old order of things. So when the nice, balmy days arrive and your thoughts turn to the joys of motoring and you take your car to the garage or repair shop to have that leaking cylinder fitted with a new piston and rings, do not be surprised if you are informed that you will have to wait weeks before even getting your machine in the shop let alone having the work completed. If you wax indignant and go to another shop the chances are that you will not fare any better. If you ask for an explanation the repairman or garageman will make use of that stock expression, "On account of the war."

Factors Responsible.

If one stops to analyze conditions he will see that the answer is a practical one, for it should be borne in mind that the output of new motor vehicles will be greatly reduced this year. Some state that it will be 20 per cent. less, while others estimate that it will be 40 if not more by the time warm weather arrives. As a result of this decreased output, conditions brought about by the war, thousands of owners will have to be content with a used vehicle; that is, will have their car overhauled, repainted and newly equipped.

Conditions Abnormal.

This means that the garageman, repairman, painter, etc., will be called upon to handle in addition to the usual tremendous volume of spring business that created by those owners who cannot obtain new cars and will have their used machines thoroughly overhauled. Ordinarily this would bring about an abnormal condition, a volume of business that could not be satisfactorily handled even if sufficient help could be obtained as in normal times.

Scarcity of Trained Labor.

In other words, the owner of a repair shop or garage handling repair work is to be confronted by the same problem as other industries and that is by a shortage of skilled labor. There is no denying the fact that there is going to be a scarcity of skilled automobile mechanics in this country if such a condition does not already exist. And conditions are not going to improve as time goes on; in fact, the scarcity of trained automobile repairmen is being noted by those who keep closely in touch with such matters.



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Why Shortage of Labor.

As an example of how skilled automobile mechanics have responded to the call or have been drafted is the statement of a well-known automobile manufacturer, who says that over 15 per cent. of his employees, practically all skilled mechanics, are serving with the colors. These conditions obtain to a greater or lesser extent among the garages and repair shops throughout the country. They exist in the large service station as well as in the country and crossroads garage, and many an owner will inquire for Bill or Pete to learn that he is driving a truck or an ambulance or engaged in helping Uncle Sam construct his fleet of airplanes.

Requirements of Government.

Few automobilists realize how many thousands of skilled and semi-trained automobile mechanics will be required by the Government to keep its fleet of mechanical transports and airplanes in condition. It is estimated that at least 10 men will be required in back of the lines for each airplane and that these will largely be men who will be drawn from the automobile industry, from the factory, garage, repair shop and service station.

No Time Like the Present.

While it is probable that the scarcity of trained automobile repairmen will not be pronounced until spring, or at least until the big fleets of trucks and airplanes are ready for shipment abroad, there is every reason to believe that the best interests of all will be served if the automobile owner will have any needed repairs made at the present time, when the services of skilled workmen can be obtained and the work more thoroughly performed than would be possible during the rush season. The tendency of the average owner to wait until spring before having any needed work done frequently means that only those absolutely necessary repairs are made. By this is not meant that the work is not properly done. It does mean that a long list of waiting cars and impatient owners creates such a demand for service that a great many details, details insignificant at the time but capable of shortening the life of the car, are generally neglected.

Transportation Facilities Congested.

There is another angle to the situation, one that should not be overlooked by the owner or the garageman or repairman, and that is the advisability of taking into consideration the possibility of delay in obtaining parts, stock, material, etc. With the transportation facilities of the country taxed to their uttermost to meet the requirements of the Government there is every reason to believe that shipments will not be as prompt as formerly. Consequently motorists contemplating repairs or replacements requiring the attention of out-of-town concerns will do well to order early if they would avoid disappointment.

The fact that motor trucks must be used in large numbers to solve the transportation problems of the country means that a new army of mechanics must be trained to care for these transports. Many will be recruited from the repair shop and the garage, attracted possibly by the lure of higher wages, all of which will serve to reduce the number of repairmen available for the repair of the passenger car.

So if you do not intend to repair or overhaul your car yourself, but will rely upon the services of the expert at the garage or repair shop, do not wait until spring before arranging for the work. Consult your repairman now and if he can do the work, as he probably can, have it done now. By so doing your machine will not only be thoroughly and properly overhauled, but its services will be instantly available. Not so with the "wait until spring" owner. There is a disagreeable surprise in store for this class of automobile owners.

SAVE AND SERVE.

Necessity of Careful, Provident Use and Expenditure.

When the first Liberty Loan was launched the cry was heard that this is not a thrifty nation and that the Continental peoples have outstripped us in the practical application of individual savings to national finances. True, at the beginning of this war, when our export balance reflected in increased billions our prosperity, we showed little disposition to imitate the careful Frenchman. But those who complained in the early months of 1917, on the eve of the first Liberty Loan, of our unwillingness to save have forgotten what this nation did when put to the test in the days of the Revolution and the Civil War. The first two Liberty Loan campaigns proved incontestably that the American people know how to "save and serve." That they will continue in this self-sacrificing, forward-gazing spirit is not to be doubted. They have heard and heeded the President:

"Let every man and every woman assume the duty of careful, provident use and expenditure as a public duty, as a dictate of patriotism which no one can now expect ever to be excused or forgiven for ignoring."

Our war bills, growing heavier as the climax of the world contest draws nearer, cannot be met however by the same measure of thrift that characterized the first months. The United States must reach and surpass the mark set in France and Great Britain. In England, one bank alone, the London City and Midland, reports that its depositors applied for $451,198,000 of the last war loan, or considerably more than one-half the amount standing to their credit. This may give an insight into the compelling pressure of patriotism upon all classes of persons in England, for the London City and Midland reaches all social ranks. It must not be supposed that these English subscribers drew all their half-billion from the bank in order to pay for their bonds. Such a step would have resulted in grave trouble. This tremendous total could not have been lent to the Government without the most extraordinary thrift and self-denial.

Keep the Rims Graphited.

The displacement of tires from detachable rims and the removal of demountable rims from wheels will be made easy by keeping the rims, etc., clean. More or less moisture finds its way to the bearing surfaces, particularly in the winter, and rust follows. Make a mixture of powdered graphite and oil, a thick paste, and smear the parts. Then remove the surplus and polish with a cloth. The graphite will fill the pores of the metal, resist the action of the water and make changing of tires or wheels an easy matter. The mixture will not injure the rubber of the shoes.

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A CHEMICAL RECTIFIER.

Method of Charging Storage Batteries From A. C. Magnetos.

BY GEORGE A. LUERS.

With those machines utilizing alternating current machines or magnetos for ignition, storage batteries employed as an auxiliary source of current supply must be removed when in the need of recharging.

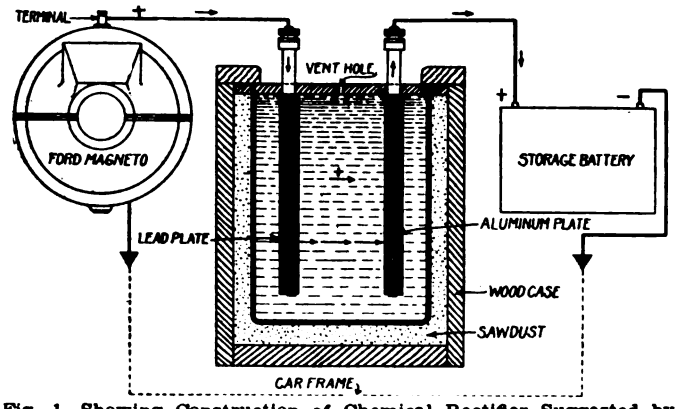


Fig. 1—Showing Construction of Chemical Rectifier Suggested by Mr. Luers.

An alternating current cannot be used for charging a battery unless a mechanical or chemical rectifier be employed. Mechanical rectifiers are expensive, but a simple chemical converter may be constructed for about a dollar.

The Principle Involved.

The aluminum and lead plate rectifier, which is one of the simplest controls for alternating current, is probably the least expensive of any.

The principle upon which this type works is that a current can pass into an aluminum plate from a lead plate, but not from the aluminum to the lead plate, when these are suspended in an acid solution.

As positive + current represents the flow from lead to aluminum and negative —, the flow from the aluminum to lead, it is realized then that the negative — current is checked and the rectifier acts as a valve through which flow is only possible in one direction.

Eliminates Cut-Out.

A feature of this type of rectifier is that the principle overcomes the need of an automatic cut-out to prevent the current flowing back from the storage battery into the magneto when the engine is not running. As a precaution, however, against a possible leak of the current when the engine is at rest for long intervals, a switch can be installed between the storage battery and the car frame where the current is grounded.

How Constructed.

The rectifier as shown in the accompanying illustration consists of a container for the electrolyte. A glass or rubber is used. A wide-mouthed quart fruit jar provides a convenient cell and suspend in this one lead plate (polished steel or carbon may be used) and one plate of aluminum.

The plates are attached to a lid of some insulating material (glass or rubber) and so separated that their surfaces will be about an inch or more apart. The cell is packed in sawdust or any soft substance in a wooden box to protect it from possible breakage when it is used on the automobile.

The Electrolyte.

The electrolyte used in the cell can be either a concentrated solution of neutral ammonium phosphate or of sodium bicarbonate. The concentrated solution of sodium bicarbonate is less expensive than the other and gives nearly as good results.

The aluminum plate used must be of this material only and not some composition having small portions of aluminum. The connections should be made as shown in the sketch at Fig. 1, in which the arrows show the flow of the positive + current from the magneto through the rectifier into the positive + terminal of the storage battery.

Should Stand Overnight.

As the coating on the plates when immersed in the solution is the rectifying agent, the cell when first made should be allowed to stand overnight or for a day before using to allow the plates to coat.

After long and continued usage the plates should be removed and scraped to remove the accumulations.

A small rectifier is not likely to be overloaded by the type of generator used for automobile purposes, but much foaming of the liquid is indicative of an overload and larger plates and container should be used when this condition exists.

Can Increase Capacity.

Where insufficient current is supplied, the rectifying capacity of the cell may be increased by using two lead plates, connected with a single aluminum plate between them as shown at Fig. 2.

This arrangement leaves less current for ignition purposes, where the current for this purpose is taken direct from the magneto as with the Ford system for example.

Enriching the Mixture.

The modern car is equipped with either a dash or steering column control; that is, a device for shutting off the air supply at the carburetor or for increasing the fuel supply for starting. Earlier models are equipped with a wire or cable running

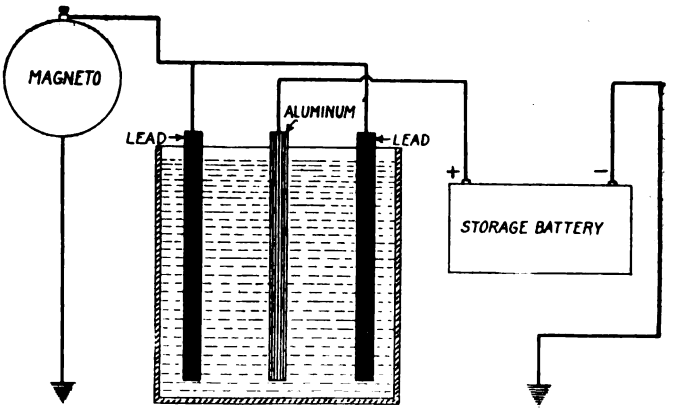


Fig. 2—Illustrating Rectifier Increasing Charging Rate at Loss of Current Supply for Ignition.

from the carburetor through an aperture in the radiator to the front of the machine. When the car has none of these devices the last named method can be used by connecting the priming cord or wire with a small metal ring. Always protect the radiator from chafing by the wire by using a fiber tube. Run the wire through the tube.

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The High-Tension Magneto vs. the Battery System of Ignition

Ignition Expert Explains in Non-Technical Language the Principles Involved and Makes a Comparison Between the Two Types

* BY J. A. WILLIAMS

The natural evolution of ignition in internal combustion engines from the hot tube to battery systems, then to the low-tension magneto and finally to the independent high-tension type of magneto, was accomplished through innumerable series of tests during the days of automobile engine development. These tests brought out the fact that the high-tension magneto gave the best results under all conditions.

The next demands on automobile engineers were for some means of starting and lighting. Mechanical starters and air pressure starters were followed by the electric starting and lighting systems and these have become universally adopted, adding, however, not only considerable first cost to the car but entailing a considerable charge for upkeep.

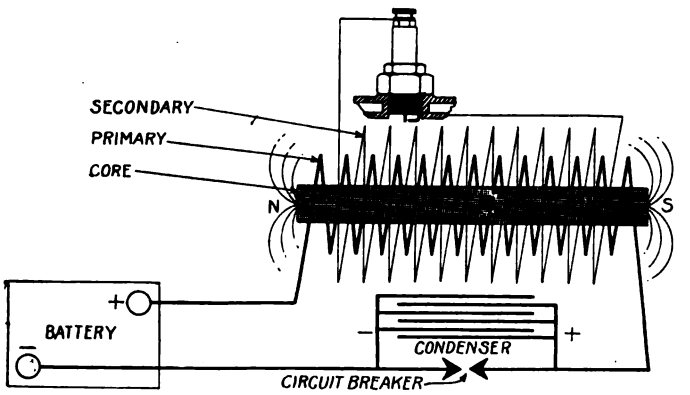


Fig. 1—Cross Sectional View Illustrating Functional Parts of Battery Ignition System.

The Commercial Aspect.

It was quite natural, therefore, for the car manufacturer to seek means to lower the cost of his car, to offset the added cost of electric starting and lighting equipment. With a storage battery as a source of current, one would naturally argue, "Why not a battery ignition system?" The result, especially among the popular-priced cars, was that most of them adopted battery ignition systems. The higher-priced cars, however, mostly continued to use the independent high-tension magneto. We find the status as to battery ignition among passenger cars this year to be that 58 models are using high-tension magnetos and 137 are using battery ignition. Trucks, however, almost universally are equipped with high-tension magnetos.

It is a regrettable fact that this change, from magneto to battery ignition, has given the general public the idea that perhaps battery ignition was just as good as high-tension magneto ignition, whereas a casual analysis of the situation shows the change was made for commercial reasons only.

In our engineering work, we have always had in mind the great difference between conditions of automobile operation and conditions of tractor operation. The tractor only resembles the automobile to the extent that a gasoline engine is used for motive power in both cases, and use is made of a transmission and differential, but right here the comparison stops.

Automobiles are built as light as possible, run on pneumatic tires on good hard roads, carry comparatively light loads and are equipped with engines of such size that they are probably operated 95 per cent. of the time at very low throttle opening. They are rarely ever called upon to develop their maximum output of power, and even then but for a few minutes at a time, and inasmuch as it is a passenger vehicle, very little thought or care is given to its fuel economy.

Tractors, however, work nearly all the time under full loads, operate steadily for hours at a time in dust and mud, and run over plowed fields under all weather conditions. Their operation is exclusively for profit. This means that fuel economy and cost of upkeep are extremely vital points. Reliability of operation is not just merely hoped for, but it is demanded.

For these reasons, the designing of a high-tension magneto for tractor work cannot be based entirely upon the experience gained in the automobile field. This applies not only to the magneto ignition system, but practically to every other accessory and part used on a tractor.

Comparison of Systems.

In accordance with the title of this paper, I have endeavored to treat both systems of ignition fairly, and absolutely impartially, from a scientific and technical standpoint. We begin with the principles of battery ignition and discuss the battery ignition system, and then in the light of these diagrams and explanations, we follow with a description of high-tension magneto ignition. We then give a comparison between the two types of ignition, concluding the paper by illustrating diagramatically how and why a hot spark causes the engine to produce more power and economize greatly on fuel consumption.

Electrical Terms Defined.

Before proceeding with the subject, it might be well to explain how a coil of wire is made to generate electricity. The only known way to generate electricity with a coil of wire is to create lines of magnetic force within its axis, or to remove magnetic lines of force from its axis, by decreasing the amount of lines of force, or, better still, by reversing their polarity or direction of flow. The greater the amount or number of lines of force your coil of wire surrounds, and the faster you can effect a rate of change in the quantity of them, the more voltage you will generate within your coil of wire.

It does not make any difference whether your coil of wire should be a spark coil, a dynamo, a magneto, or any other piece of electrical apparatus, this method of fluctuating the amount or reversing the direction of lines of force is the only known method of creating voltage or electrical pressure by means of the use of coils of wire.

The volt is the unit of measurement of electrical pressure, just as is the pound the unit of measure of steam or water pressure.

The ampere of current is the unit of measure of volume, just as is the gallon or cubic foot a unit of measure for fluids.

The ohm is the unit of resistance which opposes the flow of electricity.

We will now call your attention to Fig. 1, an outline view,

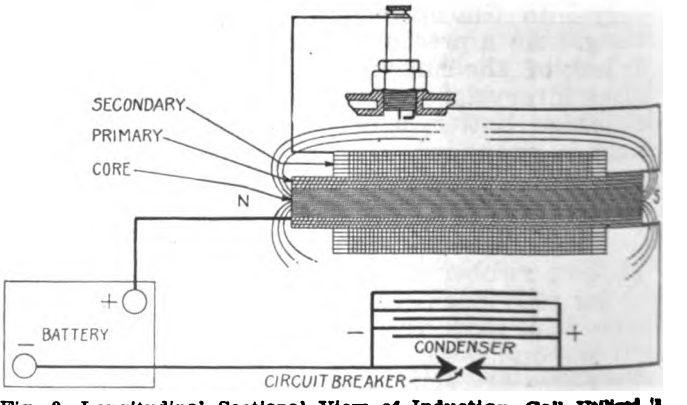


Fig. 2—Longitudinal Sectional View of Induction Coil Utilized in Battery Ignition Systems.

and Fig. 2, a sectional view of a battery ignition system. These views illustrate and show all of the functional parts, not only of one battery ignition system, but of all of them, irrespective of their different arrangement of parts or outward appearance.

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Components of Coil.

In the spark coil there is a central core of soft iron wire. This iron wire core is surrounded by, or wound with, from 150 to 300 turns of insulated copper wire of comparatively large size and low resistance, and is called the primary winding. Outside of, and surrounding this primary winding,

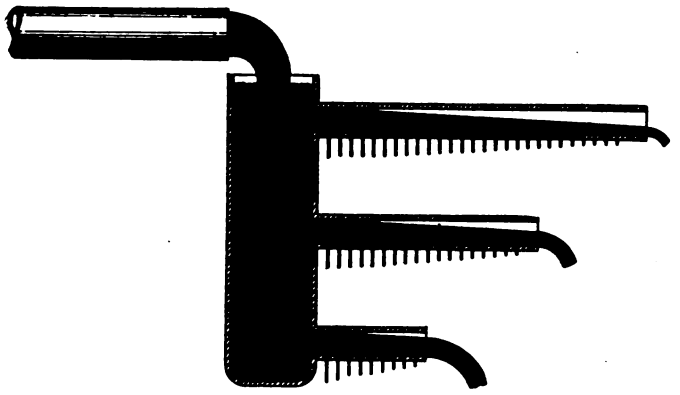


Fig. 2—Illustrating Graphically the Static Capacity of the Secondary Winding.

is another winding which consists of a large number of turns of very fine copper wire, usually from 20,000 to 30,000 turns, and is called the secondary winding, one end of which is connected either directly or indirectly to the frame work of the engine, and the other end of which is connected to the terminal of the spark plug.

Referring again to this primary winding, it, of course, has a switch in circuit, located at some convenient place not shown in the diagram, for turning the ignition on and off by opening or closing the primary circuit. It also has a circuit breaker or interrupter, as designated by the arrow heads in the diagram. This circuit breaker or interrupter is magnetically operated on the ordinary vibrating coil and is mechanically operated on other types of battery ignition systems. Connected to each terminal of this circuit breaker is a condenser, which is composed of several sheets of tinfoil. The even numbered sheets are connected to one terminal of the condenser and the odd numbered sheets to the other terminal. These sheets of tinfoil are separated and insulated from each other either by means of mica sheets or specially prepared paper.

Good vs. Bad Condensers.

There is in every ignition system two kinds of condensers, a good condenser and a bad condenser; the good condenser does the thing we want it to do, and is connected across the terminals of the circuit breaker or interrupter. The bad condenser does the thing we do not want it to do, and locates itself within the secondary winding of the coil and is technically called static capacity of the secondary winding. Inefficient ignition systems have a very large bad condenser, or a great deal of static capacity in the secondary winding. Good ignition systems have a very small bad condenser, and consequently very much less static capacity in the secondary winding. Having shown the various parts of a battery ignition system, we will discuss the function of the separate parts.

The storage battery simply acts as a source of current. The iron wire core serves to concentrate and direct the magnetic lines of force that the current circulating through the primary winding creates. The function of the primary winding is to form a path that the electric current can circulate, many times, around the iron wire core, and thus produce the magnetic lines of force in the core.

The Secondary Winding.

The function of the secondary winding is to generate a high voltage anywhere from 20,000 to 30,000, so that it will have sufficient voltage or pressure to jump the gap in the spark plug. The function of the circuit breaker, or interrupter, is to break the circuit and interrupt the flow of current when the current circulating around the core has reached its predetermined or ultimate value.

The function of the good condenser is to absorb the current that forms an arc across the gap caused by the separation of the circuit breaker points. It is surprising what a large amount of current a small condenser will absorb.

The capacity of a condenser depends upon two things: first, the area of metallic surfaces opposed to each other; second, the nearness together of those surfaces. In other words, the larger the surfaces involved and the closer together they are, the greater the capacity of the condenser to absorb current.

It is important in any ignition system to have a condenser of just the right capacity to absorb the current and stop the sparking at the points of the circuit breaker. The points, however, must be allowed to spark a little, just enough to keep themselves burnt clean.

The function of a spark plug is simply to create a gap in the cylinder of the engine for the spark to occur in. This gap should be of the proper width to absorb the maximum energy that the ignition system will produce.

It might be well, at this time, to explain the function of what we call the bad condenser, which insists on being present, to a greater or less extent, in every ignition system.

How Leaks Exist.

This bad condenser is located along every inch of wire of the secondary winding. The longer the wire in the secondary winding, and the more turns it has, the greater the capacity of the bad condenser. This absorbs the current, thus preventing the spark from being as hot as we would like to see it.

Fig. 3 illustrates further the action of the bad condenser, or the static capacity of the secondary winding. This shows three different lengths of water pipe, connected together at one end to a larger pipe, which is kept full of water. These pipes all have the same size holes drilled in them, and the same number of holes per inch length of pipe, thus creating leaks whereby the water gets away instead of running through the pipe.

Very little water comes out of the end of the longest pipe. Nearly all of it leaks away through the small holes. A greater quantity of water flows from the end of the next longest pipe. The shortest length of pipe has the greatest quantity of water flowing from its end.

Just imagine that these pipes are the secondary windings of different types of ignition systems, that the end of the pipe is the spark plug gap, and that the amount of water flowing from the ends corresponds to the current flowing across the spark plug gap. Also that the water that is leaking from the small holes represents the amperes of current that is being absorbed or wasted by the bad condenser, or static capacity of the secondary winding.

We will then realize how the secondary winding of an ignition system acts as a condenser and wastes the current we would like to get at the spark plug gap for ignition purposes. We will further see that the shorter we can have this secondary winding and still generate the voltage required to jump the spark plug gap, the more current we will have left to create heat in the spark.

We can compare these different lengths of water pipe, shown in Fig. 3, with three different types of ignition systems, as follows: The longest pipe to a battery ignition system; the next longest pipe to the old style or H armature type of high-tension magneto, and the shortest pipe to the most efficient design of high-tension magneto.

In the operation of a spark coil, current flows around the turns of the primary winding when the circuit breaker closes, creating and building up lines of magnetic force in the iron-

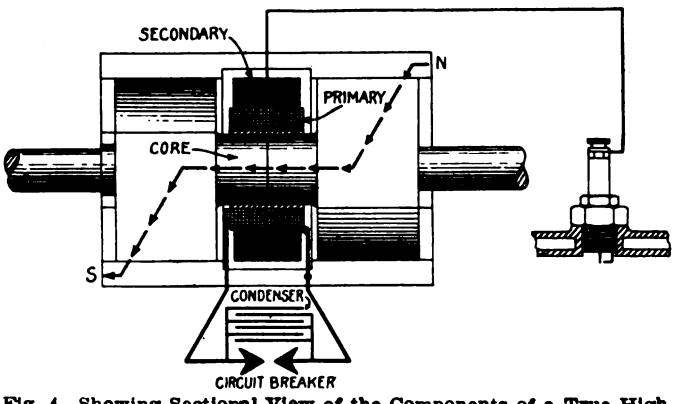


Fig. 4—Showing Sectional View of the Components of a True High-Tension Magneto.

wire core. Next the circuit breaker points open, causing the current that built up the lines of force to cease flowing. The lines of force in the core of the coil, no longer being maintained by the flow of current, fall or disappear, but in a much smaller period of time than it takes to create them. By disappearing they create electrical pressure or voltage

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in the turns of the secondary winding. This cycle of operation is repeated every time the circuit breaker points close and open.

Defining Battery Force.

The action of a battery ignition system is just like lifting up a hammer and letting it fall on a nail. The only force

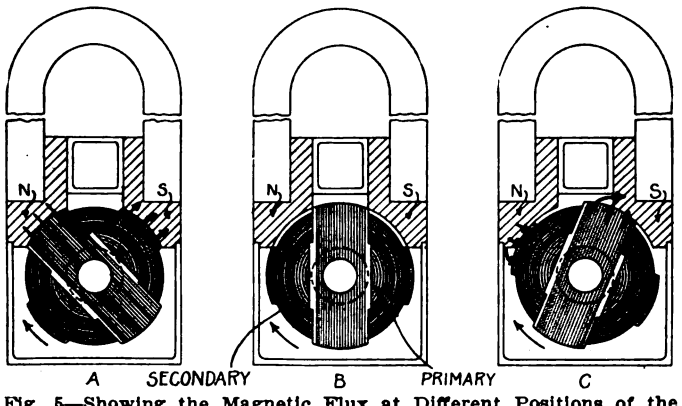


Fig. 5—Showing the Magnetic Flux at Different Positions of the Magneto Rotor.

which you have to apply to the nail is the power that the hammer exerts through its weight in falling. This is rather an inefficient way to drive a nail, is it not? We have no means in a battery ignition system to handle the lines of magnetic force any more energetically than to just let them fall, as the hammer falls on the nail.

The height which you raise the hammer can be compared to the number of lines of magnetic force built up in the iron-wire core, and their speed of disappearance compared to the force of gravitation that brings the hammer down.

Half of the magnetic circuit of a spark coil is the air. The lines of force produced in the core of the coil have to travel from one end of the core to the other.

Circuit Inefficient.

Air offers something like 280 times the resistance to the flow of magnetism as does iron, so that a battery ignition coil has an inefficient magnetic circuit, requiring a very strong current of electricity circulating around the iron-wire core in order to produce a very few lines of magnetic force.

The question might be raised as to why it would not be good construction to lengthen the iron-wire core and join its two ends together, in a ring, so that it would have a path of high magnetic conductivity in which a small amount of electrical energy could produce a large number of magnetic lines of force.

The reply to this question would be that it would then take a very long time for the electric current to rise to its full value, owing to the largely increased induction in the coil. Furthermore, after having raised the magnetism to the highest obtainable value, it would disappear very slowly on breaking the circuit, for lines of force in the core of the coil by their very generation create an opposing voltage, which tends to oppose the battery voltage and prevent its rapid rise to a maximum.

Spark coils for battery ignition systems must be made with straight iron-wire cores, in order to secure sufficient rapidity of action, consequently they must of necessity have an inefficient magnetic circuit.

If we could double the rapidity with which we vary the amount of these lines of force; or, if we could double the quantity of lines of force, we could then get along with half as many turns of wire on the secondary winding.

The effect of this shortening of the length of the wire in the secondary winding would be the cutting in half of the static capacity, or absorption of current by the secondary winding, consequently doubling the current delivered at the spark plug points without decreasing the voltage.

The more voltage that we can make one turn of secondary winding produce, the less surface we expose to absorption of the current produced and the larger the output of energy we get at the spark plug points.

In a battery ignition system we are compelled, on account of the limitations imposed by the speed of operation, to use an inefficient magnetic circuit, which generates a comparatively low voltage per turn of secondary winding. A large number of turns is required and a large surface must be exposed to the absorption of current through static capacity, resulting in the production of the skeleton of a spark at the spark plug points, leaving of the meat of the spark or amperes absorbed in the secondary winding.

Faults of System.

In battery ignition systems we find inherent faults as follows: First, they do not and cannot create enough lines of magnetic force. Second, they do not and cannot handle, with sufficient energy or speed, the few lines of magnetic force they do create.

In consequence of these two faults, they cannot generate sufficient voltage per turn of secondary winding.

Inasmuch as a low-tension magneto simply acts as a source of current and a circuit breaker and uses the same kind of a spark coil as a battery ignition system, it does not produce a much better spark; except it is, however, a much more reliable source of current.

If we can design an ignition system with all of its magnetic circuit composed of soft iron or steel, the result will be a very efficient magnetic circuit, thus permitting the generation and handle of a very large number of lines of magnetic force. We must, however, have means for causing the rapid disappearance or reversal of these lines of force.

Let us now look into the principles employed in the high-tension magneto, to see whether or not that device remedies any of the defects existing in the spark coil of a battery ignition system.

Principles of High-Tension Magneto.

Fig. 4 illustrates the working principle of a modern high-tension magneto, which is largely used in the tractor and stationary gas engine fields.

It consists of a soft iron core, a primary winding surrounding it, a secondary winding outside of the primary winding, a circuit breaker and a condenser; or of every functional part of a battery ignition spark coil.

Instead, however, of a storage battery we have permanent magnets. The permanent magnets are not shown in Fig. 4, as we are looking up from the bottom of the magneto so as to get a better view of the windings and core.

The core of the armature, which is the core of the winding, is round and short and stubby. It has two extensions on each end, so as to conduct the lines of force, from the pole pieces of the permanent magnets to the core of the winding, through the core of the winding and out at the opposite pole.

This core of the winding is located in the direct path of flow of the greatest number of lines of force from the permanent magnets; being made of the softest iron, it forms a good conductor; thus concentrating all the lines of force of the permanent magnets and conducting them to the center or axis of the winding.

The secondary winding is very short, because a large number of turns and a great length of wire are not necessary in this design.

The pole pieces, instead of being set directly opposite each other, have their centers spaced 90 degrees apart. The extensions of the armature core or rotor are also set 90 degrees apart, so as to conform to the location of the pole pieces of the permanent magnet. The shortest possible path thus exists for the magnetic lines of force to go from pole

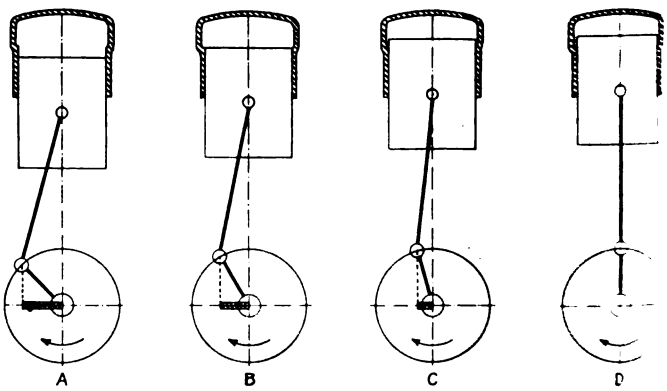


Fig. 6—Illustrating the Power Losses With Spark Occurring at Different Positions in Stroke.

piece to pole piece, and at the same time make all of them pass through the center or axis of the winding.

Fig. 5 is an end view of the same magneto: the air gap in the circuit is just as small or short as will permit of a safe running clearance of the rotor or core extensions.

In comparing the construction shown in Figs. 4 and 5 with that of the spark coil of a battery ignition system, we

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see that we have enormously shortened the core of the coil, and in addition have almost entirely eliminated the long high-resistance air path of the battery spark coil, thus providing an easy path for a large number of magnetic lines of force.

Now let us see how we can compel the rapid disappearance of this large body, or number of lines of force by reversal of polarity, thus not only handling a very greatly increased number of lines of force, but also handling them at least twice as energetically as could be done with the battery ignition coil.

Fig. 5 A shows the rotor or core at rest. The magnetic lines of force are coming down through the wing of the rotor, are passing centrally through the round core and round winding, and are going up the core extension on the other side of the winding to the opposite pole of the permanent magnet.

In Fig. 5 B, the armature is shown in a different position, just as it is being rotated to the next position. Fig. 5 C shows the rotor in position that it occupies during the time that a spark is being delivered to the spark plug. The arrows are going into the core on the opposite or further side of the winding, then through the core, passing out on this side of the winding, showing that we have a complete reversal of polarity through the winding.

Advantages of Magneto.

Summing the matter up in a few words: A modern high-tension magneto corrects the inherent defects in a battery ignition system. It handles a much larger number of lines of force, the reversal of polarity increasing their rate of change.

This is doing just what will cause the generation of a higher voltage per turn in the secondary winding, thus permitting the use of a much shorter secondary winding, consequently exposing much less surface of wire to the action of absorption of current by static capacity, and cutting down the opportunity of the so-called bad condenser to rob the spark plug gap of the current necessary to give the greatest heat of spark.

Referring to this hammer and nail illustration, with this high-tension magneto, we can raise the hammer to a very much greater height and we can slam it down with a great deal more force, thus driving our nail efficiently and quickly.

Having shown why a battery ignition system produces a weak spark and a high-tension magneto system a hot spark, it remains to be shown how and why the hot spark will cause an engine to produce more power with less fuel consumption.

Value of Hot Spark.

Opinions differ among engineers as to whether a hot spark is any better than a weak spark. Some of them seem to think that a spark is a spark, and so long as it does not make a missed explosion we are getting all out of it that is possible. Nothing is further from the truth than that assumption. In practice we find that the weaker the spark is the slower the propagation of flame in the mixture, necessitating a much greater advance to the spark.

Further, the hotter the less early must it occur in advance of dead center, for there is a direct relation between the heat of the spark and the speed of flame propagation in the mixture.

Fig. 6 is a diagramatic view of an engine, cylinder, piston, connecting rod and crank throw, showing four different positions. The spark is supposed to be occurring at all these different positions. Fig. 6 A shows the spark advanced further than in any other diagram. This represents the engine firing with a weak or battery ignition spark. Note the shaded area projected down from the center of the crankshaft. This represents negative torque, or power using up fuel in an effort to run the engine backwards.

Fig. 6 B represents the engine firing with a still hotter spark, and consequently with less spark advance needed. The negative torque is now smaller, showing less fuel burned and less power expended in the wrong direction.

Fig. 6 C shows the engine in operation with a hot, powerful high-tension magneto spark, which is occurring still nearer dead center, wasting less fuel, generating more power in the forward direction and burning less fuel.

The Ideal Condition.

Fig. 6 D represents the ideal condition, which we have not yet attained, but will attain just as soon as we can create ignition sparks as hot as they should be. If we can get an ignition spark hot enough and large, the propagation of flame through the mixture will be so fast that we will not have to begin to ignite the mixture a long way ahead of dead center, as we do now, with the weakest sparks.

Would a steam engineer admit pressure to the cylinders as far ahead of dead center as a gas engine has to admit its pressure by starting ignition?

Steam is, of course, admitted to a steam engine slightly after it passes the dead center position. So will the spark ignite the mixture in gas engines and slightly after the crank passes the dead center position. This will obtain just as soon as the engine is provided with a spark that is hot enough to give the proper rate and speed to the propagation of flame through the mixture.

One might say to this, "Why, of course we have to advance the spark in order to get the greatest power out of our engine; if we operate the engine with too late a spark our engine will run hot and will not develop its full capacity of power."

That, of course, is true, for when igniting a mixture with a weak spark, its flame propagation is so slow that unless ignited a long way ahead of dead center, it will still be burning when the exhaust valve opens, and a great deal of the fuel will pass out through the exhaust unburned.

I cannot see how anyone can doubt the greater value of a hot spark over a weak one. Suppose one were going to kindle a fire in the stove or grate, and wanted to have that fire burning briskly within the shortest possible time; would it not greatly facilitate matters if plenty of good kindling were used, and if that kindling were lighted all over at once with a hot blow-torch flame?

In the cylinder of a gas engine we are kindling a fire. In a high-speed engine we must kindle that fire and burn up all the fuel in an inconceivably short space of time.

Perfect Spark Possible.

We are constantly doing a great amount of research work in our laboratory, and we believe that this ideal spark is not only a possibility but a probability. All the results obtained from our experimental data and research work lead us to believe that we are working in the right direction.

In conclusion, since we have seen that the modern high-tension magneto not only gives now but promises for the future so much better results than any type of battery ignition, is it not the part of wisdom for builders of engines to cleave to and encourage the development of that system of ignition which promises ultimately to solve their ignition problems properly?

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*President and Chief Engineer of the K-W Ignition Company. Paper was read before the Tractor Division of S. A. E.

NEW BOOKS RECEIVED.

The Little Journal. House organ published by Arthur D. Little, Inc., Boston, Mass.

Auto School News. News and happenings in the automobile industry. Published by the Michigan State Auto School, Detroit, Mich.

Duplex Doings. House organ. Published in the interests of motor truck users by Duplex Truck Co., Lansing, Mich.

N. G. E. A. Bulletin. Official organ of National Gas Engine Association, Lakemont, N. Y.

The Qieterion. Monthly publication issued by Hyatt Roller Bearing Co., Detroit, Mich.

The Haynes Pioneer. House organ published by Haynes Automobile Co., Kokomo, Ind. Contains interesting account and instruction for timing ignition system of Haynes 12.

Delco Doings. House organ published by Dayton Engineering Laboratories Co., Dayton, O. Contains interesting account of operations in the drafting room.

Milestones. House organ published by the Firestone Tire & Rubber Co., Akron, O.

Auto Suggestions. House organ published by the Northwestern Chemical Co., Marietta, O.

Chalmers Monogram. House organ published by Chalmers Motor Co., Detroit, Mich. Presents the men who will put the Chalmers car "Over the Top."

Chevrolet Review. House organ published by the Chevrolet Motor Co., New York City.

The Truck-Smith. A service journal for Smith Form-A-Truck dealers. Published and issued monthly by the Smith Motor Truck Corp., Chicago, Ill.

Dragging Clutches.

Some types of multiple disc clutches, wet types, give trouble in cold weather unless the lubricant be changed to meet the changed conditions. This applies particularly to the old types of clutches, and when the trouble exists it may be remedied by thinning the lubricant with kerosene. The old oil should be displaced and the plates, etc., washed thoroughly with kerosene before renewing the supply of oil.

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Proper Inventory of Stock is A Valuable Business Asset

Suggestions for Simplifying the Work and Methods for Computing Costs, Etc.—Mistakes to Be Avoided in Figuring Out Values

BY FRANK A. FARRINGTON

What can you expect to know about your net or your gross profits, your stock on hand, your present worth, the depreciation in your stock, or the success of your business unless you inventory at least once every year? And the answer is, "Nothing."

Without an inventory once a year, you cannot

STOCK	COL. A	COL B	COL. C	#	¢	$	¢	$	¢

Suggestion for Simplifying the Work of Stock Taking.

know how much fire insurance you ought to be carrying or how much you ought to receive if your stock is destroyed by fire. Nor can you know whether you are carrying more stock than your business requires. You cannot make any kind of an intelligent statement to your banker when you want to show him that you are entitled to credit. Unless you know how much stock you have and how it compares with last year's, your finances are based on guess-work.

Profits or Losses.

Your business may easily be paying so little that it is not profitable for you to keep your money tied up in it, and yet you may not know this unless you inventory regularly, and there have been plenty of instances where a man was bankrupted by his ignorance, bankrupt before he really found it out.

Suppose you guess at the value of your stock and guess $250 out of the way. You might easily guess that much too high the first of 1917, and as much too low the first of 1918. Even in a small stock a good sized variation might take place unnoticed. It is not uncommon for a dealer to reason that he keeps about the same stock year in and year out and that he is not going to be far wrong in guessing at it as about the same after once taking an inventory. There never was a time when you could follow that method and know anything about what you were doing, and nowadays you simply could not tell anything about it.

How Stock Varies.

If your stock may vary $500 in a year, you may easily have a loss of $500 without realizing it. Of course, theoretically you might have a corresponding gain, but men who take no inventories are rarely the kind of business men to make much of a gain.

More or less depreciation in values of stock takes place where it will not be discovered if you take no inventories. It takes an inventory to find out what is happening in the dark corners and in the back part of shelves and boxes. For the man who has not taken an inventory in 10 years, and I have heard some men boast of that fact, there are going to be some unpleasant surprises when the inventory is taken. Selling out on an inventory basis is often a disappointment to the man who takes his first inventory then.

Stock and Insurance.

How are you planning to get your insurance money in case of a fire? Do you suppose any insurance company will insure a garage stock expecting, in case of fire, to pay for stuff they are not sure was burned? Not in a thousand years! You will have to show the insurance adjuster that you had the stuff and that it was burned. They don't adjust fire insurance on the guess basis. The man who does the adjusting is a different chap from the friendly agent who wrote the insurance and who may be your neighbor. These adjuster fellows are as hard as nails and they purpose to pay insurance according to the loss, not according to the amount of the policy.

And the Bad Bills.

In addition to inventorying your goods, inventory your book accounts too. Otherwise you cannot know how much you ought to write off for poor and uncollectible accounts and you may be surprised to find that all your profits are tied up in bills you cannot collect easily.

If you have failed to take proper inventories, it has not been so much that you don't want to know as that it is too much trouble to find out. Isn't that

1	2	3	4	5	6	7	8	9	10	11	12
25	02	04									
24											
30											
35											

Table for Computing Various Parts of a Dozen Where the Dozen Price Is Known.

so? You haven't thought the knowledge worth the work. Well, most of the worth while parts of the day's work are tiresome and sometimes the things most worth while are the hardest and most tiresome. I don't blame any man for dreading to take

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an inventory. I have dreaded it myself as most men. But that is not a sufficient excuse for neglecting it. You can't expect business to be a joy-ride, anyway. Call inventorying taking medicine, if you wish, but admit the need of the dose and take it and have it over with and get the benefits as soon as you can.

Needs Application.

Inventorying is a job that should never be allowed to drag. Put enough pep into it so it will move right along. Work at it hard while it is under way and get it finished up with the least possible delay. Don't be afraid to give it overtime, if necessary, and pay the help for overtime to get the job done. They will be as glad as you to have it finished.

You may want to put on extra help to take the inventory and you can do this because much of the work, mere counting of parts and stock items, can be done without experience in the business. Don't hold up the work of getting the inventory on paper by waiting to carry out prices and foot up columns as you go along. Get it all down as fast as you can and then you can take your time afterwards to the arithmetic part of it, or you can turn the book over to an accountant and let him figure it up for you.

How to Figure.

It is not worth while to try to get every item exact to a hair's breadth. Variations of a few cents in total sums are not worth the hours of figuring required for them. You can make your inventory right without making it infinitesimally exact.

One mistake that is commonly made in the haste to get the job out of the way is that of "lumping" certain parts of the stock. Estimating the value or even figuring out the value of a certain set of shelves and setting down on the list "Contents of five shelves next door, $256," is not going to be what the insurance company want. They want to know what was on those shelves. Their contents may have been $256 when inventoried, but how do they know they weren't down to $2.50 when the fire occurred? There have been sales and purchases and unless there is some better way of getting at the result than taking the $256 and "guessing" that about as much stock was added to those shelves as was sold, you and the adjuster will disagree right there. The insurance adjuster can be a devil if he likes, so make your plans accordingly. Keep that fire insurance money in your mind all the while you are inventorying the stock.

Honest Values Best.

Don't list junk on the inventory. Boil the list down to the goods you are sure have a value and whose value is not questionable. You cannot gain anything by fooling yourself into the belief that you have more than you really possess, and you are not going to fool anybody else by putting fictitious values on stock.

If you are dishonest with yourself in inventorying, you are just laying pipe for trouble later. Even if you could make yourself think you have a bigger stock than you actually have, what is the advantage? The facts have to come to light sooner or later—either while you are still running the business or after it becomes your estate. If there are losses in stock, take them now instead of allowing them to accumulate to be written off in a bunch.

If you want to make inventorying easier while allowing several to work at it at once, putting it all into one book in the end, work with a loose leaf book, the various workers taking separate leaves and putting them all in the common binder later. This will be more satisfactory and more convenient in the end than having several separate books.

By taking sheets with three columns before the stock item and three sets of dollars and cents columns after it, the same book may be used for three inventories, thus allowing an easy comparison of amounts of stock in separate years and saving writing down the individual items after the first time.

Short Cuts.

Two persons working together will take inventory faster than each working separately. In the former way one counts stock and the other writes down the items and each may work rapidly. The writing is thus done by a man whose paper may be on a proper support, while his hands are not constantly getting dirty and soiling the record. If one man counts and writes, he has to change jobs every item and he will be writing on top of a ladder or under a table and the result will be a mess, perhaps not even legible in parts. A short cut to getting the item cost of an article on which a gross price is given is simply to multiply the gross price by .007. Simple and quick!

Computing Prices.

Here is a plan for making a table for computing the prices of various parts of a dozen where the dozen price is known. In a column right down the left hand side of the page put the various dozen prices to be considered beginning with the cheapest goods, say 25 cents a dozen. The prices might run something like .24, .30, .35, and so on up. Following this column rule 12 columns and number the heads of them consecutively from 1 to 12, beginning at the left. In the first of these columns, under the "1," place opposite the top or lowest price figure the price of 1/12 dozen of an item costing that price per dozen. If that price were 24 cents a dozen, in this column you would write .02. In the second column put the price of 1/6 dozen, or .04, and so on down the line, doing this with each cost price. When this table is once made up, it will save a lot of figuring in carrying out the inventory prices, and it can be kept for reference indefinitely.

A perpetual inventory is carried on in some stores having comparatively few customers, but it is scarcely practical in a garage, though there is a great satisfaction in knowing all the while just where you stand. When a business man can sit down on the first of every month and in a short time know just what his business has done for him in the past 30 days, he is in an enviable position, to say nothing of the fact that he is protecting himself against the danger of his business getting on the rocks before he realizes what is happening.

The inventory is the foundation of all business figures and if it does not pay to take one yearly, then all known business rules are a lie.

The Aktiebolaget Scania-Vabis of Malmo has placed on the market an automobile entirely new in construction. It is a truck with a capacity of four tons and is especially intended for drawing other wagons of different kinds. With this object in view it is equipped with driving and steering gear on all four wheels and can be guided from both ends.

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AMONG LOUISIANA GARAGES.

Replacing a Ford Spindle.—Removing Broken Hub Cap.—Bushing Bearings.

BY JAMES F. HOBART, M. E.

The gentle art of cranking a car bids fair to be one of the lost arts ere long if the installation of motor starters continues, as it is bound to do, for

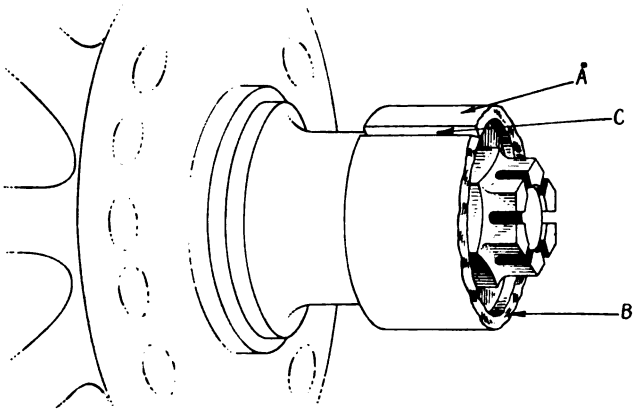


Fig. 1—Illustrating How Cut Was Made to Start Stubborn Hub Cap on Ford.

the motor starter is the only logical way of starting an engine as engines are now constructed.

But the use of motor starters is bound to take away some work from the "Fool Killer" and recently the writer saw an instance thereof. A small motor truck was drawn up at the curb and a young man, evidently left there while the truck driver went into a building, was amusing himself by cranking the engine with his foot. He would set the crank in position for a downward, instead of an upward stroke, then he would balance himself, and give the crank a downward push with one foot.

Several times he started the engine in this way, when just as he was in the midst of a downward stroke, his foot slipped from the crank, which instantly rebounded under the force of compression and the crank struck the man a blow upon the shin bone which very suddenly and completely cured him of all desire for foot cranking of engines.

Although the foolish young man was not badly hurt, he had a chance to see what might have happened had there been a kick-back. A broken leg would have been the least he could hoped to escape with had the engine fired and the crank been forced backward while he was standing on it. And it is to be hoped that the young man will remember the lesson.

Replacing Ford Spindle.

A physician recently drove his Ford car up to a garage in New Orleans and indicating the left forward front wheel from which the hub-cap was missing and the spindle seemed to be running directly upon the inside of the wheel hub, said, "How long will it take to fix?"

"I'll have it ready for you in half an hour, doctor," was the reply.

"Oh, bother!" said the M. D. as he seized his medicine case and vanished down the street almost at a dog-trot.

"Got your work cut out for the next half hour, haven't you?" the writer inquired of the garage owner.

"Oh, it won't take long to put some new ball bearings into that hub," was the reply. But it did.

Removing Broken Hub Cap.

The first thing was to remove the broken hub cap, which proved a task. The garageman tried to screw off the remainder of the cap shown at A, Fig. 1, with a Stillson wrench and failed. Then he hammered down the projecting edge B, which overhung the hub about one-eighth of an inch. He hammered away on this, trying to shape it so the stock wrench sent out with Ford cars for hub caps and spindles would catch the cap remains and screw them off. This also failed.

Then with a very sharp three-cornered cold chisel, a narrow channel was cut right across the piece of hub cap as shown at C. The cut was made right down to the bottom of the threads, cutting into the hub the thickness of the fine threads where the cap screwed on.

A corner of the old cap was raised with pliers and twisted up so a good hold could be got on the fragment with the pliers, after which the thin metal was peeled off. The repair man would never have been able to start it off by unscrewing the old cap with any means at his command. Heating with a torch might have started the cap, but that would have required a lot of time. The fine chisel cut across the threads of the hub did no harm. It was covered entirely by the new cap, and did not weaken the hub appreciably.

It was now possible to unscrew the spindle nut, after the cotter pin had been pulled out, and the stock wrench could now be used to advantage, the wheel being removed in short order. It was found that the doctor had driven the car so long after the balls came out, that the old ball race had cut its way nearly half way through the spindle and from the bottom side.

"These doctors don't give a darn," said the garageman. "They abuse a car worse than any other class of drivers. All they care is that the wheels will go 'round and that they can get there. Doctors ought to buy stouter cars than the Fords. The Ford is all right if you take care of it once in a

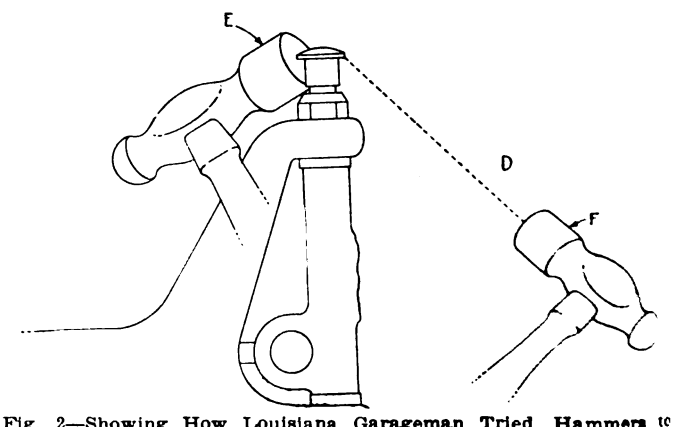


Fig. 2—Showing How Louisiana Garageman Tried Hammers to Displace Knuckle Pin.

while, but a doctor won't, and that's all there is about it."

"Hey, Bill," said the garageman, "step around to White's and get a new front spindle, left side. Get the whole thing except the starting lever!"

"Don't you carry any Ford parts at all," the writer asked of the garageman.

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"No," he replied. "It don't pay for me to bother with ordering, carrying and keeping account of the parts when I can go around the corner at any time and in 10 minutes get any Ford part I need."

"But you are 10 minutes out, twenty times a

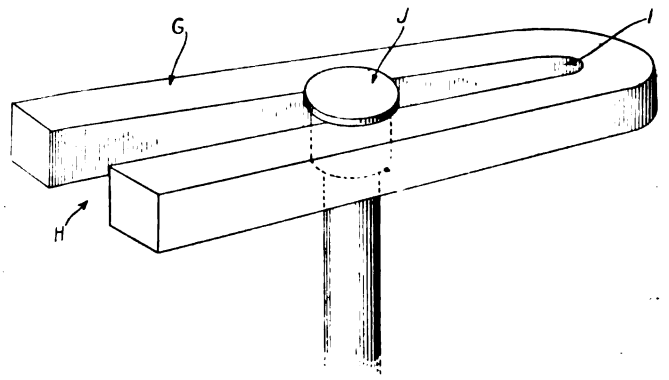


Fig. 3—Tool for Driving Out Ford Knuckle Pin or Spindle Bolt.

day, aren't you, going after parts as often as you have to?"

"Out nuthin'! What do you think? That I'm in the automobile repair business for my health or to get a little exercise? What does that 10 minutes amount to? Aren't I working on that car, or one of my men is, and charging up our time too? Well, I guess yes, and charging every minute of it, too. So, who cares if we go to the supply store 10 times a day or twenty?"

The "wash-can" was fetched and the inside of the hub of the wheel well washed out, the old spindle also well cleaned and the entire knuckle given a liberal splashing with coal oil.

"Yes," said the garageman, "we use coal oil entirely for cleaning. Haven't used gasoline for a couple of years. The coal oil costs only about one-half as much as gasoline and it cleans just about as well. And another thing, the coal oil isn't all the time evaporating when it happens to be left uncovered, and there is no danger of fire when kerosene is used for cleaning metal parts. Why, a man used to lose enough time uncovering and covering gasoline cleaning cans to pay for all the coal oil we use for that purpose. The change to coal oil for cleaning has been a mighty good one, viewed from all sides!"

Pulling Out Knuckle Pins.

Removing a knuckle pin is a mean job at best. To begin with, the pin is fitted very closely and the dirt, grease, rust or paint which may have found lodgment on the pin, between top and lower knuckles, does not help matters when a pin has to be removed. The car in question had its wheel jacked up but there was little room under the knuckle for backing or driving out the pin. The garageman tried the double hammer business as shown at Fig. 2. He held one hammer, a fairly heavy one, against and under the head of the pin as shown at E. Then with a lighter hammer F he tried to strike upward against the under side of head of pin, as shown at D, so as to drive the pin up and out, the heavy hammer E acting to absorb the sidewise effect of the blows from hammer F, leaving the upward force thereof to draw the pin from its place.

Somehow this plan didn't seem to work very well and the garageman, after thinking a bit, took a 12-inch piece of 5/8-inch key steel G as shown at Fig. 3, and bent it in the middle as shown at I, leaving it a little less there than the diameter of the pin. At H the opening was left greater than the pin diameter so that when the tool was placed against the pin J the tool could be driven along until it pinched against pin J and held it tightly. Then it was easy to drive the pin out by striking fair blows under one end of G, the other end of the tool being held securely with tongs or with a monkey wrench screwed tightly against the tool G.

Before making this tool the garageman tried driving the pin while holding it in a new, adjustable end wrench, but quickly abandoned the plan, saying, "That wrench cost me $2.50 and I ain't going to spoil it a-driving out knuckle pins!"

Reaming a Spindle.

It is necessary to ream a hole in a new spindle for the knuckle pin. Sometimes it is necessary to put in a pin which is larger than the old one on account of the knuckles having become worn a bit, then reaming is necessary. All extra knuckles are sent out with the pin hole small and are reamed to size.

A stock reamer has its flutes turned in the direction opposite to which the reamer is rotated, and sometimes the reamer does not take hold readily, especially where the hole in the spindle is a bit small. In a case like this it is well to give a couple of turns with a twist drill of just a little less diameter than the reamer. This treatment will make the reamer "bite" quickly and easily and the workman can save a bit of time by thus starting the reamer.

While the spindle was being reamed the reamer "balked" twice. It stopped cutting all of its own accord after it had been well started into the hole. The workman removed the reamer and found that the chips had "bridged" the hole, notably at the bottom of the "chamber" in the spindle which is made with a small hole at either end and a cored chamber in the middle, where no reaming has to be done. This form of construction saved metal, time and reamers but the workman has to be careful when reaming and not let the chips bridge

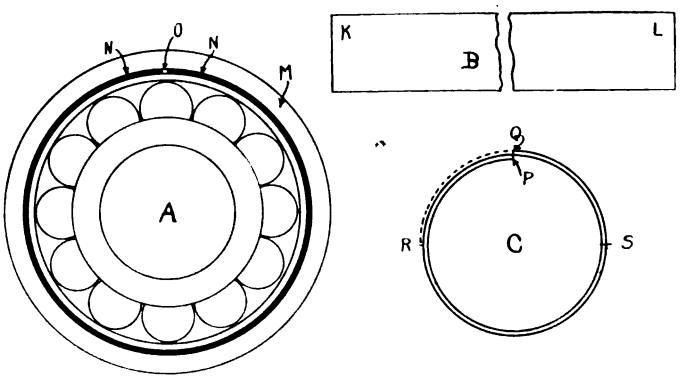


Fig. 4—Ford Repair Hints; A, Bushing a Bearing; B, Bushing Made of Sheet Brass; C, Making the Bushing.

across at the bottom of the chamber, ahead of the reamer.

Next time this workman reams a Ford spindle he will take a bit of wire, No. 16 or 14, and occasionally push the wire up from the bottom of the spindle to dislodge the chips which otherwise might

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lodge there and bridge across so thoroughly that the reamer could not be pushed through them.

A reamer twisted in the direction opposite to which it is turned for cutting will never be drawn into the work too fast. On the other hand, especially after the reamer gets a bit dull, it may be necessary to force the reamer to its work a bit. This was what the workman thought had happened when the reamer stopped cutting in the middle of the hole. Accordingly the man pushed a bit harder on the reamer and kept pushing, with no results, thereby wasting several minutes of time.

Assembling New Spindle.

The pin, after all its hammering during the backing-out, was found to be in good shape. It was cleaned thoroughly in coal oil. The workman next draw filed it a bit, holding the pin in one hand, while he applied the file with the other. He did not place the pin in a vise for the very light filing, which was done merely to remove rust and grease, not to remove any of the metal. Draw filing in the vise would nave resulted in removing metal.

The cotter holes were next well cleaned out and the workman noted particularly the direction of any cotter hole before he put the nut in place over that hole so that he knew just where to look for the hole when the nut was nearly screwed home. In this way the workman saved a good many minutes which otherwise would have been wasted in hunting for the cotter hole, as the nut was tightened.

A liberal dose of oil was given to the spindle knuckle pin before it was driven home, and the workman gave a good bit of attention to adjusting the castle nut at the lower end of the pin. He first tightened that nut until the spindle was locked in the knuckle. Then he took a small machine hammer and struck a few smart blows on the top or head end of the pin. This treatment seemed to settle the parts together in an extra close manner and the knuckle, which was tight before the hammering, could be moved easily with the hand after the blows had been struck.

"I always like to adjust knuckle pins in this manner," said the workman. "It keeps them from getting loose for a long time after such an adjustment. In fact, pins thus adjusted usually never need tightening, as the parts are set together so closely that the small amount of dirt and rust which gets into the joint prevents them from even becoming loose enough to require the castle nut to be set up another segment."

Bushing Ball Bearings.

When the larger ball bearing was placed inside of the wheel-hub it was very quickly discovered that the cage or race was too small, that the bearing would lie loose inside of the hub. "The hub has been worn and perhaps stretched," said the garageman, "because of the old cage running loose in the hub, for nobody knows how long hammering itself to pieces and expanding the hub a little at the same time.

"But I'll fix that," he continued, and he went to the storeroom and brought back some very thin sheet brass, stencil brass, he called it, almost as thin as paper. A strip was cut about ¾-inch wide and just long enough to reach around the larger ball bearing cage. The strip is shown at K, L, Fig. 4, B.

The cage was then started into its seat in the hub with the strip of brass wrapped around. A little juggling was necessary in order to make the strip of brass drive in evenly with the cage, as the garageman did not want one part of the strip to go in while another portion stayed out.

But after a few false starts the cage and the bushing were driven to the bottom of the hub cavity, evenly and snugly, as shown at Fig. 4, A, in which M M is the portion of the hub which contains the cage cavity. O is the bearing cage and N N is one edge of the strip, which projects quite evenly past the edge of the ball bearing cage. With a sharp knife the workman marked heavily into the brass bushing, closely along the edge of the cage O and against the surface of hub M M. One end of the bushing was caught at N with pliers and rolled up a bit until it commenced to tear along the knife mark. The projecting strip was next quickly pulled entirely off, leaving the bushing with a clean edge, flush with and all around the cage O. The cage was driven pretty solidly into place by means of a bit of soft steel which was moved around from place to place and blows struck against the steel until the cage was fairly into place.

A Variable Bushing.

When the small cage, the one at the front side of the wheel, was tried in its place, that one, too, was found to be very loose. "More stretch," said the garageman, and he proceeded to apply a shorter strip of the thin brass which, by the way, if found to be hard when purchased, can be heated and plunged into water while almost red hot, thereby removing all springiness from the metal and making the brass very soft indeed.

Finding the bushing did not fix the cage firmly, the workman looked for a thicker piece of brass, but failed to find any in stock. He next cut a strip which, when rolled up to the diameter of the smaller ball cage, as shown at P Q, Fig. 6, A C, would not tighten the cage. The workman simply cut a longer strip which lapped as per the dotted lines, from Q to R. The bushing was inserted in this manner and found to make the cage a bit too tight, whereupon the bushing was shortened a little and until it tightened the cage to suit the workman.

"Don't that method of bushing throw the cage out of center?" the writer asked the garageman?

"Well, I suppose that it does a very little, but if one stops to consider how mighty thin this brass is, and that the cage may not be quite round or the inside of the hub exactly true, then it will be pretty hard to figure whether the cage is out of true one-thousandth of an inch or two one-thousandths. And even with this amount of 'wobble' if you or anybody else can detect it in the running of a wheel thus bushed, then let me know and I will hunt up some other way of bushing ball bearing cages when they need it, which is almost always the case when a new bearing is put into an old hub.

"We work this thing the other way, sometimes," he said. "When the bushing proves to be just a little too thick and the cage will not drive home without danger of springing, then I cut off a bit of the bushing from Q back toward S, as far as may be required to make the fit just tight enough. This throws the cage 'out' a bit, too, I reckon, but I never have been able to find a man who can prove that the error is enough to do any harm in the running of the wheel thus bushed! Can you?"

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Defining the Various Standard Electrical Measuring Units

Their Names, Derivation, Quantity, Quality, Etc., Explained By Simple Chart Including Various Methods of Wiring

BY AUGUSTUS A. WEST

Electricity is a form of energy reputed to have derived its name from the Greek name for amber, elektron, because some 2,000 years ago it was found that amber, when rubbed with cloth, had a property of attracting and repelling objects of light weight. Magnetism is the residual property of electricity in steel. Magnetism and electricity are similar. There are various methods of producing electricity, such as by chemical or mechanical means, but it is similar. Where it comes from or goes to we do not know, but it has a host of useful applications. A more recent theory defines the primal source of everything as electrons which are a smaller unit than elements.

A number of electrical measuring units have been standardised, those in common use being the volt, ampere, ohm and watt. The names of the units have been given in honor of scientists as Count A. Volta, Italian electrician, 1745-1827; A. M. Ampere, French physicist, 1775-1836; C. A. DeCoulomb, French scientist, 1736-1806; M. Ohm, German physicist, 1787-1854; James Watt, Scotch inventor, 1736-1819; M. Faraday, English physicist, 1791-1867; J. P. Joule, English physicist, 1818-1889, and Joseph Henry, American physicist, 1798-1878.

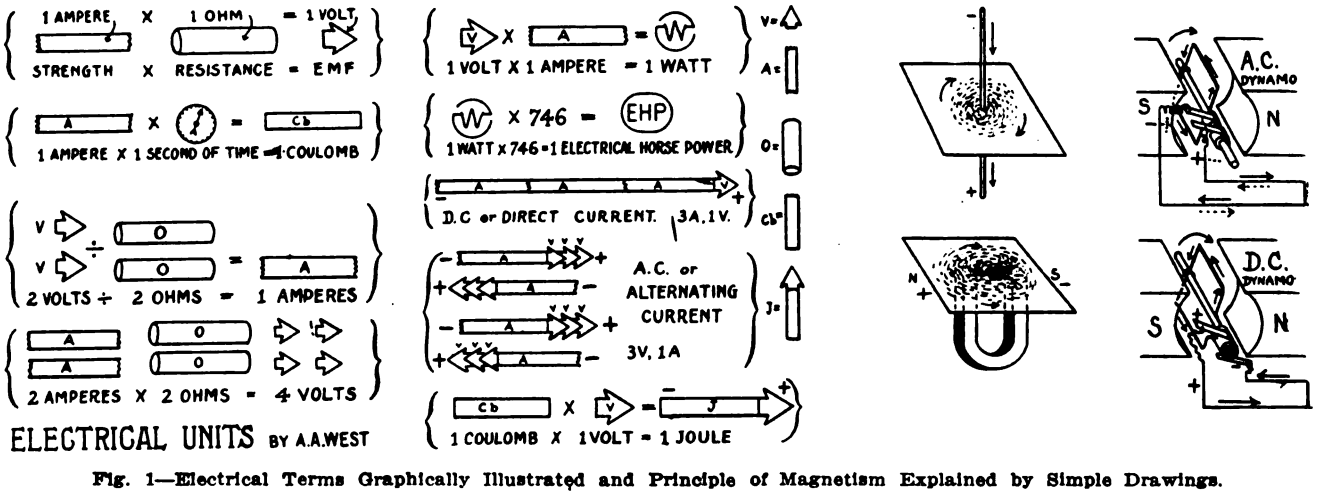


Fig. 1—Electrical Terms Graphically Illustrated and Principle of Magnetism Explained by Simple Drawings.

Electrical Units.

The volt is the unit of pressure, the electromotive force, E. M. F. It is a current of one ampere through a resistance of one ohm. The quantity of current is the coulomb. It is a current of the strength of one ampere for one second of time; thus three amperes of current flowing one second would be three coulombs. One ampere of current is one coulomb flowing in one second. It is the unit of strength. An ohm is the unit of resistance, as 9.3 feet of No. 30 (B. S.) copper wire has a resistance of one ohm. The watt is the unit of power. It is a current having a pressure of one volt and a strength of one ampere and is equal to 1-746th of a horse power. One electrical horse power, E. H. P., is 746 watts. A kilowatt is 1,000 watts. The farad is the term for the capacity of an electrical conductor. A surface that will retain the quantity of one coulomb at a pressure of one volt is one farad. A micro-farad is one millionth of a farad, which is the unit of electrical capacity. The henry is the unit of self-inductance. An inductance of one henry existing in a circuit changing at the rate of one ampere per second induces a pressure of one volt. The millihenry, or 1/1000th henry, is the accepted working unit. The joule is the unit of electrical energy, equal to 10.7 absolute units or ergs or the amount of work done when one coulomb moves under a pressure of one volt, also called the volt-coulomb. One joule per second is equal to one watt. Four and two tenths joules equal one small calorie.

The electrical chart shown at Fig. 2 will be convenient for reference, as it gives the names of the units, their derivation, quality, such as resistance, quantity, etc. The name of the measuring instrument is also indicated. Fig. 1 shows the volt as an arrow head, the ampere as part of the arrow shaft with broken ends, the coulomb as an exact section of the arrow's shaft as it is the flow per second of time. The ohm may be compared to a tube through which the arrow must pass, and a joule as a complete arrow. In a direct current flow the arrow goes from negative, or —, to positive, or +. Alternating currents flow first one way and then in the opposite direction.

The drawing at Fig. 2 shows three batteries in series. These are two volts, four amperes per battery. When thus wired we obtain six volts or pressure and four amperes. In parallel the same cells will provide two volts and twelve amperes. In series parallel, four volts and eight amperes.

Series and shunt motors are shown, S standing for switch and R for rheostat or resistance.

When the electro magnet shown is wrapped with

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an additional wire coil an induced current is obtained. The condenser also works by induction.

Direct current flows in one direction as from a positive to a negative pole. The principle of a dynamo and motor is similar. The dynamo is power driven and generates a current while the motor requires current to operate. The motors used on automobiles are direct current machines.

All dynamos would be alternating if collector rings were used instead of commutators which directs the flow in one direction. The first dynamo had permanent magnets and pole pieces, like the ignition magneto. The present day dynamo and motor have a round external iron ring with internal fields and center pointing poles. The modern motors used on motor cars are generally series wound. When a wire is carried across between two lines it is called a shunt. When two shunts are used the construction is called in multiple or parallel.

The electro magnet is a bar of soft iron wrapped with a number of coils of insulated wire. By insulating the wire the current proper is confined to the wire proper, but induced currents are made possible because there surrounds all metals carrying an electrical current a halo or field of force. Visible effects of this electrical radiation may be seen by piercing a card with a wire, sprinkling iron filings on the card. When a current is sent through the wire the filings will form in circles around the wire. Magnetism's relation to electricity is shown in like manner by placing iron filings on a paper held over the poles of a magnet. A wire coiled like a spring shows polarity the same as a magnet.

Primary batteries provide current through chemical action. The secondary or storage battery stores the current sent into it and delivers it afterward. The so-called dry battery is a semi-moist primary battery and when run down can be partially revived by a salt or sal ammoniac solution.

ELECTRICAL TABLE BY A.A.WEST

UNIT OF		NAME	DERIVATION		INSTRUMENT
E.M.F. or Electro Motive Force	V.	...VOLT...	Ampere X Ohm...	AXO.	Voltmeter...
Resistance	R.	...OHM....	Volt ÷ Ampere...	V÷A.	Ohmmeter...
Current....	C.	AMPERE..	Volt ÷ Ohm....	V÷O.	Ammeter...
Quantity....	Cb	COULOMB.	Ampere X Second.	AXS.	Galvanometer.
Capacity....	F.	FARAD.	Coulomb ÷ Volt..	Cb÷V.	Coulombmeter.
Power.....	W.	WATT..	Volt X Ampere..	VXA.	Wattmeter.
Self-inductance	H.	HENRY	Current+Current	A+A.	Galvanometer.
Electrical Energy	J.	JOULE..	Coulomb X Volt..	CbXV.	Joulemeter.
Ohm's Law-Ampere=Volt÷Ohm or C=E÷R					
Applied Power.	HP	Horse Power	746 Watts...	EHP	Dynamometer
$W=C^2XR$ and $W=E^2\div R$.			A Kilowatt-1,000 Watts = $1\frac{25}{746}$ EHP or 1⅓ HP		
A micro-farad = one-millionth of a farad = unit of electrical capacity					
Magnetism.	M	MAGNET	Stored Electricity in iron or steel.	C+Metal	Compass.

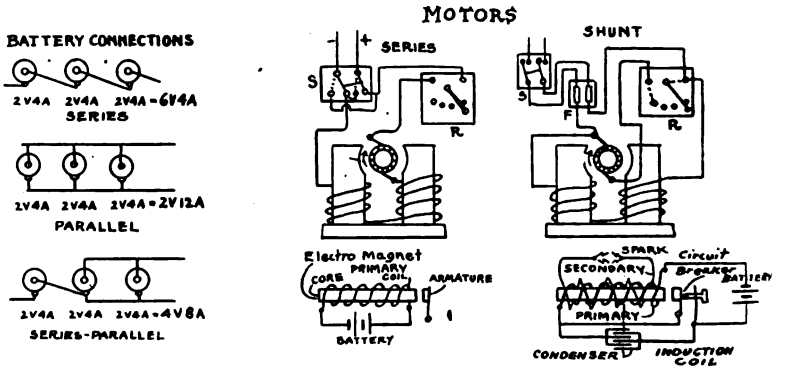


Fig. 2—Table or Chart Giving Names of Electrical Units, Various Battery Wiring Methods and Construction of Series and Shunt Wound Machines.

Secures Restraining Order.

The American Bureau of Engineering, Inc., Chicago, Ill., maker of Ambu, the electric trouble shooter, through their attorneys appeared before Judge Carpenter in the United States Circuit Court and secured a restraining order prohibiting the sale of the so-called Official Wiring Guide as published by the International Motor Institute.

The contention of the American Bureau of Engineering, Inc., was that the wiring diagrams published and offered for sale by the defendants are deliberate copies of the copyrighted, authentic wiring diagrams of the American Bureau of Engineering, Inc. As part of the comprehensive information comprising Ambu service, the wiring diagrams, distinguished by the circular copyright imprint of Ambu, are looked upon as standard and authoritative and the garage men should therefore be warned of this action.

Prevents Fuel Evaporation.

Experts estimate that for every gallon of gasoline placed in the hands of the ultimate user a quart is lost through evaporation; that is, the highly volatile part. This part that is lost could be mixed with lower oils in the proportion of one to three, thus doubling the commercial gasoline supply.

To eliminate this evaporation in storage, Claude S. Briggs has formed the Hydraulic Oil Systems Corp., Detroit. The system is the invention of Frederick G. Farr, and its principle consists of the storing of oil, whether gasoline, lubricating or crude, over water in a sealed tank, thus keeping it from the air and preventing evaporation. The oil is taken from the top of the tank, avoiding the possibility of sediment, etc., being present in the piping. It is also claimed that the water pressure necessary to keep the tank full to the top also provides a very forceful "head" of fuel, making delivery rapid and eliminating hand pumping. Systems are to be produced for the retail trade, etc.

Australia Needs Bodies.

Efforts are being made to obtain permission to import bodies for motor cars into Australia to supply the demand until such time as factories can be equipped to manufacture them in sufficient quantities. It is pointed out by those interested in the trade that at least 10,000 bodies will be required within the next year, and that it is extremely doubtful whether one-fifth that number can be manufactured in Australia with the factories' present equipment. The normal output of motor car bodies in Australia is estimated at 1,100 a year.

To Make Tires in Cuba.

A firm to manufacture automobile tires and all kinds of rubber goods under the name of the "Cuban Tire and Rubber Co." has been established in Havana, Cuba. It is stated that it intends also to put in rubber-restoring machinery, thereby using old rubber.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2315 **Desires Much Information.**

From W. M. Mitchell, Illinois.—Please answer the following questions dealing with the Ford engine: 1—How many thousandths in inches clearance on the top and skirt of the piston is correct to fit the cylinder? 2—How many thousandths clearance should rings have in piston grooves to allow for good expansion? 3—How many thousandths clearance should rings have between points or ends when fitted to the cylinder and to allow for expansion under heat? 4—Is it not imperative that wrist pins should work in bronze bushings fitted to the piston owing to the tremendous heat caused by burning of the gas? 5—Isn't the wear on piston pins when fitted to a piston without a bushing very severe? 6—Is it not true that the wristpin should be fitted to bronze bushings in piston to make a good mechanic's job? 7—Give the distance of movement in fraction of an inch of movement of wrist pin in rotating during one complete revolution of crankshaft. 8—How many thousandths inches lateral movement should connecting rod have on crankshaft? 9—Should wristpin have a snug fit in bronze bushing? 10—Would not a loose fit on wristpin and connecting rod, that is, laterally, produce a knock when engine is running, especially when weight of car runs on engine after closing the throttle? 11—In operating the Ford engine on the battery for several days and without using the magneto, would not the magnetism generated by the magneto burn up the magneto coils; that is, burn the insulation around the coils, causing a short in the coils? 12—Is it not a fact that when the engine is run on the batteries for any great length of time the magneto should be grounded so in case of a short in the magneto, which had been dislodged and the magneto begins to generate again, it could not burn up the magneto coils? Am I correct? 13—When magneto is set 3/16-inch from coil spools is not the magnetic lines of force weakened to such an extent that the output of the magneto is low?

Reply.—The Ford pistons are fitted (factory) with a clearance of from .003 to .004-inch; that is, the clearance at the wristpin. 2—The rings have a side clearance of from .001 to .002-inch in the ring groove. 3—The top ring is usually fitted with a gap from .004 to .008-inch between the ends. The middle ring has a gap of from .008 to .012-inch and the lower ring from .012 to .015-inch. 4—Bronze is generally utilized for those types of pistons having wristpins oscillating in the piston bosses as the design mentioned. 5—The amount of wear would depend upon the materials utilized. Where the wristpin is fixed in the piston bosses the wear occurs both on the wristpin and the small end of the connecting rod. 6—No. See answers to questions 4 and 5. 7—The wristpin moves .21-inch during one complete revolution of the crankshaft. 8—The bearings of rods are fitted, not installed, according to dimensions. 9—Yes, fairly so. 10—Yes, loose rods, etc., are the source of knocks. 11—Operating the engine on batteries for several days will not injure the flywheel magneto. In fact, one could run the engine on batteries for months or even years without injuring the magneto in any way, providing it was not acted upon by some outside force, such as attaching the battery to the magneto terminal on the transmission cover or due to a short circuit. 12—No, you are wrong. 13—The proper gap between the magneto clamps and the coil spools is 1/32-inch and that distance should be uniform all the way around. If the distance was 3/16 the output of the magneto would be decreased on account of the reduction in the magnetic lines of force.

2316 **Dealing With Rheostats.**

From T. E. Joy, Maine.—I have a 30-volt 12-ampere generator which I use to light my garage. Also an ammeter and a voltmeter. Then I have a type 9G rheostat made by the St. Louis Electrical Works. This has an ammeter and is supposed to charge from one to four batteries at the same time. If I keep the generator at 30 volts will this auxiliary rheostat cut the voltage down so I can charge one six-volt battery without damaging it?

Reply.—It is possible to charge one six-volt storage battery from the generator with the 9G rheostat and still maintain 30 volts on the generator, but you should not charge the battery at more than a six-ampere rate. A higher charging rate or current than six amperes with 30 volts will damage the rheostat.

2317 **Why Battery Fails to Charge.**

From E. Steding, New York.—I have a 1916 Elcar, made by the Elkhart Carriage & Motor Co., and equipped with Apelco system. Have been having trouble with the motor starter. The battery, after charging from outside source, will start the engine via starter, but in a very short time the starter will not operate for the reason, the local battery man tells me, is that one side of the battery is not charged by the generator, and if I want to use the starter at all, must charge the battery independent and at least once a week. I may say in connection that the three cells, towards the universal joint (on the inside of the car) refuse to be charged, and the battery man wishes me to tell you that the battery is all right and that the polarity is O. K.

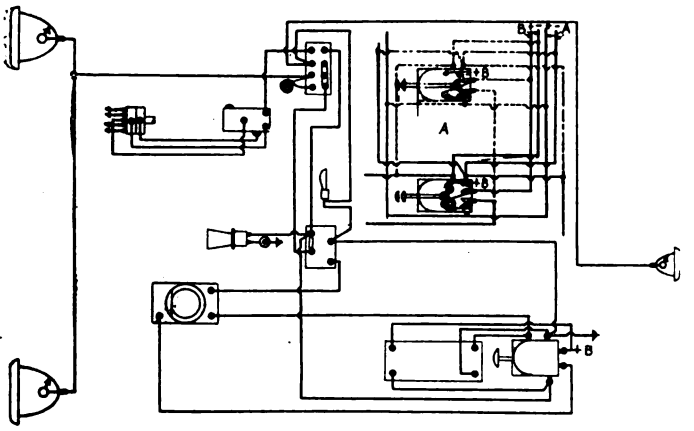
Now where can the trouble be? We suspected a short circuit, as the cables flashed when connected with binding posts, but we cured that, as the nuts on the binding post were loose, and now the battery man claims that the trouble is very likely in the switch.

I may say that the generator seems to work all right. The indicating switch shows on as soon as

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the car is started, but when the current is tested with an ammeter the outside cells show they are being charged but the inside show they are not.

Looking over the wires there does not appear to be any short circuit leading from the generator to



Illustrating Wiring Plan of Apelco System and Components Responsible for Failure of Dynamo to Charge Battery.

the switch, nor any other wire that I can see, so probably it may be in the switch, as he claims; the starting switch regulates the charging of the battery. He admits it is guesswork on his part.

Reply.—According to your description it appears that the jumper inside the switch is burned out. This jumper connects from the upper left-hand post to the postive +B on the starting switch. See accompanying large drawing B. The paralleling finger contacts may not close. These should close when the switch is in the running or upper position and open when in the starting or down position. This strip and contact are shown in the smaller drawing, the inset, marked A. Care should be taken to disconnect the battery leads A+ and B+ before working on the switch to prevent short circuits, also connect carefully and according to the large wiring plan. In case the wrong wires are connected the strip above referred to is likely to burn out or the switch be injured. When the strip or paralleling contacts are open the battery will be only half charged; that is, one half will get all of the charging current from the generator which makes for poor starting and may injure the system.

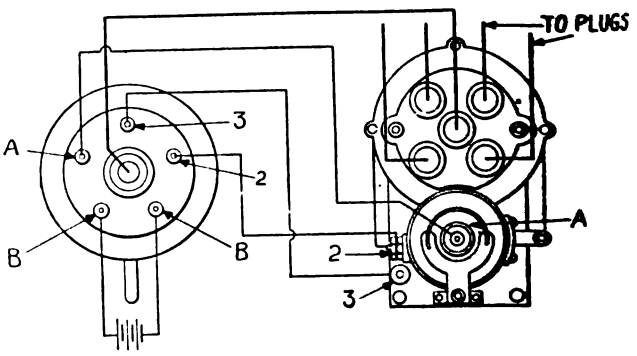
2318 Starter Gear Won't Mesh.

From Campbell & Co., Michigan.—We have a model 81, 1915 Overland equipped with an Auto-Lite starter. We, in common with several other owners here, have trouble with our starter spinning against the teeth on the flywheel and not meshing with the flywheel teeth but gradually wearing them out. Our first flywheel teeth were torn out in this way until eventually there were no teeth in two spots on the flywheel. This necessitated the purchase of a new flywheel, and the present wheel is going the same way. Letters from the company state that the starter was not properly placed, although they placed the first one, and we were careful to have the starter properly placed after putting on the new flywheel. The fact is that the four bolts that attach the starter to the frame plate of the car cannot be varied if the bolts are drawn up tight (and they are) for the reason that the bolt holes are a perfect fit, in fact, they have to be tapped through with a hammer they fit so tight. So the starter placement cannot be varied. It is just where the makers intended it to go. Can you tell of any adjustment that can be made so that the teeth of the starter pinion will always mesh with the flywheel teeth when the heel lever is compressed? The trouble of course is that the flywheel does not always stop just right, but the pinion gear ought to find the teeth in the flywheel, and in perhaps 75 per cent. of the times it does. The balance of the time it does not, but will rip and tear against the edge of the flywheel teeth instead of gaining entrance so eventually the teeth are worn away, not from their surfaces but from their rear ends. When meshed the teeth of both seem to be just a nice fit. Not too tight, not too much play. Can you help us as you have helped many others?

Reply.—Your trouble is due to the fact that the switch is making contact before the starter pinion is properly engaged with the flywheel. It is explained that in pushing the starter button the starter pinion is pushed into mesh with the flywheel, and at the same time the switch makes contact, causing the motor to revolve. To correct this trouble it will be necessary to remove the switch from the starting motor and readjust the blade so that the contact will not take place until the starter pinion is completely engaged with the flywheel.

2319 Has Ignition Puzzle.

From Edward J. Hinchcliffe, New Jersey.—I have a 1910 Mercer with Splitdorf dual ignition system, round type of coil. Starting on the batteries I could always start on the second pull of the crank and on the coldest days. But about six weeks ago the engine would not start on batteries although they tested to 20 amperes. Looked at switch but could not see anything wrong. Put in new wires, thinking a short circuit might exist. Nothing doing. Did everything I could think of. I tried cranking her over a couple of times, then pushed the starting button, and presto, she started and ran as long as I kept pushing the button. The engine did not run steady as I could not push the button regularly enough. I now start by turning the engine over a couple of times, then push the button and when she starts throw over on to the magneto. The engine runs all right on the magneto, but will not start on the batteries except as described. It strikes me that



Showing the Wiring Plan of a Splitdorf Dual Type of Magneto and TSF Transformer Coil.

the coil must be all right as the engine would not run on the magneto were it not. Please advise as to trouble and the remedy.

Reply.—It is very probable that the coil and magneto are not properly wired. The accompanying diagram shows the wiring plan with the TSF trans-

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former. If wiring is correct and the trouble continues, it is advisable to drive to the nearest service station and have the switch mechanism inspected.

2320 **Installing Ammeter.**

From R. E. Norris, Arkansas.—Please give a diagram in your next issue showing how to connect an ammeter to show charge and discharge on a model C-25, 1915 Buick. Do not want to show starter discharge if it can be avoided and am at a loss to know how to connect so as to cut out the starting discharge. Also advise how to increase the output of the Delco generator and also the Auto-Lite generator as used on the later model Overlands.

In connection with the Overland 90 and 85-6, we have had trouble with automatic cut-out sometimes failing to close when the engine is running at a sufficient speed to generate. At times it closes and opens rapidly when engine is running at charging rate, causing batteries to deteriorate. Fail to locate any trouble with the cut-out or any other unit in the system. On the 85-6 the ammeter will not show charge until engine is run a few minutes, then shows good charging rate, but later this rate decreases until at 20 to 25 m. p. h. the current indicated is not over 10 or 12 amperes when at that speed it should show 14 or more amperes. Brushes on this generator have been dressed down, also the commutator, after this trouble appeared, with visible results.

Reply.—An ammeter can be connected in the charging circuit of the 1915 model C-25 Buick that will show both the charging and discharging rate of the storage battery by disconnecting the wire from the No. 1 terminal on the back of the combination lighting and ignition switch, and connecting this wire to the negative — terminal on the meter, and from the positive + terminal on the back of the meter, connect a similar wire to the No. 1 terminal of the switch. An ammeter connected in this manner will not show discharge from the storage battery during the cranking operation.

The charging rate of the generator on this car cannot be changed. The charging rate is regulated by a reverse series winding in the field coil, and the number of turns in the field coil are constant and the only way the charging rate could be varied at all would be to either remove some of these turns of wire or to increase the number of turns, and to do this is not practical for the average equipped garage. The maker of the Delco system strongly disapproves of any attempt to change the charging rate.

Relative to the trouble experienced with the system on the Overland cars. This is a pretty hard condition to diagnose. It appears that the trouble is in the armature winding and due to an intermittent short. We would suggest that you return the instrument to the factory with a letter of instructions at the time of the shipment, advising the maker as to the nature of the trouble.

2321 **Has Ground in Secondary.**

From H. B. Hazen, Rhode Island.—I am having trouble with my Ford running with a good deal of noise. When the spark is advanced it sounds worse and as though all the cylinders were trying to fire at once and hold the engine back. The spark is just where it has been and the engine runs quiet and has lots of power. The engine seems to squeak and rattle all over. I find the cylinder head charged all over or at least I receive a shock by simply laying my fingers on it. The engine was overhauled by an expert in July. Have tested the intake manifold and cylinder head and both are tight. Have new spark plugs. Starts very easy on a cold morning but does not run flexible. Have a J. & B. timer, nearly new. It looks O. K. but does not look bright where roller makes contact. I have about concluded there is a short circuit or that the timer is not right. No carbon and valves are O. K.

Reply.—The fact that your cylinder bloc is charged indicates a short or ground in the secondary circuit, not in the primary, as you would not receive a shock from the primary current in this ignition system. Look for a faulty secondary wire or connection. Make a systematic search, tracing each wire and connection from source to plug. Inspect and test each spark plug. It is doubtful if the timer be at fault.

2322 **Says Polarity Changes.**

From C. H. Epps, New York.—I had a case of electrical trouble come to me the other day and would like to know a little something about it. The car was a 1918 Oakland, a light six, and they had let the battery go dry. There was not enough juice in it to start the engine with the hand crank. I got another battery and installed it to start the engine. When I got it started the generator charged the wrong way so I reversed the wires on the battery. The battery then charged all right but when the car was driven at night the lights and ignition took so much current or something that when we tried to start the car the next morning the battery was about exhausted. The generator had changed so it charged the wrong way, as it did the first time. Every time the battery did this the generator changed polarity. It is a Delco two-unit system. What makes the generator change polarity?

Reply.—The only way the polarity of the generator on this car can be changed is to reverse the connections of the storage battery, and should the negative — side of the battery be connected through the switch to the generator when the ignition button is pulled out the current would then travel through the frame of the car and the generator winding in the opposite direction which would change the polarity of the pole pieces of the generator which, of course, would reverse the direction of the current going from the generator.

If the ammeter on this car shows a reverse reading, it is undoubtedly caused by either the storage battery connection having been reversed or the leads on the back of the meter have been changed. The characteristics of the shunt wound generator are such that when a storage battery is connected to the two main leads and the circuit is closed, the generator will charge the battery in the right direction when driven.

2323 **Retempering Ball Bearings.**

From L. F. Hardestry, West Virginia.—Will you please inform me where I can get ball bearings retempered that have been through a fire? The bearings are not injured, only the temper is gone.

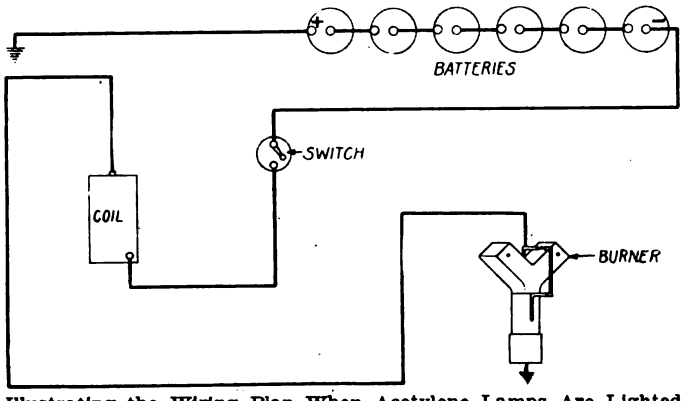
Reply.—It is best to send the bearings to the

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maker as the factory is best equipped to temper the balls, races, etc., and to make any needed repairs.

2324 **Lighting Gas With Spark.**

From E. C. Clark, New Hampshire.—Please advise me how to run wires from a battery through a coil to headlights equipped with acetylene burners. I want to obtain a spark for igniting the gas. Can it



Illustrating the Wiring Plan When Acetylene Lamps Are Lighted by Spark Coil Current.

be done with the coil on the Ford car or would it be necessary to have a separate coil? I have a Remy coil, a four-cylinder unit. Could that be used and how? Any information you can give me on this subject will be appreciated.

Reply.—An accompanying illustration shows the principle involved in utilizing a spark from an induction coil for igniting the acetylene. The cells are connected in series and one side is grounded. The other wire leads to the primary of the coil. Incorporated in the primary circuit is a switch, but a type of push button would be preferable. The secondary circuit is simple. The high-tension current is conveyed to an insulated member on the tip of the burner which is grounded. The current jumping the gap, and much in the same manner as with the spark plug, ignites the gas.

You will need some form of a control valve for regulating the supply of acetylene from the tank, and it is advisable to use an automatic reducing valve on the tank proper. Such a valve will keep the pressure to about two ounces at all times. The Prest-O-Lite Company, Indianapolis, marketed a complete outfit several years ago and it may be possible to secure the material you require by writing the company. Insofar as the coil is concerned, any type of vibrating coil is adaptable. The wiring is simple, the principle involved being similar to the wiring of the ignition system of the internal combustion engine.

2325 **Acetylene for Starting.**

From Hart E. Buell, Connecticut.—Please state how to start a Ford car in cold weather when there is no hot water available for the carburetor. How would you connect a branch pipe from a Prest-O-Lite tank with the carburetor so as to make starting easy? Would there be any danger of blowing up the car?

Reply.—Increase the fuel supply by regulating the needle valve which is adjusted from the dash. Prime the cylinders with gasoline or a mixture of sulphuric ether and gasoline. The acetylene gas can be introduced into the intake manifold above the carburetor. There is no danger if properly used. If a tank is employed it will be best to make use of a reducing valve. These valves are made by the Prest-O-Lite Company, Indianapolis, Ind.

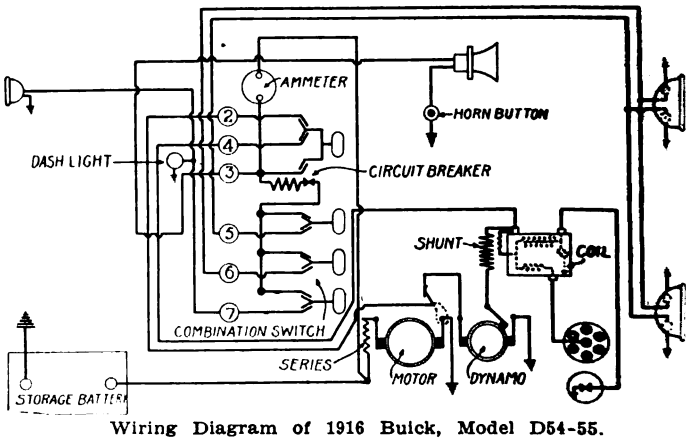
2326 **Will Ruin Magneto.**

From Oscar Rodenbach & Son, Pennsylvania.—Please supply answers to the following: Would it be harmful to connect a storage battery with the Dixie true high-tension magneto so as to use it for starting purposes, the current to go through the magneto only when the starting switch is engaged? Please give us a diagram of the wiring, also state whether it would harm the magneto. Mention at which part of the coil the current should go through.

Reply.—If you attempt to connect dry cells or a storage battery with the magneto as mentioned, you will seriously injure it. A true high-tension magneto is not constructed to be used as you suggest. It has two windings, a primary and a secondary, the last named transforming the low-tension current into a high. Magnetos are constructed, however, wherein use is made of dry cells or a storage battery as described, but these instruments are known as the low-tension type; that is, the armature has but one winding, a coarse or primary winding. The current generated and that supplied by the batteries is transformed or stepped up by a coil. Some true high-tension magnetos are made with a double breaker box, one interrupter mechanism serving the magneto current and the other the battery current. This type of instrument has an induction or transformer coil for building up the voltage of the battery current. It should also be borne in mind that the current obtained from a magneto is alternating, while that from a chemical source of supply, batteries, is direct.

2327 **Pinion Doesn't Mesh.**

From F. L. Hansen, Indiana.—Would like a diagram of the Delco starting, lighting and ignition system used on the 1916 Buick large six. The trouble we have is that when we pull the ignition button the armature does not roll so as to let starter gears



Wiring Diagram of 1916 Buick, Model D54-55.

mesh when stepping on starter pedal, but when gears do mesh the engine starts fine.

Reply.—There may be one or more parts at fault. It may be due to the armature trouble or in the brush contacts which change the instrument from a dynamo to a motor and vice versa. There may

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be a case of misalignment. Unless familiar with armatures would not advise testing same. Better send unit to the nearest service station.

2328 **Kerosene as a Fuel.**

From G. D. Wood, Arkansas.—Please advise me what the injuries are in using kerosene in a four-cylinder engine properly equipped for burning such fuel, with a double manifold similar to the Wilmo and a double bowl Kingston carburetor with a small water carburetor attached? The engine is a heavy duty type with a bore of 4½ inches and a stroke of 5¾.

Reply.—The use of kerosene in a four-cycle, four-cylinder engine should not be productive of injury if the carburetor or other device properly vaporize the fuel and obtains a homogeneous or dry mixture. Kerosene is practical for the internal combustion engine when it can be so vaporized that the resultant mixture is not affected by variable loads and variable speeds. These factors are the problems which must be overcome before the heavy fuel can be utilized with success in the variable speed, variable load engine. Where the load and speed are practically constant, kerosene can be used with success.

2329 **Wants Estimate on Work.**

From C. R. Hill, New Jersey.—I have a 1916 little Grant Six and wish some advice as to same. The engine in this car has never been equal to or done the work of the other Grant cars. Last spring I had American rings put in, thinking the trouble was due to rings, but the engine isn't what it should be. Now I am thinking very seriously of crating the engine and sending it to the factory. I wrote the factory as to cost and all they could say was that if I paid the transportation and 80 cents an hour they would overhaul the engine. I am at a loss as to what to do. I was under the impression that it was a safe plan to send the engine to the factory but since I cannot get an estimate I might be making a mistake. Will you kindly advise me?

Reply.—The factory or a garageman cannot give you an estimate on an unknown quantity of work; that is, it is not practical to do so, particularly when it is not known what part is at fault. The factory cannot tell what the trouble is until they have made a test or tests. Repairs are based on hours of labor and material although fixed prices are observed for certain well known repairs. We would suggest that you either send the engine to the factory and trust to their ability or take it to a service station or factory branch of the maker. The last named should be able to locate your trouble and give you an estimate as to the probable cost of the work.

2330 **Fixed vs. Variable Spark.**

From J. H. Erkmann, Missouri.—Am taking the liberty of asking you a few questions regarding a model 22 Metz car. 1—The manufacturers advise me that the installing of an adjustable spark magneto in place of the set spark instrument is absolutely of no advantage. Do you agree with them? 2—Can you tell me what are generally considered the advantages of the Metz friction drive, compared to a shaft-driven car? 3—My car is geared 3 to 1. Do you think I would obtain better all around results with a lower gear?

I surely like your magazine. It is very instructive to me and I anxiously await its coming each month. I have saved all of the magazines ever since I have been getting them and I always reread them and find something of value now.

Reply.—1—Opinions differ as to the fixed and variable advance type of magneto but inasmuch as you have asked for our opinion we would state that we believe the variable type superior to the fixed, particularly when the operator uses good judgment as to the proper amount of advance. 2—The advantages of the friction drive as pointed out by the makers are: Light weight, elimination of gears and transmissions, quiet operation, simplicity and a wide range of speeds. It is also claimed that the cost of maintenance is less than with the conventional type. 3—It is doubtful.

2331 **Anti-Freeze for Generator.**

From W. Tunnell, Missouri.—My son has an acetylene generator for making gas in his home and has no place to put it where the water will not freeze. What chemical can be used in the water to prevent its freezing?

Reply.—Use calcium chloride. The amounts to use to prevent freezing and at various temperatures were given in the October number. It is stated by acetylene engineers that the use of the calcium chloride is beneficial.

2332 **Repairman Is Right.**

From F. Conklin, New Jersey.—After emptying oil from the crankcase and pouring in a gallon of kerosene is there any danger if I run the engine for one minute to loosen the dirt and sediment? The garageman will not do it for me. Is it necessary to empty out the transmission case and wash with kerosene once a year? Can you tell me where to oil the clutch on a 1916 Hupmobile?

Reply.—Running the engine under the conditions named is a dangerous thing to do. If you wish to loosen the dirt, etc., why not remove the plugs or open the petcocks and crank the engine or spin it for several minutes? This should loosen the deposits, etc., and you will avoid the possibility of damage. The garageman would not do the work as he probably knows the effect of thinning the lubricant in the bearings, etc., by using kerosene. The 1916 Hupmobile has a multiple disc clutch running in oil.

2333 **Information Wanted.**

From H. V. Sweet, New York.—I wish to obtain the address of the maker of a rectifier known as the Rollinson electrolytic rectifier. It is a jar containing an alkaline solution with electrodes of iron and aluminum. Can you advise me where it is made?

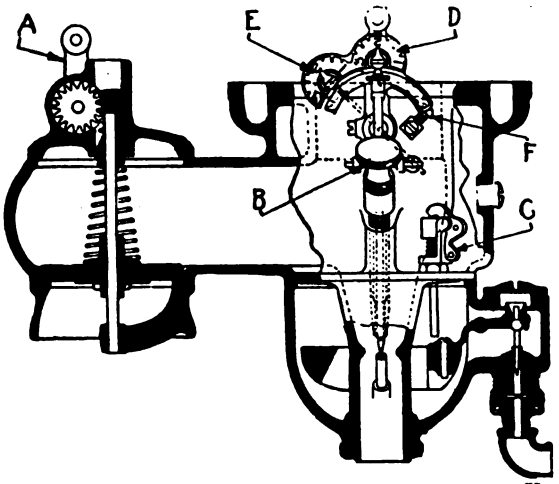
Reply.—We have no record of the rectifier mentioned. Perhaps some of our readers may know who makes this instrument.

2334 **Desires Better Mileage.**

From Frank S. Pickering, Texas.—1—Will you please tell me how to adjust the model L Schebler carburetor? How should the air intake (auxiliary

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intake, I think) operated by a spring valve with adjusting screw on top, be adjusted for a temperature of from 50 to 80 degrees Fahrenheit? Do you need to touch any adjustment other than the needle valve in adjusting this carburetor? I have changed the air adjustment somewhat and would like to know the most economical way this carburetor should be adjusted. It also has a hot air intake.



Showing the Model L Schebler Carburetor With Parts Used for Making Adjustments.

2—Equipped with the model L Schebler carburetor is not 12 to 15 miles per gallon gas a low figure for a car weighing 3,000 pounds? 3—Will attaching a "gas saver" consisting of a copper tube leading from the dash to the intake manifold affect the working of a vacuum gasoline system if the tube enters the manifold through the tube leading from the top of the dash tank (under the hood) to the intake manifold? I am figuring on putting a two-way cock in the intake manifold in lieu of the nipple now tapped in the intake manifold which is a part of the vacuum system, and attaching the tube, ending in a cock on the dash, to one opening of this two way cock. Can I do it without affecting the operation of the vacuum system? 4—I have adjusted my headlights as instructed in your letter to me but they don't seem to focus on the same point in the road; that is, one lights up the road to the left and the other somehow or other fails to illuminate the right side of the road. What is the reason? 5—If it would not be asking too much I would like to hear through the columns of your excellent magazine from drivers of the Lambert car as to proper method of starting the car on a steep hill or other hard pull where it is necessary to have the brake set to hold the car and also necessary to have the engine speeded up so it will not die when the load comes on it.

Reply.—1—In warm climates or temperatures closely approaching those of summer the amount of fuel should be cut down or the supply of air increased. An accompanying illustration shows the carburetor in question with the adjustments marked. These are as follows: A, air valve which should be set so that it seats firmly, but lightly; B, needle valve adjusting screw, practically the low speed adjustment; C, priming lever, used to flush float chamber; F, throttle lever screw or stop, used to regulate butterfly valve. D and E on the numbered dials are for adjusting the intermediate and high speeds. Increasing the numbers, that is, from 2 to 3, for example, increases the supply of fuel. It is customary to set the intermediate pointer back until the engine backfires, then advance it slightly. This obtains an economical mixture for the speed. It is suggested that all adjustments be made thin and until the engine backfires after which slightly increase the fuel supply. This is a matter of experimentation. 2—This is a difficult question to answer as there are so many factors to be considered. 3—We have no record of an attachment being made as suggested but would advise so installing device that tube entering manifold be not near that of the fuel feed member. 4—Bend the brackets until the proper distribution of the rays is obtained. 5—Perhaps some of our readers will give Mr. Pickering the benefit of their experience.

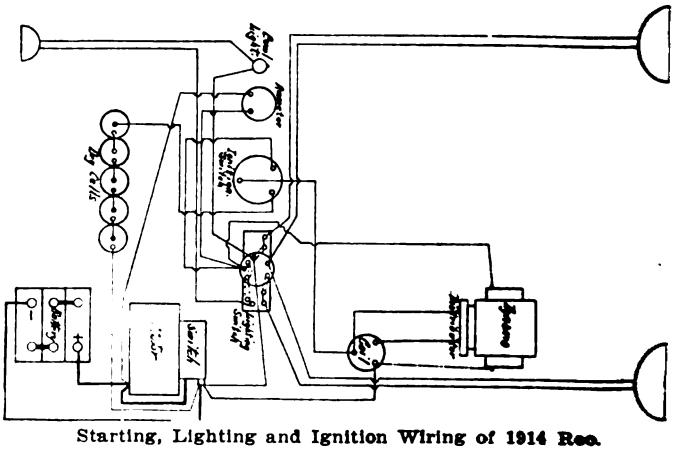
2335 **An Ignition Fault.**

From J. E. Hoyle, Massachusetts.—Please advise me about ignition on my 1911 Overland having a Remy magneto with a transformer coil. The engine will hardly run on the magneto, but when the switch is thrown to the battery side it will run fine. When on the magneto the engine runs on all except the fourth cylinder. Have had several experts look it over. Some say it is the coil. What do you advise?

Reply.—Your question is slightly misleading. You say it will hardly run on the magneto, then add it runs on the magneto and that the No. 4 cylinder will not fire. If the engine will run satisfactorily with the batteries supplying the current and trouble is experienced only with the No. 4 cylinder when on the magneto, it looks very much as if the magneto did not generate sufficient current to overcome the resistance of the gap of the plug in the No. 4 cylinder. Inasmuch as the fault is with the No. 4 cylinder, and assuming that there be no fault with the compression, etc., it should be an easy matter to trace the trouble by beginning with the distributor (No. 4 terminal) and following the wire to the plug. The plug can be easily tested by trying one from the No. 2 or No. 1 cylinder in the cylinder giving the trouble. It is doubtful if the coil be at fault.

2336 **Wants Reo Wiring Plan.**

From E. K. King, Ontario.—Please publish the



Starting, Lighting and Ignition Wiring of 1914 Reo.

wiring plan of the lighting, starting and ignition system used on the 1914 Reo coupe.

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2337 **Suggests Salt Solution.**

From W. E. Youngs, Kansas.—At this time of the year I notice you are asked a great many times about anti-freezing solutions. I myself have always used marketed solutions and have found them satisfactory. In my opinion the base of all of these is calcium chloride. A friend of mine, a retired doctor, but now in the ice business, for years used large quantities of calcium chloride in the manufacture of ice. But lately he changed this solution and now uses sodium chloride (common salt) with the same results, and it does not injure the metal container as much as calcium chloride. Now the freezing point of a salt solution would be as low as like solution of calcium chloride. It would not injure the metal as much. So why would not it be a good anti-freeze to use? Of course I realize you must use a saturated solution and no more as the excess would settle and clog up the water circulation. The solution could be made as follows: Take a large amount of rock salt, add about half a gallon more of water than required for the radiator and boil about 30 minutes. Let it cool, after which drain off the water from residue of salt and what crystals that might form around the edges at the top. Use the water for the radiator. This may seem foolish to you, but I would like to have your opinion anyway. I have at different times taken about all of the automobile journals published, but I like yours best of all.

Reply.—The disadvantage of the saline solution is that incrustation or deposits of salt will follow evaporation of the water.

2338 **Reducing Length of Manifold.**

From James L. Whitney, Rhode Island.—I have a 1913 Cadillac that has an intake manifold about 15 inches long and hot water jacketed. After the water becomes warm good results are obtained, but it is next to impossible to start the engine when it is cold, owing to the distance the vapor has to travel and the poor quality of the gasoline. The car has the Cadillac carburetor and the best I have been able to obtain is 12 miles to a gallon. If I should take out the jacketed section and connect the carburetor close to the cylinders would the engine start any easier, and would there be any saving of fuel? I use a gravity feed and if I make the change will use a vacuum and dispense with the water jacket.

Reply.—Reducing the length of the intake manifold should aid in starting, but dispensing with the heat of the water jacketed section would probably offset any advantage gained by the change suggested. This, however, could be compensated for by the use of heat from the exhaust, by the use of a stove.

An Offer for Mr. Risden.

From Albert Lentz, Michigan.—I was interested in the article entitled "An Efficient Fan Belt," and fail to see why C. W. Risden, of California, does not get good service from his fan belt running over such large pulleys, 5 x 8 inches. I used a flat belt, one inch wide, on pulleys 3 x 6, for four years and it was a good belt when I sold the car and is good for two years more.

I have a Saxon Six that has fan pulleys 2½ x 5 inches and one belt has run two years thus far and can't see but what it is good for two years more if not longer. Mr. Risden says that his belts 30 inches long by 1½ inches wide cost $3. I do not know where he buys his belts that they should charge him $3. I have been in the belt game for more than a quarter of a century and I will be only too glad to supply him with his belts for 80 cents each and first-class leather at that. Of course, his pulleys may be out of line, which may be the cause of short service. My first belt was canvas and it lasted but four months. It was the endless type. I then put on a good leather belt that gave me four years' service with prospects of at least two years more.

Will Enlarge Piston Grooves.

From J. P. Hancock, Colorado.—I have a 6-30 1917 Chalmers five-passenger car. Have run it 4,000 miles. I drove this car direct from the salesroom to my garage and personally renewed all the pistons and fitted two Miles' double seal rings. To say this car has 30 h.p. is a crime, besides the cores of my plugs look like they just come out of an oven. My gas consumption has decreased 2¼ miles per gallon city driving and four miles in the country. This is less than I did with the sister to the car. My pet hobby is efficiency. I am a good mechanic, also an electrician. Now I really believe that I can get more from this car. In the spring, when I overhaul the car, I thought of removing the Miles' rings (3¼ x 3/16) and have the top piston ring groove turned to fit a similar ring 3¼ x ¼, taking the metal from the top side of the groove. For the other two rings I will use the step ring that came with the car. The ¼-inch ring I will lap in. My idea is that the grooves in the pistons are too small, causing the patent rings to be manufactured so frail that they soon lose their tension. Now with a ¼-inch ring I would have another 1/16 inch of stock, consequently a more efficient ring and one that should last longer. The piston has stock enough to make the cut. Am I practical? If not, I am open to conviction.

Ed. Note.—Perhaps some of our readers who have had experience with the make of engine referred to will give Mr. Hancock the benefit of their experience. Mr. Hancock states that his mileage has decreased more in the country driving than in the city, whereas generally the figures are reversed owing to traffic conditions.

Says No Harm Results.

From Palmer F. Moe, Illinois.—Concerning J. Chauncey's inquiry (No. 2260) about the use of trailers. About two months ago I took an auto trailer trip with a party of Boy Scouts, 15 in all. We went about 50 miles in all, over all kinds of roads and up rather steep hills. The equipment consisted of a 1912 five-passenger Reo, carrying five boys and their camping material on the running boards. The trailer consisted of a grocery wagon loaned me by a nearby store. It was attached to the car by an iron rod made at the blacksmith shop. This rod was attached to the frame of the car. In the wagon were 10 boys with their luggage, a tent, stove and various other items. After the trip I might say that I noticed no damage or strain to the car. The engine did not seem to notice the extra load at all. As far as I can learn from this trip I think it would be all right for Mr. Chauncey to take his trip.

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Foreign Subscriptions ..... $1.50, or 6s. 3d.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, JANUARY, 1918.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

A BLOW AT INTELLIGENCE.

The new second-class postage rates established by law at the last session of Congress, to go into effect July 1st next, are a blow at intelligence—a deliberate attempt, apparently, in the guise of taxation, to deprive the people of this country of the opportunity to secure reading matter at prices they can afford to pay.

It was freely stated, when the matter was before Congress for discussion, that there were too many periodicals. One Congressman is reported to have said that 90 per cent. of them ought to be suppressed. Another so-called intelligent Congressman (whose constituents should be profoundly ashamed of him) boasted that he had never read an advertisement in his life. His idea was that publications containing advertisements were an incumbrance in the mails.

The alleged reason for increasing the postage on periodicals was that they were being carried at a loss by the Post Office Department. It was claimed, while the subject was being debated, that the government lost from seventy to ninety million dollars a year.

Not one of those, however, who made this claim was able to prove it. Even the Post Office Department itself had to go on record as "estimating" that the loss was about as stated. No less an authority than the Hon. John Sharp Williams, of Mississippi, defined in the Senate, at the last session of Congress, the word "estimate" to be no better than a "guess." Why doesn't the Post Office Department tell us exactly what the loss is? The reason they cannot do it is that under the present accounting system of the department there is no possible way to find out what the loss is—provided there is any, which is disputed by many publishers. The Post Office Department admits that it is able to carry parcel post packages for three cents a pound and make a profit. Why, then, should they allege that it costs eight or nine cents a pound to handle second-class matter? In point of fact, as Senator Smith of Georgia stated, in a speech on the subject, it is possible to ascertain accurately what it costs to transport second-class matter on the railroads, but it is impossible to ascertain accurately the cost of handling. The Government has to have postmasters and assistant postmasters, regular carriers and rural route carriers, whether or not there is any second-class matter to handle. Second-class matter simply adds something to the burdens of these employees, without apparently increasing the expenses of the department to any appreciable degree.

Thirty years ago, or thereabouts, Congress passed a bill allowing periodicals of all kinds to go through the mails at a postage rate of a cent a pound; and this was done on the ground that such publications were of educational value and that the larger their circulations the better it would be for the people of the entire country. The intention of Congress was to furnish the people with literature at a low rate. The publishers met Congress half-way by giving to the people all the advantage which they obtained from this low rate of postage.

Under this beneficent law millions of dollars have been invested in the publishing business in New York and other large cities. The publishers employ large numbers of men and women in their offices. Thousands of printers are engaged in bringing out these publications. Thousands of men are employed in making the paper which goes into them. Has Congress any right, moral or otherwise, after passing a law to encourage the building up of a great industry, to cripple it, or practically destroy it?

One of the favorite charges among Congressmen hostile to the present second-class rate, is that this rate is a "subsidy" to the publishers. This charge is ridiculous. If there were any "subsidy" about it, the publishers would be making a profit on subscriptions; but in point of fact, the advantage of a low rate of postage, as already stated, was given away to the public years ago by the publishers. If there is any "subsidy" about it at all, it is a subsidy to the people of this country, in the shape of low subscription rates, and the new law, if it goes into effect will compel such an increase in rates that large numbers of people will be deprived of the reading matter they have been in the habit of depending upon.

The Pacific Coast States, and all the far Western and far Southern States will be cut off from cheap periodicals of all kinds, as the publishers will be compelled to seek circulation nearer by. Millions of people are to be deprived of low-priced literature because somebody in Congress "guesses" that it costs more to transport second-class mail than the Government gets for it.

Some Representatives and Senators, while they do not sanction the prohibitive rates established at the last session, seem to think that some kind of "readjustment," as they call it, is necessary. What need is there of a readjustment of second-class post-

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age rates, any more than a readjustment of the publications in the Agricultural Department, millions of which are sent free of charge to farmers everywhere; or a readjustment of the free distribution of farm and garden seeds?

The publishers are as patriotic as any other body of men in the country. They are perfectly willing to pay their share of the war taxes. They freely surrendered thousands of dollars' worth of space to the Government in advertising the Liberty Loans, to make them a success.

But it can easily be seen that the tremendous increase in postage called for by the new bill, will constitute **double taxation,** which is manifestly unfair, and not even necessary, as the Postmaster General claims that his department last year made a profit of nine million dollars.

Our readers can assist in bringing about a repeal of this new and obnoxious law by protesting against it in letters to their Representatives in Congress and demanding a repeal. We urgently request our readers to lose no time in writing to their Representatives in Congress, and to the two Senators from their State. If you don't know the name of your Representative, ask your postmaster; he will undoubtedly know; and your letter to a Representative should be addressed to House of Representatives, Washington, D. C. Letters to Senators should be addressed to the Senate Chamber, Washington, D. C. The postmaster will know the names of your Senators, if you don't remember them.

A CHEERFUL SUBSCRIBER.

It is a pleasure to receive such a letter as the following from Dr. Charles M. Grover, Grant, New Mexico. He says:

"I see that once again the date has rolled around for renewing my subscription to The Automobile Dealer and Repairer, and I assure you it is a genuine pleasure to renew it, and to feel that for another year I can look forward to its arrival, packed from 'kiver to kiver' with helpful, cheerful automobile lore—with every word on every page replete with knowledge and the pointers that are so vitally useful to both owners and drivers of automobiles.

"I always hail its coming with delight, and hasten to open it up, never laying the new number down until I have, if there is time enough, sketched through it from front to back, including the covers, for even the covers have matter on them that is well worth the attention of the autoist that wants to know something about the best the market carries. In the meantime, here is the dollar for 1917-18, and if you are compelled to raise your price, I'll cheerfully stand the raise."

We are hopeful that Congress will so modify the outrageous law that it passed at its last session, increasing the rates of postage on second-class matter from 300 to 800 per cent., that it may not be necessary to increase our subscription price.

HOW ABOUT YOUR INSURANCE?

Are you carrying enough insurance to cover your loss in case of a fire? It should be borne in mind that everything costs much more now than it did before the war. What would have been enough insurance three years ago, may not come within 50 per cent. of being enough now. Perhaps your policies carry a co-insurance clause, by which, in case of a loss, you would share it with the insurance company.

Look over your policies, and then figure the cost of replacement, both of building and contents. You will probably find that you are very much underinsured, in which case you will be wise to increase your insurance at once. It never pays to take chances. Fires have an unpleasant habit of breaking out where least expected.

While you are about it, do not neglect to insure your car. We have reason to believe that very many car owners are negligent in this respect.

WHY HESITATE.

Those of our readers who may be in a condition of hesitation as to whether they shall renew their subscriptions to The Automobile Dealer and Repairer, or experiment with some other journal, are invited to read the following, from one of our subscribers. He says: "Find enclosed one dollar, for which please renew my subscription to your paper. I was undecided whether or not to renew, as I got a letter from another auto magazine which looked good to me; but in the November issue of your magazine I found in the 'Trouble Department' an article which helped me a great deal."

We are inclined to think that if any subscriber who has been reading The Automobile Dealer and Repairer for a year is in doubt whether or not to renew, that doubt may be removed by a careful inspection of our "Trouble Department," in almost any number.

SLOW MAILS.

Owing to the frightfully congested condition on about all the railroads in the country, the mails are being delayed in all directions.

If your copy of The Automobile Dealer and Repairer does not arrive at the usual time, wait patiently a few days before sending your complaint. Do not forget that The Automobile Dealer and Repairer is not a first of the month publication. It is due to come out the middle of the month, and sometimes we are several days late. If your copy, after waiting a reasonable length of time, fails to come, drop us a postal card, and we will send you another. Sometimes copies are lost in the mails.

Subscribers, in asking to have their addresses changed, should always remember to send us their old address, as well as the new one.

SHALL WE INCREASE OUR SUBSCRIPTION RATE?

Most of our readers are aware that a clause was embodied in the Tax Bill at the last session of Congress increasing the rate of postage on second-class matter from 300 to 800 per cent., to begin next July. At that time it is going to be a serious problem with publishers what to do about subscription rates. With second-class postage at a cent a pound, where it has been for about 30 years, we can publish The Automobile Dealer and Repairer for a dollar a year, and not lose very much by it.

It may come as a surprise to a great many readers to learn that the actual cost of paper, printing and binding for The Automobile Dealer and Repairer for a year is from $1.20 to $1.30. When we

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get a dollar for our publication for a year, we are losing between 20 and 30 cents on the bare cost of manufacturing it, to say nothing of rent and office expenses.

Many will say, "How can you afford to do it?" The answer is that the returns from advertising not only reimburse us for whatever losses there may be on subscriptions, but also give us a profit. Subscribers, therefore, to any journal, no matter which one, are under obligations to advertisers. But for them, subscription rates would be three or four times as much as they are now. There is a point, however, below which no publication can go and be published at any profit whatever.

One of our subscribers, in sending us a dollar recently for a year's subscription, wrote as follows: "I would not want to be without your magazine at double the price."

How many of our readers would be willing to pay double the price—$2.00 a year—for The Automobile Dealer and Repairer? How many would be willing to pay 50 per cent. or more—$1.50 a year? The increase of 50 cents would not make us quite whole on the new postage, but it would help considerably.

We wish our readers would consider this matter and write us about it. We would like to know their views. Is the reading-matter (to say nothing about the advertisements) contained in 12 issues worth to you $1.50 a year?

AUTOMOBILES IN ARGENTINA.

The Bureau of Foreign and Domestic Commerce of the Department of Commerce, Washington, D. C., Burwell S. Cutler, Chief of Bureau, has recently brought out a bulletin, "Miscellaneous Series No. 62," giving particulars with respect to the demand for motor vehicles in Argentina and the prospects for working up business in that country, not only on passenger cars, but motor trucks, farm tractors, accessories, etc. Any reader can obtain a copy of this document by sending five cents in coin to the Superintendent of Documents, Washington, D. C. Postage stamps will not be accepted for public documents by the Government.

FALSE ECONOMY.

Occasionally we receive a letter from a subscriber who has decided to stop his subscription because of the demands upon his purse from various sources, as a result of the war. He thinks he must economize.

Is it ever real economy to stop your subscription to such a valuable and practical magazine as The Automobile Dealer and Repairer? In almost any number information may be obtained really worth far more than the insignificant subscription price of a dollar.

We advise our readers to subscribe as liberally as they can to the Red Cross, the Y. M. C. A., and other associations formed for the alleviation of conditions growing out of the war; but not to cut out their favorite journals for economical reasons. That course would be, in every case, probably, false economy.

Canada raised its letter rate to three cents, but had the wisdom to let the second class postage alone; and is still carrying all its perodicals at a quarter of a cent a pound.

No Race Sanction During War.

There will be no sanctions granted for race meets during the period of the war. The contest board of the American Automobile Association met recently and made this decision. This means that racing is to be abandoned until after the war. One of the several reasons for the step is that the government is in need of expert mechanicians. There are over 1,200 drivers and mechanics registered with the A. A. A. The contest board adopted the following resolution:

"Whereas our country is in a state of war in which our entire available man power is needed for national activities; and

"Whereas the national need for skilled workmen in numbers greater than it is possible to furnish is urgent; and

"Whereas the national need for mechanics, automobile drivers and others skilled in the care and maintenance of motor apparatus, that is playing such a leading part in the war, is imperative; be it therefore

"Resolved, That it is the sense of the contest board of the American Automobile Association that it will not sanction automobile contests during the period of the war exigency and that during the aforesaid period the rules of the contest board shall be suspended."

President Voices Approval.

The decision of the American Automobile Association to discontinue racing until after the war has been commended by President Wilson, who thus voices his approval:

"I am very glad indeed to learn that it is the purpose of the American Automobile Association to stop automobile racing until after the close of the war. It is so destructive of materials and involves so great a consumption of gasoline that I think every man who cares for the proper fulfillment of our duties during the war and the necessary conservation of resources which the performance of those duties involves must applaud the action of the association in this matter. Faithfully yours,

(Signed) "WOODROW WILSON."

Convict Labor on Roads.

Missouri is to employ 500 convicts on road work. It is likely that the first road to be built by convict labor will be the Columbia-Jefferson City road, which will link the State university with the State capital. Arrangements for the construction of a permanent highway over this route have been under contemplation for several years, and the drafting of Missouri's quota caused a labor shortage which threatened to check road building indefinitely. Prison labor became the solution as a result of the abolition this year of prison contracts.

Form Minnesota Motor Reserve.

Minnesota motorists are organizing motor reserve corps to assist in the transportation of army and government officials within 300 towns and within reasonable radius of such towns. Hundreds of owners of passenger cars have offered their cars and services to the government. Secretary Baker has approved the plan. Similar organizations may be effected throughout the country, it is said.

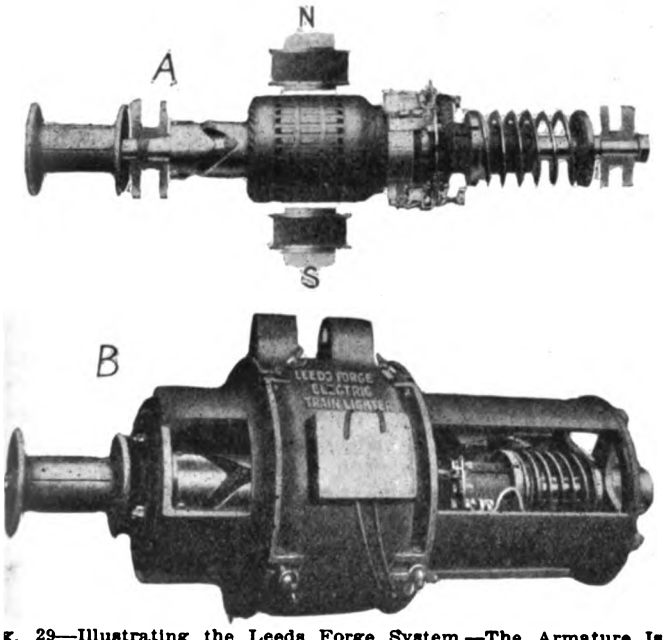
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Considering Various Methods of Charging the Storage Battery

Describing the Advantages and Disadvantages of Chemical and Mechanical Apparatus and How Pressures Are Best Controlled

BY SYDNEY F. WALKER, M. E.

There is one other method of accomplishing the result aimed at, reducing the magnetic pressure in the same proportion as the speed was increased, and that is by increasing the magnetic reluctance of the dynamo, this being accomplished by displacing the armature longitudinally in the polar space in which it revolves. It has been explained that the number of lines of force present in the armature core, and in the space in which the armature cores revolve, depends directly upon the resultant magnetic pressure, and inversely upon the magnetic reluctance of the magnetic circuit. It was also pointed out that the magnetic reluctance depends directly upon the length of the path the lines of force have to traverse, and inversely upon the sectional area of that path, also that the magnetic reluctance of air is enor-



g. 29—Illustrating the Leeds Forge System.—The Armature Is Displaced Longitudinally to Neutralize Increase in Speed.

ously greater than that of iron, and that that was ie reason why the pole pieces of the field magnets 're made in crescent form so that they can embrace ie armature as fully as possible.

It will be obvious that if the sectional area of the r spaces between the pole pieces and the armare core is reduced by forcing the armature out of s position, the magnetic reluctance will be ineased and the equivalent will be obtained, if the lculations are correct, of the reduction of the magtic pressure by the creation of secondary and teary magnetic pressures as described above. Fig. , A and B, show the arrangement diagramatically. ie writer is not aware of its having been introced yet for dynamos employed in motor car lightg, although it is used in one form of engine starter, but in the opposite way; that is, the armature is pulled into position and a pinion on its axle is pulled into mesh with teeth on the fly wheel of the car engine.

Principle Involved.

The principle is the same, although it is applied in the opposite sense. The method has been employed by a large firm in the United Kingdom in train lighting by electricity and the writer believes has been adopted by several railway companies. In the arrangement the armature is mounted on a sleeve, which runs on the axle, instead of directly upon the axle itself. Power is delivered from the axle to the armature sleeve by the pin shown in the drawing. It will be noticed that the pin is free to move in a V-shaped slot, and when the armature is running the pin tends to ride along the slot, and to force the armature out of its position longitudinally. A regulating spring on the other end of the armature axle keeps the armature in place when at rest, and until the speed rises above a certain figure. It is claimed that no action takes place except when the speed has risen to a figure such that the pressure furnished by the dynamo would be above that required to charge the battery.

Using Batteries Only.

There is one other method of dealing with this problem and that is by having the batteries of sufficient size for all the requirements of lighting and starting, and of such size that they will hold their charge for the day's run and charging them when the motor car is in the garage. The writer favors this method very strongly, as he believes that it would lead to simplification of the arrangements on the car. It has already been established by American as well as British practice that it is best for the motor to be a separate machine from the generator. If the plan suggested is adopted, that is, a battery of batteries sufficient for all the work that electric currents have to perform is carried on the car, the whole thing will be simplified very considerably. The switchboard would be much simpler if the battery was of sufficient size, and there would be little necessity for the driver to give any attention to the electrical portion of the apparatus except to switch lights or horns on and off and to switch the starting motor on. If this plan is adopted care must be taken that the battery is large enough. A good deal of the trouble with batteries in the past has been due, in the writer's opinion, to the cells being too small.

Cause and Effect.

Automobile engineers and mechanical engineers generally fully understand what happens when an engine is put to do more than the work for which it is designed. If it is very well made it will try to do the work, but usually some of the parts will be

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strained and a breakdown occurs later on. Similarly, if a battery has a larger current demanded from it than it has been designed to supply, it will furnish the current but with disastrous results to the battery. The Edison battery is claimed to have many advantages over the lead type, inasmuch as the same

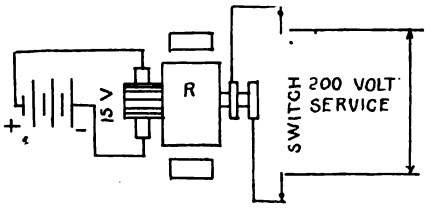


Fig. 30—Showing How Charging May Be Performed with a Rotary Converter.

care is not required to prevent overcharging nor to prevent its being run down.

As with the lead battery, it is recommended that the Edison cell be not allowed to fall below a pressure of 0.9 volts per cell, but it is claimed that nothing serious will happen if the pressure the cell furnishes goes right down to zero and is left there for a considerable time. All that is necessary is a little care in charging up again. As has been pointed out, if the lead cell is allowed to fall much below a pressure of 1.8 volts per cell trouble always follows, and the longer the low pressure is allowed to remain the greater will be the trouble. The Edison battery has a very distinct advantage in its greater mechanical strength but against that is the necessity for maintaining effective insulation between the active plates and the containing vessel.

The writer understands that no difficulty has been found in accomplishing this so that the Edison battery should be a distinct improvement. The Edison has also the advantage over the lead battery in that it welcomes a boosting charge whenever it can be applied. With motor cars touring the country it may often be possible to "boost up" the battery during lunch. The writer looks forward to the time when every hotel, in addition to providing garage accommodation, will also provide a supply of current for charging the batteries of motor cars. In America the engineers of electricity generating stations are very much alive to the advantage of supplying charging current for batteries. They have learned the lesson which our engineers are slow to learn, and that is that every unit of current that can be sold makes good business and that there are long periods in every day when batteries could be charged.

Charging in the Garage.

The question arises as to whether it is economical to charge batteries in the garage or at generating stations in place of charging them from the dynamo carried on the car. The principal reason for suggesting that the battery should be charged in the garage, or in any other manner convenient from sources of current outside of the car, is to simplify the electrical arrangements on the car. The arrangement of a battery supplying current to lamps, ignition apparatus, horns and starting motor, is exceedingly simple. But immediately a generator is added to the apparatus, although it renders the car independent of outside sources of current, it enormously increases the complication. It obliges at any rate the automatic switch to be added, and up to the present it has been the practice to provide one or other of the apparatus described for maintaining the pressure furnished by the dynamo at the required figure.

Is Wasteful of Current.

The point that will be raised against charging batteries by outside sources of current is that a certain amount of waste is inevitable, but under the very best conditions obtainable with a dynamo carried on the car the efficiency must be very low. That means waste that may easily be equal to or greater than the waste inevitable when charging from an outside source of current. The efficiency of the small dynamo employed on motor cars can hardly be greater than 70 per cent. at the best, while the compensating arrangements described will nearly always reduce the efficiency to 50 per cent. or less, that is to say, the cost of charging the battery in fuel will be twice that represented by the actual current furnished.

The arrangements for charging batteries in the garage or in generating stations depend upon the current supplied. If it is continuous current at 200 volts or thereabouts, two courses are open. The pressure of the current may be reduced by the insertion of a certain number of incandescent lamps arranged in parallel, as shown in Fig. 31A, to obtain the pressure required by the battery. This is a very wasteful method. The waste was not of much consequence where the batteries to be charged were the small cells used for ignition but it would be quite serious with the cells that it would be necessary to carry if the suggestion made above were carried out.

It would be wasteful in two ways. First, the current passing through the lamps would be wasted unless it could be so arranged that they were employed to light some portion of the establishment while the charging was going on. This might be possible where charging took place regularly every night.

An Economical Method.

A better method, one that would probably be more economical than running lamps in series with

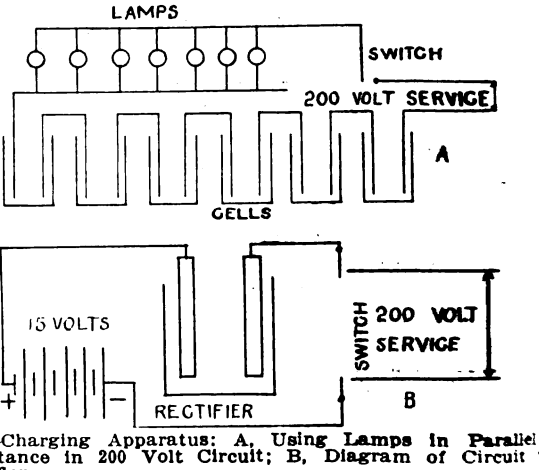


Fig. 31—Charging Apparatus: A, Using Lamps in Parallel as Resistance in 200 Volt Circuit; B, Diagram of Circuit with Rectifier.

the battery, would be to fix a small motor generator to reduce the pressure from that of the supply to that required by the battery. This arrangement is shown in Fig. 32A. The motor-generator consists, in the case of continuous current service, of two con-

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tinuous current machines, as shown in the diagram; one running as a motor and taking current from the supply service at the 200 volts or thereabouts, and driving the other as a generator, the second machine furnishing the current required by the battery at the pressure required.

The axles of the armatures of the two machines would be coupled together, and it would be possible to vary the pressure furnished by the generator, if required, by a variable resistance in the field magnet circuit. Machines have been made that will perform the conversion in one machine as shown in Fig. 32B. In these machines there is only one set of electro magnets and one armature, but the armature has two commutators, one at each end and two windings. A fine wire winding to take the current at the higher pressures from the supply service and a comparatively thick wire winding to generate the larger current at the lower pressure. Either machine will answer the purpose and in the writer's opinion the waste would not be greater than that incurred by the small dynamo on the car.

Methods of Charging.

Where the supply is alternating current, there are again two methods. A rectifier which is at the same time a pressure absorber may be placed in the circuit, as shown in Fig. 31B. The rectifier is a special form of galvanic cell in which usually aluminum is employed. It has the property of stopping the negative currents by building up an oxide and allowing the positive current to pass through. The efficiency of the apparatus is necessarily low and it has the disadvantage of being another chemical apparatus to look after. By the other method, either a motor-generator or a converter may be employed, to convert the alternating currents to continuous currents.

The motor-generator is very similar to that described for use with continuous currents, but the motor is made to work with alternating instead of continuous currents. The converter is an apparatus that is a good deal employed in the distribution of electric currents from generating stations. It is an adaptation of the machine described above in which the conversion of continuous high pressure to low pressure was accomplished in one machine. In the alternator current converter the current is converted from alternating to continuous, and the pressure is lowered, if required, by the same operation. The machine is constructed like a continuous current machine and has an armature wound as a continuous current armature and a commutator similar to continuous current machines. If driven by any source of power it will furnish continuous currents which may be taken from the brushes in the usual way.

How Armature Is Wound.

The windings of the armature are tapped at certain points, the tappings being connected to copper rings carried on the axle on the opposite side of the armature to the commutator. The copper rings, which are known as slip rings, are insulated from the axle and from each other and carbon brushes bearing against them delivering currents to them or take currents from them. When the converter has continuous currents delivered to its commutator it runs as a motor and delivers alternating currents to the brushes bearing on the slip rings at a pressure which bears a fixed proportion to the pressure of the current delivered to the commutator. When alternating currents are delivered to the slip rings the armature runs as a motor, the field magnets receiving currents from the brushes just as if the machine was running as a generator, and currents are generated and delivered to the brushes bearing on the commutator in a fixed proportion to the pressures delivered to the slip rings. There is always a fixed ratio between the pressure on the alternating side and those on the continuous current side, and so no lowering of pressure is practicable by the machine itself. The pressure is lowered to the figure required to produce the necessary continuous current pressures by the aid of static transformers.

The Static Transformer.

The static transformer is another apparatus that is largely used in the distribution of electric currents for light and power. It is practically an induction coil in which the proportion between the primary and secondary wires is the same as that between the two pressures, that of the supply service

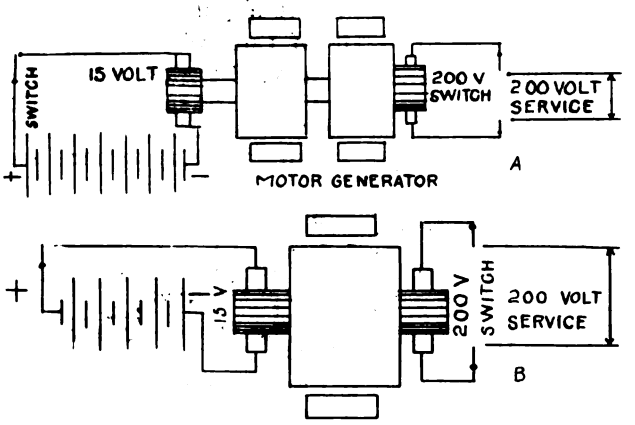


Fig. 32—Charging Storage Batteries: A, Using Motor Generator to Reduce Pressure; B, Using Dynamo Having Two Armatures and Two Sets of Coils.

and that of the lamp, or in this case the battery service. With a supply service of say 200 volts, and a continuous current charging pressure required of 15 volts, the pressure of the supply service would be reduced to a little over 20 volts on the alternating side of the converter by a static transformer in which the ratio between the number of turns of the primary and secondary wire would be about 10 to 1.

Fuel Supply Is Limited.

Automobiling is growing in favor with the Seville, Spain, people, and country races, speed trials, and hill-climbing contests were recently held with considerable enthusiasm. At present automobile owners are having much difficulty in securing gasoline, owing to a serious shortage of that commodity in Seville, and the matter has been taken in charge by the automobile society of the city, which is allowing only 2 liters, or a little over half a gallon, of gasoline a day to each of its members except in cases of emergency.

Oil and the Commutator.

Keep the commutator or timer clean and renew the supply of oil with a clean, thin lubricant in cold weather. Dirty oil, particularly when foreign elements are present, such as metal dust for example, set up a considerable resistance to the passage of the current.

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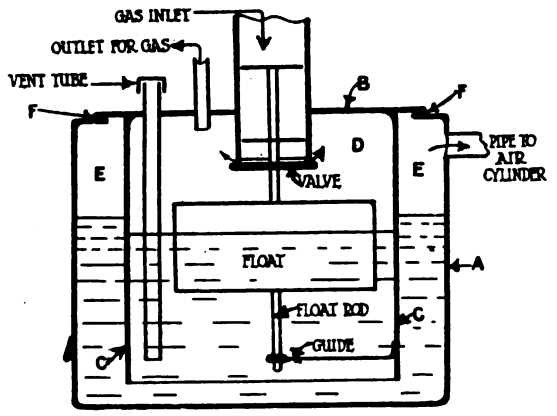
CONTROLLING GARAGE HEAT.

An Automatic Device Said to Compensate for Variable Temperatures.

"Last winter I fitted a gas-heated garage boiler but my gas bill was rather higher than I had expected. Putting on my thinking cap I reasoned that what was really needed was some means of turning down the gas when the thermometer was well above 32° Fahr., and of automatically turning the gas flame up when there was the slightest sign of Jack Frost paying a visit," says a writer in The Autocar. "After a lot of experimenting I hit on the plan described below; it works very well—in fact better than I expected—and can be made very cheaply by any one able to use a few tools. I may say I have adopted the Argand type of burner, as the Bunsen type is so liable to blow back. The general idea is shown in the diagram, which is not to scale, as sizes could be varied considerably without affecting the principle and working of the apparatus.

Principle of Control.

"An outer tank A has a lid B which can be made gastight at the joint F. I used for my experimental model a syrup tin. The gas inlet tube soldered to the lid B has its lower end faced up square so as



An Automatic Gas Control Device Reducing the Volume of Gas Passing to the Heater as the Atmospheric Temperature Rises.

to form a seating for the valve, but has one or two notches cut so as to provide a leakage supply of gas even when the valve is closed. The leak supply is just enough to keep the gas burner from going out altogether.

"The leather-faced type of valve is not necessary, as the valve is intended to be leaky. It merely consists of a brass disc soldered to a spindle which has also a dual guide consisting of perforated discs in the tube at the top and a guide at the bottom end. The spindle or float rod also carries a float fixed to it. I used a carburetor float from an out-of-date pattern carburetor which may be readily obtained for a few cents from any motor junk dealer, but could easily be made from tin or zinc. The lid B also has soldered to it the inner casing C, which is open at the bottom, so that when in position there is a gas space D in the inner chamber and an air space E in the outer chamber.

How Device Operates.

"From the outer chamber E an air pipe is led to an air cylinder, which is preferably placed outside the garage so as to be exposed to the outer air, and therefore more readily affected by climatic temperature variations. The gas burner is connected to the outlet pipe, and by means of the vent tube the apparatus is filled with very light engine oil. The gas may now be turned on and then more oil added until the float rises and just closes the valve. If now the temperature falls, the air in the air cylinder will be reduced in volume; that is, contract, and therefore the oil level in E will rise and the level in D naturally fall, thus opening the gas valve and so increasing the height of the burner flame. The diagram shows this condition of affairs; that is, temperature near freezing point. When the outside temperature increases the reverse action will take place; the air in the air cylinder will expand, force down the level of the oil in E, raise the oil level and the float in D, and thus close the valve and reduce the quantity of gas passing to the burner.

Economical of Gas.

"The volume of the air cylinder should be at least fifty times the volume of air space E, and this air space should be at least equal to the volume of D. I use a five-gallon oil drum for my air cylinder; it must be quite airtight, of course, and the same applies to the pipe leading to it. The apparatus works exceedingly well, and can be readily adjusted to cut down the gas at any required temperature. The saving in gas is obvious. I cannot imagine any other system of garage heating being more economical, and there is really nothing to get out of order."

Harsh and Slipping Clutches.

Various remedies are suggested for harsh acting leather-faced cone clutches, but as a rule the relief is temporary. A more efficient repair is to insert a number of old hacksaw blades or similar strips of material under the leather at points diametrically opposite to one another.

To do this, the clutch cone should be removed or the clutch fully disengaged. Raise the rear edge of the leather with the blade of a screwdriver, so that a thin strip of metal may be driven underneath the leather. The insertion should extend from one side of the cone to the other. Rotate the clutch and insert a strip exactly opposite. Then place two intermediate pieces at equal distances from the first, and so on, using six or more. The strips must be opposite each other or the balance of the clutch will be disturbed.

The metal strips raise the leather slightly at six points, and these parts must be compressed before the grip of the entire clutch surface is obtained, and the engagement is gradual. The same method may be utilized to cure a slipping clutch due to the leather becoming hard, but the remedy will be temporary. If the action of the clutch is harsh after fitting a new leather, treat it with neatsfoot or castor oil, and if this fails to obtain the desired results sprinkle the leather lightly with powdered graphite, which will obtain a polished surface.

According to official and semi-official figures, the Italian motor industry produced, in 1916, 21,100 motor vehicles of all kinds and employed about 26,000 workpeople. The Fiat heads the list with 15,000 cars and 20,000 employees. This company claims to have supplied a greater number of motor vehicles to different allied armies than any other factory in the world, the number delivered up to the end of last year being 68,000.

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This department is maintained for the protection of our readers—especially our reckless readers, if we have any.
The object is to encourage every operator of a motor vehicle to be careful and avoid accidents, especially the inexcusable accident of a collision at a railway crossing.

The number of inexcusable accidents, those resulting from the brakes not acting or holding properly and from collisions with railroad trains, is increasing. Despite the warnings issued by the railroads, motorists continue to attempt to cross tracks without exercising proper caution. Fully 75 per cent of the fatalities of the past month were caused by carelessness. There is an increasing number of accidents due to the brakes not working, at least the brakes are blamed for the accident. There is no excuse for the brakes not operating as they should. The motorist has warning as to when the efficiency of the brakes decreases, but if one persists in putting off their repair until tomorrow he invites trouble. With the average car equipped with two sets of brakes there is no reason why one should not work, should not hold the machine on a steep grade and check or stop its movement within a reasonable distance. It is to instil the habit of caution that the Lessons for Drivers are published.

Brakes Failed to Hold.—A woman, the owner of an expensive car, was killed in Maryland recently when the engine stalled on a steep hill. The chauffeur applied the brakes, but they failed to hold the car, which ran backwards and overturned.

Clutch Not Disengaged.—Failure to disengage the clutch and to place the gearshift lever in neutral, caused the death of an owner near Boonville, N. Y. The motorist started to crank his engine without noting if the gearset was in a neutral position. The engine started and the car pinned the owner against a telephone pole.

Light Failed.—The combination of faulty lights and brakes caused the death of two persons just outside of Denver, Colo., recently. The party was returning from a trip when the lights went out on a steep grade. The brakes failed to hold the car, which ran off the road and plunged 40 feet to the bottom of the grade.

Killed by Train.—Neglecting to observe the signs of the railroad to "Stop, look and listen" was responsible for the death of two persons at Carthage, O. The tracks were partly obscured by a long sign, but had the driver observed due caution the accident would have been avoided.

Brakes Cause Skidding.—The too sudden and harsh use of brakes caused the death of a state official's wife near Wilmington, Del. The accident took place in a storm and was primarily caused by the sudden appearance of a team. The driver of the motor car applied the brakes too vigorously, causing the machine to skid and turn turtle.

Cigarette Causes Fatality.—The death of a motorist and his friend near Vincennes, Ind., is blamed to the cigarette. It is stated that the driver tried to light a cigarette, as he was in the habit of doing when driving, and the car swerved off the road, striking a rock. The machine turned turtle, instantly killing both men.

Fatal Race With Train.—An accident resulting in the death of two persons and said to be the result of trying to race a train to a crossing took place outside of Milwaukee, Wis. The automobile was totally demolished.

Brakes Failed to Hold.—While working about his machine near Lancaster, Pa., an aged man was killed when the brakes released and the car rolled backward down an incline, crushing the owner against a wall.

Causes Broken Leg.—Failure of the driver to note if the gears were in neutral and brakes set resulted in a broken leg for the chauffeur, who cranked his machine on a ferryboat as it was nearing a landing in New York harbor. The car plunged through the gates into the river.

Skidding Fatal.—The skidding of a car on a bridge just outside of Portsmouth, N. H., resulted in the death of one passenger recently, the machine crashing into a telegraph pole.

Hat Causes Fatality.—The loss of a hat by a passenger of a touring car led the driver to apply the brakes too harshly and as a result it turned turtle, killing one and injuring four. The driver was a woman and the accident occurred just outside of Theresa, N. Y.

Brakes Failed to Hold.—Failure of the brakes to hold a loaded truck on a grade near Fort Lee, N. J., cost the driver his life and probably fatally injured the helper. The machine ran off the road and dropped 40 feet.

Racing Injures Three.—Crowded off the road by two cars which were being raced by their drivers, near York, Pa., a machine driven by a third party ran over a bank and upset. Three were seriously injured.

Another Accident Due to Hat.—Turning his head to see where his hat had been blown cost the driver of a machine his life near New Rochelle, N. Y., recently. The machine left the road and crashed into a tree.

Response to Appeal Is Gratifying.

The response to the appeal for skilled automobile mechanics for service with the repair and maintenance division of the Signal Corps is very gratifying. Many men have left good positions, and a large number of chauffeurs have responded to the call.

Relative to the continued need for more such men the Committee on Public Information says:

"Thousands of chauffeurs and mechanicians are needed to support the American airmen behind the lines in France. The supply of skilled men of this sort is limited and every man with the proper qualifications will be given an opportunity to fill an immediate and valuable place in the great air army. Chauffeurs are needed, not so much to drive cars, but to do all the important mechanical work in connection with airplane engines, for which their training and experience especially fit them."

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Recent Legal Decisions of Interest

A limited agency contract for the sale of automobiles provided that the principal would not be bound by requisitions, but would do its best to fill them. The agent made a requisition for six cars, which the principal refused to ship. The requisition stated that it was "under our limited agency contract." The South Dakota Supreme Court holds, Kilker vs. Ford Motor Co., 164 N. W. 57, that the failure of the principal to ship the automobiles did not render it liable to the agent. It is within the power of the principal and the limited agent, when contracting, to insert into the contract a stipulation relieving the principal from liability for failure to honor requisitions of the agent.

Lease or Conditional Sale of Automobile.

An agreement with an automobile dealer provided that the dealer thereby leased an automobile for one and one-half years; that it should remain the property of the lessor; that the lessee should pay for its use $25 a month until $317.70, with interest on that sum, should have been paid; that when that sum had been paid in full the lessee might use it free of charge for the remainder of the term; that on failure to make such payments it should be lawful for the lessor to take possession, and the payments should be forfeited; that if the lessee should desire to buy the car during the term, all money paid as rent should be applied toward the purchase, and the price should be $317.70 with interest; and that until the lessee should avail himself of such option and pay such amount in full, the ownership of the automobile should remain vested in the lessor. The Massachusetts Supreme Judicial Court holds, Hurnanen v. Nicksa, 117 N. E. 325, that the agreement, though in the form of a lease, constituted a conditional sale. Under the Massachusetts statute providing for the registration of automobiles by the "owner" thereof, the registration of an automobile, sold conditionally with a reservation of title until paid for, in the name of the buyer, was held not invalid, so as to impose liability for injuries sustained in a collision with the automobile, as in the case of an unregistered automobile.

Storage Contract—Sale of Garage Business.

In an action for damages to the plaintiff's automobile it appeared that the defendant contracted to store the car in his garage and render incidental services. He subsequently sold his business. The Michigan Supreme Court holds, Banks v. Strong, 164 N. W. 398, that the contract continued until the plaintiff consented to change it or until he had notice that the defendant would no longer undertake to perform it. A mere sale of the defendant's business did not relieve him from performance of the contract where the plaintiff had no notice thereof, and hence, notwithstanding such sale, he was liable for damage sustained by the car while it was being taken from the plaintiff's residence to the garage by a garage employee.

Driver's Duty in Passing Wagon.

An automobile was turning to the left to pass a wagon on the tail of which was seated a six-year-old boy. When the automobile was within a few feet of the wagon the boy jumped down and ran in such a direction that a fender of the car struck him, though the driver applied his brakes an instant before striking the boy. The Iowa Supreme Court holds, Bishard v. Englebeck, 164 N. W. 203, that the driver was not bound to anticipate or know the intentions of the boy, and was not negligent in failing to give a signal of his approach and of his intention to pass the wagon.

Torts of Servant—Scope of Employment.

The South Carolina Supreme Court holds, Knight v. Laurens Motor Car Co., South Carolina Supreme Court, 93 S. E. 869, that where a defendant motor company's mechanic, who sometimes operated cars for transportation of passengers, took the defendant's car at night for a joy ride, the motor company was not liable for the mechanic's torts while on such trip. And retaining the mechanic in its employ after knowledge of his tort would not constitute ratification, binding the employer.

Damages for Injuries Caused by Street Excavation.

A physician, returning home in his automobile at night, drove into an excavation which had been made in the street for the laying of a gas pipe, because of the want of a red light, resulting in injury to himself and his car, for which he sued the construction company and the city. He testified that he was driving between 10 and 15 miles an hour, saw a white light on the sand pile, and drove around it according to regulation. The defendants contended that the plaintiff was guilty of contributory negligence on his own evidence that he was driving over 10 miles an hour in violation of a city ordinance. It was held that it did not follow that the unlawful speed was the cause of the injury. The plaintiff's negligent speed would not bar recovery unless it was the proximate cause of the injury. Judgment for the plaintiff was affirmed. Hardy v. West Coast Const. Co., North Carolina Supreme Court, 93 S. E. 841.

Liability for Acts of Daughter Driving Car.

The Virginia Supreme Court of Appeals holds, Blair v. Broadwater, 93 S. E. 632, that the liability of a father for injuries caused by an automobile owned by him, while being operated by his daughter, cannot be based on the mere relationship of parent and child, but must be based on the relation of master and servant; and a daughter is not using an automobile in her father's business, so as to create the relation of master and servant, merely because the automobile was purchased for the use and pleasure of the family, and is being used by her for the precise purpose for which it was purchased.

Rights of Mortgagor of Automobile.

Although a mortgage on an automobile is past due and unpaid, the mortgagor has such property rights in the car as entitles him to maintain an action for injury to it.—Martin v. Seaboard Air Line Ry. Co., South Carolina Supreme Court, 93 S. E. 336.

According to H. L. Brownell, manager of the Detroit, Mich., Safety League, Detroit occupies first place in the matter of accidents. Street car accidents have increased 100 per cent. and automobile injuries 185 per cent.

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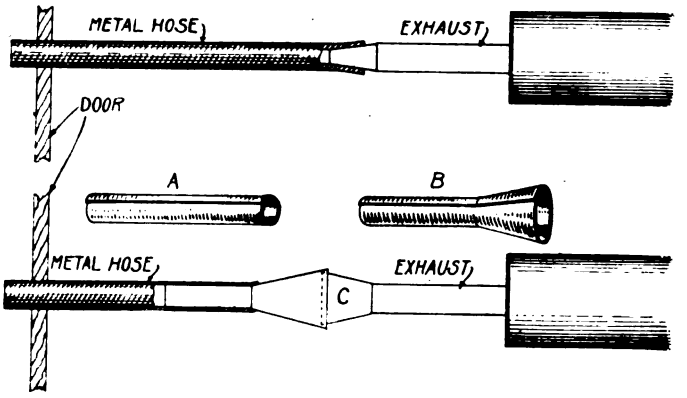
THE DEADLY EXHAUST GASES.

How Carbon Monoxide Can Be Avoided in the Garage and Heat Conserved.

The occurrence of a number of accidents, some of them fatal, whereby people have been overcome through breathing air that has been vitiated by the exhaust gases from internal combustion engines discloses a hazard that is more serious than it is generally conceded to be. The Automobile Dealer and Repairer pointed out this danger in the December number and is again calling the attention of its readers to the particularly hazardous practice of operating an engine with the doors and windows of the garage closed.

Is Odorless and Colorless.

For the benefit of the new subscriber it is explained that carbon monoxide is a colorless, odorless and tasteless gas. It is extremely poisonous because it combines with the red coloring matter of the blood more readily than oxygen does and blood that is saturated with it cannot take up oxygen. Exposure to an atmosphere containing 20 per cent. would doubtless cause a man at rest to collapse within an hour and exposure to as little as five per cent. causes headache in several hours' time. The dangerous



Suggestion for Conveying Exhaust With Its Deadly Monoxide from the Garage.

symptoms come almost without warning and collapse in a garage would prove fatal unless outside aid arrived very soon, because the operating engine would continue to generate carbon monoxide and continue to make the air more poisonous.

Where It Exists.

Experiments show that there is a slightly higher per cent. of carbon monoxide nearer the floor than six feet above it. Dangerous amounts of the poison will be found present in the farthermost part of the garage and after the engine had been run a few minutes. The tests further proved that it is highly dangerous near the car.

It has been suggested that the windows and doors be left open. While this might avoid to a certain extent the possibility of a sufficient quantity of monoxide gathering to be fatal, it means a cold garage. And it is the conservation of the heat that has proven fatal in cases of monoxide poisoning.

Avoiding the Danger.

The only practical method, if the engine must be run in the garage, is to devise some method of getting rid of the dangerous exhaust. An accompanying illustration suggests a method that can be utilized in the small or private garage where economy of heat is practiced. The method consists of conveying the exhaust gases from the muffler pipe or outlet by means of flexible metal hose to the outer air.

With those types of exhaust pipes having a taper the flexible metal tube can be slipped over them, provided the inside diameter of the tube is slightly larger than the diameter of the pipe. The flexible metal tube can be led through the door, side of building or other convenient way. With fan-shaped exhaust pipe the suggestion at B will be practical. It consists of rolling a piece of heavy tin as shown at A and to a diameter sufficient to make a snug fit in the flexible pipe. The tube should be made at least eight inches long to permit of so anchoring it in the piping that the possibility of leakage will be avoided. If necessary the tin tube can be soldered to the flexible member.

Preventing Leakage.

Where the exhaust pipe is flared as shown at C, the tube should be compressed as indicated at B, and it should be bent to conform as nearly as possible to the shape of the exhaust member. To prevent leakage of the gases, which have more or less pressure, the end of the exhaust can be wrapped with asbestos or asbestos fitted to the part A.

Ordinary rubber hose cannot be utilized nor can friction tape be employed to seal any leaks in the exhaust line of the device owing to the heat given off by the exhaust gases. While a slight back pressure may result from the use of the flexible pipe for getting rid of the carbon monoxide, it should not be sufficient to interfere with the operation of the engine. Not only will the arrangement permit of working in the garage and around a running engine with safety, but additional heat will be provided from the flexible tube. The flexible tube can be secured of various diameters at any supply house or direct from the makers.

The Modern Gasoline Automobile.

The 1918 edition of the Modern Gasoline Automobile, by Victor Page, M. E., and dealing with its design, construction, operation and maintenance, has made its appearance. The new edition is much larger than its predecessor, considerable new material having been added, to say nothing of illustrations. A feature that should appeal to the laymen is the clearness with which the author presents his subjects. Much of the new material deals with tractors, plows, etc., bringing the contents of the book thoroughly up to date. The book is published by the Norman Henley Publishing Company, New York City, and lists at $3.00.

Increased Use of Cars.

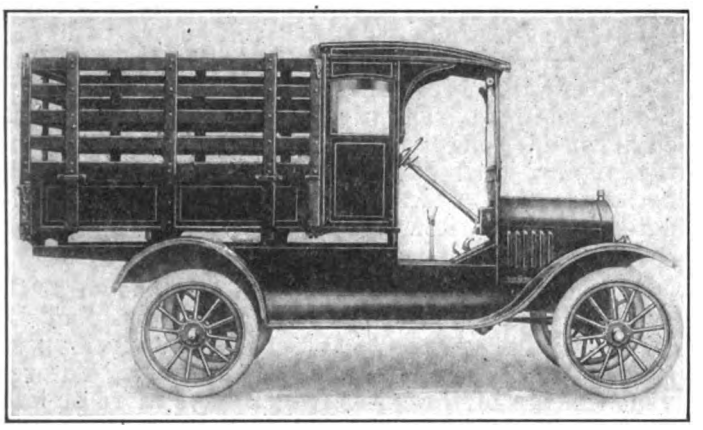
An addition is being made to the motor car house near the Balboa station of the Panama Railroad to add four bays for automobiles under repair, including two new pits, and to extend the workroom. The original two-story building was designed for railway motor cars only; in July, 1916, a one-story extension was made, to contain five bays and repair benches for highway motors, and the new addition will make nine bays. There are four repair pits, 17 feet long, and one of extra length, 27 feet. The addition is necessary to keep pace with the increased use of automobiles in the government service.

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NEW PARRY BODY.

Is a Convertible Farm and Stock Body and Adapted to Ford Chassis.

The Parry Mfg. Co., Indianapolis, Ind., well-known makers of motor vehicle bodies, has brought out a new design for the Ford chassis. The new type is termed the convertible farm and stock body, and



Illustrating the New Parry Convertible Farm and Stock Body.

as shown by the accompanying illustration, can be utilized for a large number of purposes.

The design combines the advantages of both the platform and express types of bodies and has a loading space of 70 inches long and 60 wide back of the driver's cab. The sides have 12-inch panels and chain end gate. The floor is constructed of grain proof material and is provided with iron strips. The removable stock racks are equipped with a rod both front and rear and hold the racks securely.

Protection for the driver is afforded by a cab having straight sides. The lower panel is of metal and a glass window is provided one either side. The Parry convertible farm and stock body comes with or without racks, weighs 500 pounds uncrated and is richly painted. The design will more nearly care for every hauling requirement than any other style of body. A similar design is being worked out for service on the Ford one-ton truck.

Trucks Supply Army's Meat.

Motor trucks continue to play an important part in the war. The French army, which consumes vast quantities of meat, is supplied by truck divisions each supplying 20,000 men. Each machine transports approximately 4,000 pounds of meat, and seven machines have averaged 218 tons of fresh meat the month or about one ton per day. Many of the cars are rebuilt Paris motor buses.

Scotch Building Trucks.

As an indication of the reduced imports of motor cars, only 234 complete cars and chassis were landed in Great Britain in November, 1916, as compared with 2,079 in the corresponding month of 1916; but the value of each machine imported in 1916 averaged $4,866, against $2,263 in 1915.

In Scotland the manufacturers are turning out commercial cars exclusively. It is expected that with improved facilities, new methods and larger factories many firms will be in a position to compete after the war in markets previously beyond their scope.

The Arrol-Johnson works have been engaged in government work; the Halley Industrial Motor Co. is producing motor trucks; and the Albion Motor Works have been making motors and accessories for the government, large extensions having been effected at their works.

Kerosene-Burning Tractor.

A concern in Ohio is to market a new type of two-wheeled tractor with a kerosene-burning engine of 35-horsepower and having a starter. The engine will be geared 93 to 1. A production of 2,000 machines is planned.

Priority for Tractors.

Tractors and other farm machinery is to have priority in transportation second only to war supplies, according to a recent ruling of the War Industries Board.

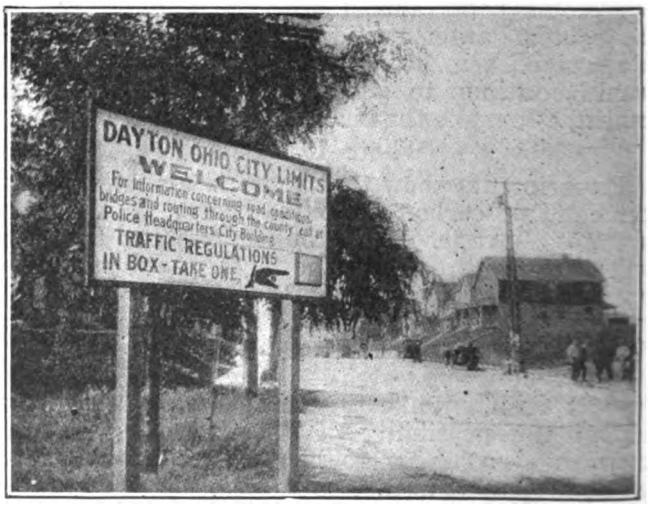
Novel Use of Signboard.

BY FELIX J. KOCH.

Farmers and those living at or in the vicinity of crossroads are frequently annoyed, and at all times, by travellers seeking information as to the roads. The use of a signboard does not always remedy the trouble, for generally the boards give but directions. Such information is not always that which the autoists, etc., desire.

The following suggestions are worthy of attention and are derived from a signboard in service on the outskirts of bustling little Dayton in south Ohio.

The farmer may erect an inexpensive guidepost, painting it white, to be most visible at night. To the post he can attach some old metal can, anything with a waterproof lid. Over that mount a placard: "Help yourself to road-directions inside." Then, next time in town, for perhaps a dollar, one can have some printer strike off several hundreds of the



Illustrating Novel Use of Signboard in Outskirts of Dayton, O.

cheapest leaflets, giving all information as to either road.

On the back of the leaflet might be put the farmer's advertisements, his price for varied products, bringing business.

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New Cars and Accessories to be Revealed at the Chicago Show

The next great event in automobile circles will be the Chicago automobile show, which occurs January 26 to February 2, and there is every reason to believe that this national show will keep pace with the New York event, if not excel it.

In many respects the Chicago show is held to be more important than the New York event. Geographically, Chicago is more of a national center than New York, as it is now more of a center of sales for both motor vehicles and accessories.

The exposition, which will be managed by Samuel A. Miles, of the National Automobile Chamber of Commerce, has always exceeded all predictions as to business transacted and attendance, and the 1918 event will be conducted on that same liberal and wide-awake scale which has made Chicago famous.

The Chicago show enjoys an enviable reputation among manufacturers, as it attracts a much greater number of dealers and other trade men than does New York. Another feature of the Chicago event will be the first public display of the products of a number of car makers and manufacturers of accessories and equipment.

Every bit of space has been contracted for and both the Coliseum and the First Regiment Armory will be taxed to care for the large number of exhibits. This will be the last show to be conducted under the present conditions, as plans are being consummated whereby the available space will be greatly increased.

Country Needs Engineers.

The Army and Navy staff departments continue to demand men of engineering experience, especially in industrial lines. At present the outlook is that this demand will continue throughout the period of the war.

In calling attention to this, the United States Public Service Reserve, Washington, D. C. (where records of men willing to serve when called will be kept on file), points out that a man of engineering experience has a rare combination of opportunities open to him, which are not open to the average patriotic American, as follows: 1. To serve the country in his most effective capacity. 2. To keep in touch with his own profession, with the result that his patriotic service will not have caused him to become rusty by the time peace returns. 3. To become a commissioned officer and receive much better pay than the average man who has wholly subordinated personal interests and now works for the national good. 4. To perform his service usually without leaving the United States.

Electrically Heated Gloves.

Owners of cars equipped with electric lighting might profit by the experience of the Fiat testers and obtain a heating arrangement at practically no cost. These men are called upon to test cars at extremes of temperature, and as test chassis cannot be fitted with windshields, the problem of keeping warm on Alpine roads is one of no small order.

The Fiat testers are now supplied with electrically heated gloves, obtaining current from the lighting system on the car. The gloves have resistance wires set in the back, between two layers of thin sheet asbestos. Connection is made to the electric light terminals at the most convenient points, and the fine flexible wires attached to the wrist of the gloves by pressure buttons.

The wires are of sufficient length and are sufficiently flexible not to interfere in any way with driving, and the current passing through the resistance keeps the hands at a warm temperature on the coldest days. If it is necessary to leave the wheel, the wires can be disconnected from the gloves merely by a pull on the push button connections.

While the Fiat drivers use this system of heating for the hands only, there is no reason why it should not be applied to the waistcoat and boots; indeed, in the aviation service of some of the Allied forces electric heating for all the clothing has already been adopted. Most motorists, probably, would be satisfied with heated gloves only, and by the method described can obtain these readily and cheaply.

COMING EVENTS.

Milwaukee, Wis., January 18-24.—Show, Milwaukee Auto Trades, Inc.

Detroit, Mich., January 19-26.—Show, Detroit Automobile Dealers' Association.

Montreal, Can., January 19-26.—National Motor Show of Eastern Canada, Montreal Automobile Trade Association.

Cleveland, O., January 19-27.—Show, Automobile Show Co.

York, Pa., January 21-26.—Automobile Show, the York Auto Dealers' Association.

Scranton, Pa., January 21-26.—Show, Scranton Motor Trades Association.

Portland, Ore., January 21-26.—Show, Motor Car Dealers' Association.

Mifflintown, Pa., January 22-26.—Show, Automobile Trades Association.

Allentown, Pa., January 23-28.—Show, Lehigh Auto Trades Association.

Harrisburg, Pa., January 26-February 2.—Show, Capital City Motor Dealers' Association.

Chicago, Ill., January 26-February 2.—National Automobile Show, National Automobile Chamber of Commerce and Motor & Accessory Manufacturers.

Minneapolis, Minn., February 2-9.—Show, Minneapolis Auto Trades Association.

Kansas City, Mo., February 9-16.—Show, Kansas City Motor Car Dealers' Association.

Bronx, New York City, February 9-16.—Show, Bronx Automobile Dealers' Association.

St. Louis, Mo., February 11-16.—Show, St. Louis Automobile Manufacturers' & Dealers' Association.

Kansas City, Mo., February 11-16.—Third Annual Tractor Show, Kansas City Tractor Club.

Newark, N. J., February 16-23.—Show, N. J. Auto Exhibition Co.

San Francisco, Cal., February 16-24.—Second annual Pacific automobile show, Motor Car Dealers' Association of San Francisco.

Waterbury, Conn., February 18-23.—Show, United Shows Co.

Springfield, Ohio, February 18-23.—Show, Springfield Auto Trade Association.

Syracuse, N. Y.—February 18-23.—Show, Syracuse Automobile Dealers' Association.

Pittsfield, Mass., February 18-23.—Show, State Guard.

Grand Rapids, Mich., February 18-23.—Show, Automobile Business Association.

Des Moines, Iowa, February 18-23.—Show, Des Moines Automobile Dealers' Association.

Brooklyn, N. Y., February 22-March 9.—Show, Brooklyn Motor Vehicle Dealers' Association.

Omaha, Neb., February 23-March 2.—Show, Omaha Auto Trades Association.

Columbus, O., February 27-28.—Show, Columbus Auto Show Co.

Muskegon, Mich., February 25-March 2.—Second annual show.

Boston, Mass., March 2-9.—Automobile Show, Boston Automobile Dealers' Association.

Great Falls, Mont., March 16-20.—Second annual show, Montana Automobile Distributors' Association.

San Francisco, Cal., March 19-24.—Show, Motor Truck Dealers of San Francisco.

Trenton, N. J., March 20-23.—Show, Trenton Auto Trade Association.

Stockton, Cal., April 9-13.—Show, San Joaquin Auto Trades Association.

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Accessory Exhibits Divide Honors With Cars at New York Show

Despite the fact that the New York show was a war-time show and the attendance of the younger element was noticeable for its absence, it will go on record as the biggest accessory show ever held under the auspices of the N. A. C. C. All told, 331 different manufacturers of accessories had their product on exhibition, as against 323 at the previous show. Those who have attended the shows for several years past noted the absence of several exhibitors and products which have been prominent in previous years. The representation of tire manufacturers was very small and several makers of ignition specialties, fuel tanks, engines, bearings, axles, etc., were missing.

Small Wares Noticeable.

An analysis of the exhibits shown on the two floors revealed the fact that the majority of accessory concerns displayed what may be termed small wares. Here and there could be seen the displays of makers of heavy garage equipment, such as arbor presses, etc., but these were in the minority. Although the oxy-acetylene welding process has made great strides in the automobile industry, but one maker displayed welding and decarbonizing equipment.

As has been previously stated, the tendency was toward the exploitation of small material, equipment that may be termed standard. The fact that the dealers appeared to be more interested in those accessories appealing to the owner of the used car, and in devices bringing an older model more up to date, would indicate that one of the effects of the war is to greatly increase the demand for practical accessories and equipment.

Dealers and Repairmen.

One of the features of the show was that the accessory display attracted an unusually large number of dealers and repairmen, particularly the latter. Interest appeared to center in time and labor-saving devices, tools making readily accessible those components of the chassis not easily reached with ordinary tools. Indicative of the economical trend was the careful inspection of piston rings and fuel-saving devices. That the manufacture of piston rings is being given the attention it deserves is indicated by the display of a patent ring by one of the largest and best known makers of ignition apparatus. Despite the reported shortage of material, the number of new accessories exceeded that of the previous show. The presence of a large number of jobbers shows that the dealer and repairman are dominating influences in the automobile industry today.

New Era "Moto Nose."

Several new specialties were shown by the New Era Spring & Specialty Co., Grand Rapids, Mich., of which Smalley Daniels is president. Among the new articles was the "Moto Nose" (air breather) for Ford cars. This is a practical device and one that should appeal to Ford owners in that it prevents the water in the cooling system from overheating under the most severe conditions of service. The principle of the "Moto Nose" is that of the ship funnel method of ventilation. The device is screwed into the filler tube of the radiator, replacing the radiator cap. When the car is in motion a stream of cool air is directed through the "Moto Nose," over the surface of the water and at its hottest point, the top of the radiator. A screen prevents the entrance of foreign elements. The "Moto Nose" is neat and substantial and comes finished in either nickel or black enamel. Is moderately priced.

Another New Era specialty is the interchangeable spring bumper which is sold with a permanent guarantee. The double front bar affords maximum strength, is of highly tempered steel, and has attaching arms of semi-tempered material that will bend when subjected to severe shock. One of the several practical features of the bumper is that a drum-like rebound is obtained by the double bar being tied in the center so that both bars act simultaneously. The interchangeable feature, one that adapts the bumper to 93 per cent. of the cars, is shown in an accompanying drawing. These are the ratchet type of attachment shown at A, B and C and the hook-on type shown at D and E. The double front bar interchanges on these types, also with three-quarter and with all special fittings. The New Era Spring bumpers are supplied in black and black with nickel front bar.

The New Era "Korect" rear tire carrier for Ford cars is designed to carry Ford casings with or without demountable rims, also Firestone special rims. Carriers for wire wheels are also supplied. The tire carrier is attached directly to the chassis as shown, and as there are no holes to drill it can be installed by the owner. Steel is used throughout and the carrier is sufficiently strong to support a heavy person. It is rigid and free from noise or rattles. This design not only properly supports the tire but locks it and the rim, thus preventing theft. Although made to carry one tire it can be converted into a double carrier in a few minutes by the addition of extra parts. The material and workmanship are first class in every respect.

Petry Ventilator.

The N. A. Petry Co., Inc., 1307 Race street, Philadelphia, Pa., showed in addition to their regular line the Petry ventilator for Ford cars. This is a practical construction that should appeal to the owners of the Ford in that it permits of regulating the temperature of the driver's compartment. As may be noted by the accompanying illustration, the Petry ventilator throws or directs the currents of air on the floor of the driver's compartment and not on the passengers. The ventilator is so constructed that rattles are avoided and throughout the construction is sturdy. The device can be easily installed on the cowl of the car and the finish is in keeping with the high grade maintained by the company. The ventilator is rain and dust proof. The Petry cut-out and Petry universal pedal were also shown by this company.

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Cig-R-Lite.

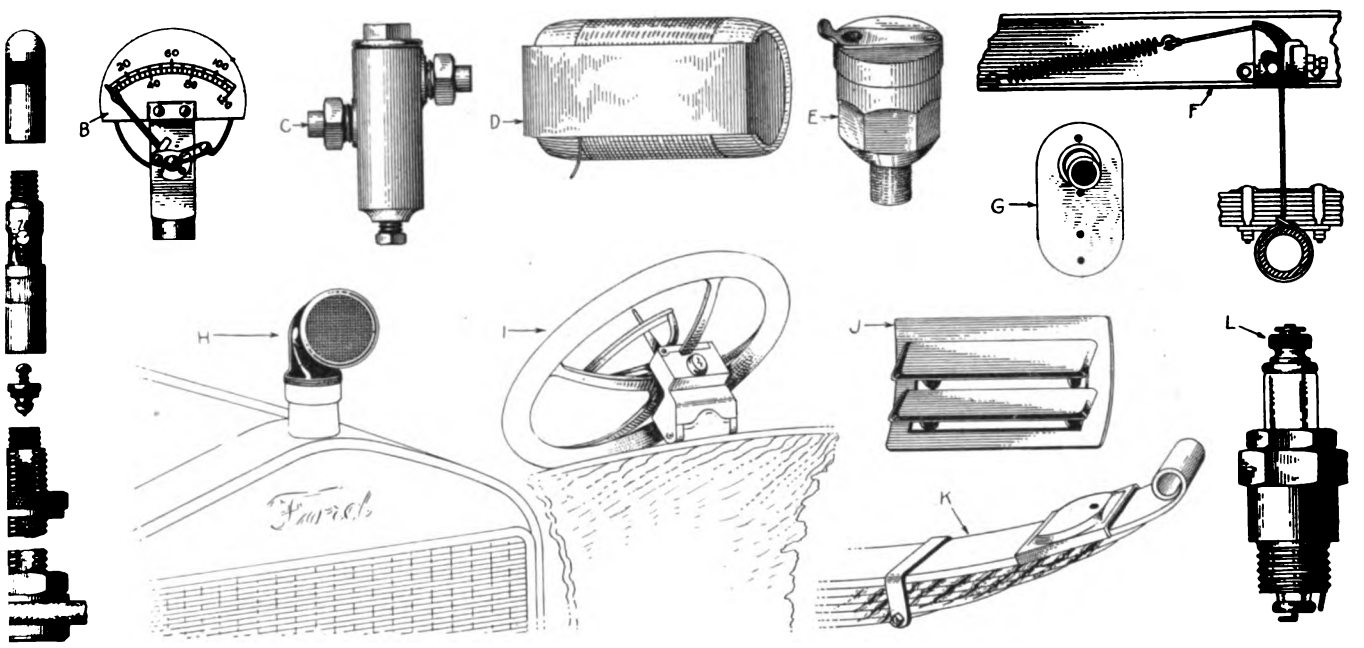
One of the new electrical devices displayed was ıe Cig-R-Lite, an electrical device for lighting a gar or cigarette when the driver or other passen-ɜr desires a smoke. One of the several interesting ıatures of the lighter is that when it is withdrawn ɔm its receptacle, the electrical circuit is auto-ıatically completed. The wire coils in the tip of .e lighter immediately become red hot, enabling ghting of the cigar under all weather conditions. coiled spring rewinds the flexible cord and the ghter returns to its receptacle, automatically break-g the circuit or extinguishing the light. The lighter made for six or 12-volt circuits and consumes very tle current. It is made in several types, flush for ɜtrument board, for cowl dash, smoker's case, cket, etc. That illustrated is the flush type and but 2⅛ by 3¾ inches. The device is nicely fin-ıed and moderately priced. It is manufactured

Pressurite.

The Improved Gauge Mfg. Co., 302 West Water street, Syracuse, N. Y., maker of Pressurite gauges, displayed several forms, these including a tire tester, control indicator, tube indicator, etc. Accuracy and durability are features emphasized of the products of this company, which also produces spring oilers. The Pressurite gauges are constructed entirely of metal, and all bearings are of non-corrosive German silver. They are held to be accurate to within two per cent., the error allowed by the United States Government specifications. The accompanying illustration shows the working parts of the gauge and its simplicity is noticeable. Accuracy is due to the use of the Borden tube. The company issues an interesting booklet describing its products.

Twin Fire Spark Plug.

A spark plug that attracted considerable attention because it would continue to supply a spark after



Accessories Seen at the Show: A, Kahn Automatic Safety Valve Standard Equipment with Armstrong Tubes; B, Mechanism of Pressurite Gauge; C, Sasco Fuel Strainer; D, Ajax Wire Spool; E, Lubrik-Oil Cup; F, Common Sense Shock Absorber; G, Cig-R-Lite; H, New Era "Moto Nose"; I, Husted Auto Lock; J, Petry Ventilator; K, G. W. L. Spring Oiler; L, Twin Fire Spark Plug.

ɜhe Electric Automatic Cigar Lighter Co., 556 t 27th street, New York City.

G. W. L. Automatic Spring Oilers.

ɔoper lubrication of the bearing surfaces of the ıgs not only prevents breakage, saves the tires makes the car ride easier, but eliminates annoy-squeaks. To provide proper lubrication of the gs the Auto Specialty Sales Co., 47 West street, York City, has brought out the G. W. L. auto-ɜ spring oilers, which consist of a light, neat, ɔroof metal holder containing a felt pad. The l case has an oil reservoir, and the lubricant is d to the bearing surfaces or between the leaves e springs that a thin film of oil is deposited ntire length of the spring. The lubricant is ied automatically; that is, it is fed only when ar is in motion. The G. W. L. oiler is placed ther end of the spring. It snaps easily over ɔring and requires no tools to install it. It is oticeable when attached and is very compact.

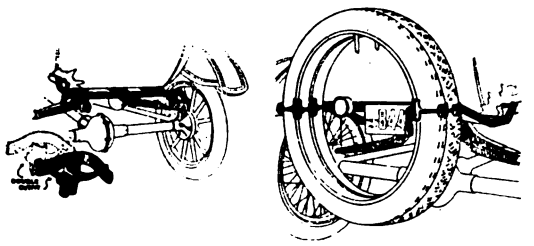
the demonstrator short-circuited one of the gaps, was the Twin Fire plug, so named because two sparks are provided. This plug fires two sparks in series, and the maker states that one point will fire even when the second is fouled with oil, carbon, etc. It is also claimed that the explosions of the mixture will clean the fouled point. The Twin Fire plug is constructed in the conventional manner with the exception that an intermediate electrode is employed and two gaps are used. The number 1 gap, so-called, is set at .015 inch, and the number 2 at about .020. The Twin Fire plug is made in standard ½-inch, ⅞-18 regular and ⅞ extension sizes as well as metric. The maker claims that a greater volume of gas will be ignited by the plug and that soot or oil will not prevent its successful operation.

Common Sense Shock Absorber.

A new and novel type of shock absorber, one that is easily and quickly installed, was shown by the Common Sense Mfg. Co., Runyon street and Sher-

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man avenue, Newark, N. J. The Common Sense shock absorber is attached to the inside of the channel of the chassis frame, where it is concealed from view as well as not affected by water, mud, etc. It consists of a spring secured to the frame by means of a bolt, a strap and a triangle. The last named is bolted some 14 inches from the shock absorber



The New Era "Korect" Rear Tire Carrier for Ford Cars.

proper. The strap is attached to the spring by means of an eyelet. The proper tension of the device is obtained by means of a setscrew having a lock nut. The construction of the shock absorber is such that the reflex action or recoil of the car spring is controlled or checked. The device permits of free downward movement of the spring. The Common Sense shock absorber is made in two types, for light and medium weight cars and heavy machines.

Husted Auto Lock.

A lock for preventing theft of the car in that the steering wheel is so locked that it cannot be turned, was displayed by Asch & Co., Inc., 24 West 61st street, New York City, distributors for the maker, the Husted Mfg. Co. Youngstown, O. One of the features of the construction is that there are no holes to drill in attaching nor are there places where leverage can be obtained for displacing the device. The lock is pivotally mounted on the steering column and is so made that its two sections meet and enclose the spoke of the steering wheel. When locked in position the device practically obtains a solid construction, one that the makers claim will defy the most clever thief. No two locks are alike. The lock is made of high-grade steel, all bolts are enclosed and the finish is nickel. A key is used only to unlock the device.

Lubrik-Oil Cup.

An oil cup supplying lubricant to the bearing surfaces of a motor car, etc., has been brought out by the Warnola Mfg. Co., 73 Wooster street, New York City. It is designed to replace the conventional grease cup and is made for both vertical and horizontal positions, such as for a shaft and spring shackle bolts. The method of conveying the oil from the source of supply to the bearing surface is novel in that a steel ball contacts with an oil wick and carries the oil to a standpipe. This pipe communicates with the bearing surface. The ball is set in motion by the movement of the car, and the amount of oil fed is regulated by the size of the ball, speed of the car, etc. The supply is by means of a felt wick, and capillary attraction carries the oil up the wick to the point where contact is made by the ball. One of the features of the cup is that it has a dirt-proof filler opening. Any dirt in the lubricant settles to the bottom. It is stated that one supply of oil will serve a car for 3,000 miles. Standard as well as special sizes are supplied, also different finishes.

Armstrong Tube and Valve.

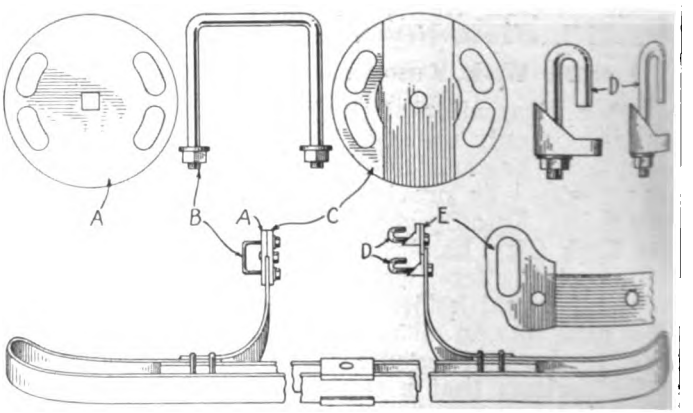
Maintaining the proper or original pressure and avoiding the possibility of over-inflation of a tire are among the novel features of the new Kahn automatic safety valve used as standard equipment with the Armstrong inner tubes, made by the Armstrong Rubber Co., Inc., 122 Adams street, Newark, N. J. These tubes are extra heavy, are laminated, and eliminate the usual spreader iron and patch. Because of these features the maker claims that running with a flat tire will not damage the tube. The valve, which can be set for any desired pressure, eliminates the use of a pressure gauge, and if the valve be set at 70 pounds the gauge will blow off if more air is used. The maker claims that a superheat steam type of packing or washer absolutely avoids the possibility of leakage. No extra dust cap is required with the Armstrong cap, which can be pulled through the felloe of a wheel when changing demountable rims, thus making removal of the cap unnecessary.

Ajax Wire Assortment.

Annealed or flexible wire is exceedingly useful in the garage and repair shop. When stored in ordinary coils the wire tangles and kinks. To prevent these troubles the Russell Fraser Wire Co., 70 North 9th street, Brooklyn, N. Y., is marketing its wire wound on spools, and the wire cannot unravel because of the use of a patented metal clip attached to the spool. Another feature of the spool and clip is the use of a tension spring which keeps the wire close to the spool as the wire unwinds. This makes for economy and convenience. The wire is a soft, pliable galvanized steel, and Ajax wire is put up in four salable sizes on one size of spool. The number of feet per spool is printed on the holder. The company is marketing the Ajax wire assortment consisting of 72 spools of four sizes, 16, 18, 20 and 22 iron wire gauge. This assortment comes in a neat wooden container and forms an effective silent salesman.

Sasco Fuel Strainer.

Much of the trouble experienced with engines is due to the accumulation of dirt and other foreign



The Interchangeable New Era Spring Bumper.

matter in the float chamber of the carburetor. The presence of foreign deposits can be prevented by the use of a strainer, and when the fuel system does not include one, one should be installed. A

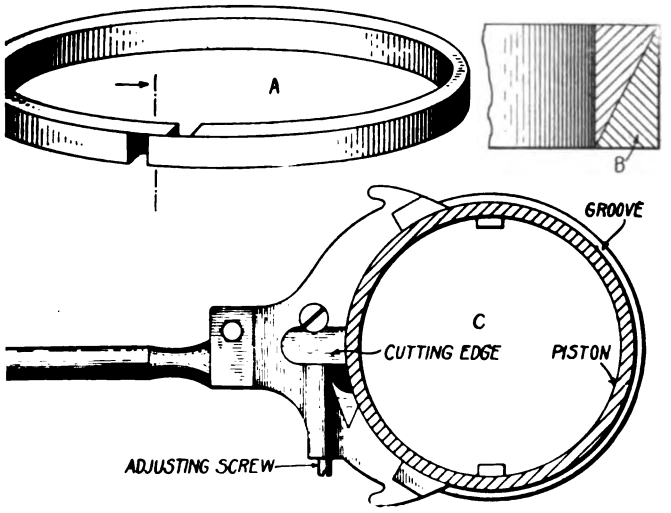
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strainer that is not only very light, but adapted to motorcycles, motor boats, automobiles and other internal combustion engines, is the Sasco made by Sage Bros. Inc., 780 Union street, Brooklyn, N. Y. It is so made that should two-thirds of its basket mesh become filled with dirt, etc., the flow of the fuel will not be restricted. The foreign matters can be easily and quickly displaced by a few turns of the ground joint top cap, which when removed affords access to the strainer basket. The reservoir for trapping the water in the fuel is well arranged. The Sasco strainer comes with ground joint couplings to fit 3/16, ¼, 5/16 and ⅜-inch tubing, outside diameter. The material used is aluminum.

Munger Piston Rings.

One of the features of the exhibit of the Splitdorf Electrical Co., Newark, N. J., well-known makers of ignition and electrical apparatus, was the display of the Munger "Always Tight" piston rings, a new design and one that proved interesting to the dealer and repairman in that a regrooving tool is supplied with every set or carton of rings.

This tool is shown in an accompanying illustration and is designed to eliminate the need of dis-



e Munger Piston Ring: A, the Ring; B, Showing the "Always Tight" Feature; C, the Adjustable Regrooving Tool. A Ring Insertion Tool is Included.

acing a piston from the connecting rod when new ngs are to be fitted. Instead of placing the piston a lathe to true up the grooves and reducing the ng to obtain the proper fit, all of this work is acmplished by the Munger regrooving tool. Inasich as the tool is adjustable, the ring grooves can trued to receive oversize rings as well as irregurities removed. The construction of the tool is ch that its use does not require experience with ting rings, etc., and the maker claims that a vice can true up grooves and properly fit rings.

A One-Piece Construction.

The Munger ring is a one-piece ring; that is, it made of a single piece of metal, and its joint is a ible cut so made that even when the ring exnds it remains gas-tight. It is of the concentric pe, a design the outside and inside surfaces of ich obtain two perfect circles and walls of uniform ckness even after the ring has been in service some time. It is also pointed out that a patted process of peening enables the ring to fit perfectly the cylinder walls as well as insures an even pressure.

The surfaces of the Munger ring coming in contact with the cylinder walls are not polished, but are finished with minute grooves. These enable the ring to seat itself quickly and to adapt itself to all points of the cylinder walls through the yielding of the grooved surfaces.

Insertion Tool Supplied.

In addition to the regrooving tool there is supplied the Munger ring insertion tool, which simplifies the installation of a piston ring. With this tool a ring can be put on in a few seconds. The complete equipment consists of eight rings of regular size and four oversize in addition to the tools described. This combination of rings is supplied because of the difference in wear of the ring grooves. For the present the Munger "Always Tight" ring equipment is being marketed for the Ford engines, but it is understood that rings will be produced for other makes of cars.

The equipment comes packed in a neat carton, and one of the features of the rings is that they are made rust-proof by the Parker process. The Splitdorf Electrical Co. issues a comprehensive booklet on fitting rings, etc., and which describes the advantages of the Munger ring.

AMONG MASSACHUSETTS GARAGES.

How a Novel Test Was Made of Faulty Coil With a Telephone.

BY JAMES F. HOBART, M. E.

"My spark coil is N. G.," said a man recently who had been driving a car over Massachusetts hills. "I can't get a kick out of it. Will you see what is the matter with it?"

The car was deep among the Massachusetts hills, with no garage or repair shop within several miles. The house of the car owner was close by and thence was taken the defective spark coil and the battery.

No buzz could be obtained at the contact breaker when the various wires leading from the instrument were connected. By bringing the battery wires to the buzzer and touching piece after piece it was found that a very slight spark could be obtained almost anywhere, but no steady buzz of the vibrator could be obtained. The wires were carefully examined for breaks or for poor connections, but were found to be in perfect condition.

Testing Cells with a Spark Coil.

A battery tester was not at hand but each cell was tested separately by attaching them, one at a time, to the terminals of a wipe spark coil and then attaching one wire from the coil to a bastard cut file. The other wire from the battery was drawn across the file whereupon a shower of sparks showed approximately the condition of the cell.

After each cell had been tested they were connected in series and tests made after each addition of a cell. It was found that the sparking increased constantly and regularly, showing that each cell was in good order even though its exact voltage was unknown. This test avoided use of a dead cell.

But each cell proving to be in fair condition, and nothing being discovered wrong with the coil, it was determined to make a magneto test of the coil and

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to use the "Granger" telephone in the house of the man who owned the coil under examination.

But here a snag was encountered. "You must not touch the telephone. There would be all kinds of trouble should you use it for testing the automobile and they might take out the instrument. Then we would be in big trouble!"

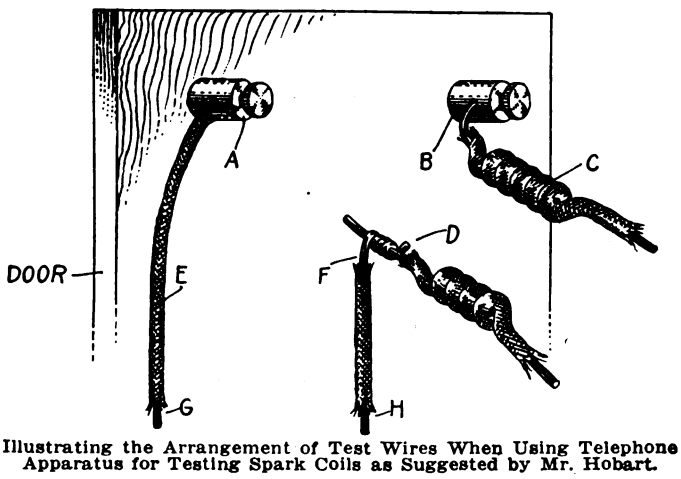
Using the Phone.

After repeated assurances that what they did not know would not hurt the feelings of the telephone company, a reluctant assent was given and the 'phone was pressed into service.

Tracing the main wires into the telephone box, the wires in question were quietly disconnected at their binding posts and so placed that durng the test the ends of the detached wires could not come in contact with each other. This action simply cut the 'phone from the main wires without disturbing any other instrument on the line, just as a single incandescent lamp may be taken out of circuit without disturbing the remainder of the lighting service. Had the two disconnected wires chanced to touch each other then the resulting short circuit would have caused trouble on the line.

Arranging Test Wires.

The little box upon which the magneto bells are located was then opened. Some boxes are locked but



Illustrating the Arrangement of Test Wires When Using Telephone Apparatus for Testing Spark Coils as Suggested by Mr. Hobart.

the lock may be easily picked by means of a bit of crooked wire. This box was not locked. A round head screw held it closed and a small screwdriver soon opened it. On the back of the door were several binding posts, two of which are shown at A and B in an accompanying illustration. When the receiver was in place upon its hook and wires C and D in place in posts B and A respectively, the bells would ring when the crank was turned. One of the wires was removed as at D, and the bell would not ring when the crank was turned. A couple of the battery wires having been disconnected for the purpose of testing as described were then connected as shown at E and F.

Wire E was slipped into binding post A and fastened there by means of the binding post screw. Wire F was attached directly to wire D by twisting together the ends of the two wires. By turning the magneto crank and touching together the ends of the wires G and H, the magneto bell of the telephone would ring and the ends G H were used in making the tests at the spark coil terminals.

It is to be understood that the telephone was not removed from its position upon the wall while the coil was being tested. The wires G and H were long enough to permit of their being brought in contact with the coil while that instrument was lying on a chair near the telephone.

In making the test wires G and H were touched to the two primary coil terminals and of course the bell would ring through the primary coil when the crank was turned. One of the wires was kept in contact with a primary and the other wire was placed in contact with the wire leading from the secondary coil and the bell rang through the secondary coil also.

This test showed that the coils, windings, both primary and secondary, were unbroken. In this coil one end of the secondary was attached to the primary thus connecting them together.

A match was then placed in the vibrator in such a manner that connection between the spring and its platinum point, upon which it rested when current was off, was prevented. A test was then made with the two primary (battery or magneto wires) connected as in the first test. The placing of the match should have broken the primary circuit but it didn't in this case, and the bell rang as before!

Here was trouble. With one wire (G) made fast to one of the three wires which entered the coil, wire H was touched successively to each bit of brass in the vibrating mechanism, and no form of contact could be found in which the bell would not ring strongly. This was tried with the other two wires, one after the other, and the bell rang freely.

This meant that something was decidedly wrong inside of the coil, that the two windings were evidently short-circuited and that the coil had best be sent back to its maker for repair.

And this you should always do, brother mechanics, automobile owners and drivers. You may test out the coils as fully as you choose, in the above described manner or in any other way as long as you do not use the electric lighting current for test purposes, and sometimes even that will not harm the coils, but it might burn out some of the fuses in your lighting circuits unless proper precautions were taken by putting a lamp in series with the test wires.

A mechanic to whom the story of testing out a spark coil with a telephone magneto had been told said that he had for a long time wanted a magneto for frequent testing but had not been able to get hold of one, but that he intended to cut in a double pole snap switch, same as is used for lighting purposes.

This man said he was going to connect one of these switches into the magneto circuit of his telephone in such a manner that by simply giving the switch a half turn he would be able to cut the magneto into a permanent testing service without interfering in the least with the telephone or with the calling of the central office. Then whenever he wanted to call "Central" it would only be necessary to give the switch another half-turn and the 'phone would be again ready for its legitimate use.

Better look out, though, before you try this scheme, and see that you have a magneto connected with your telephone, for some systems do not use magnetos. They use what is known as "Central Energy" for calling and it is only necessary to remove the receiver from the hook in order to call Central. You can't use the magneto for a testing instrument with this kind of telephone system.

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Care of Tires in Storage.

Suggestions for proper preparation of tire and tubes which are to be stored during the winter months are made by Frank C. Millhoff, general sales manager of the Miller Rubber Co., Akron, O. "Those who do store their cars should take at least one precaution," says Mr. Millhoff, "and that is remove each tire.

"Next I would cleanse the outside of the casings with ordinary soap and water. The object in this is to remove all traces of oil which, as is well known, operates detrimentally to the life of the tire. Then I would examine both the inside and the outside for bruises or injuries; make what repairs were needed and finally wrap the tire carefully in a clean cloth—or preferably black paper—and lay it flat in a cool dark room. The inner tube should not be neglected. A leaky, faulty tube simply shortens the life of the tire by thousands of miles.

"I would not allow a tube to remain in the casing, no matter how good or how poor it was. I would carefully clean off each one, then lay it flat in a cool dark place as in the case of the tires. A cool dark place is recommended because the actinic rays of light are injurious to rubber.

"If I did not want to remove the tires, the very least I should do, would be to jack up the car enough to take the weight off the tires and leave just enough air in them to keep them tight and in shape. The spirit of conservation calls for simple precautions as these, but from another standpoint—they are necessary if the motorist is to get out of his tires all that he can reasonably expect."

English Demand for Electric Vehicles.

It is probable that after the war there will be a favorable opportunity in England for the sale of electrically propelled vehicles. American manufacturers would do well to look to this field and be prepared when normal times return to get a fair share of the trade. In the past this type of car failed to obtain much popularity, but the scarcity and high price of gasoline and the difficulty of obtaining any of the ordinary liquid fuels have caused a change.

Many persons are convinced that the price of gasoline will remain high even after hostilities cease, and in fact may never again be as low as in prewar times. It is true that coal gas as a substitute for gasoline has been largely employed by many motorists, but for various reasons, especially on account of the space that it occupies, only a small proportion have adopted it as a way out of the gasoline difficulty. Already the use of electric commercial cars has begun to show an increase, although they are difficult to obtain under present conditions.

When the war is over it is thought that there will be a large demand for the electric car. Several municipalities have been experimenting with heavy electric vehicles and obtained satisfactory results. They have been found to be especially suitable for such work as town scavenging.

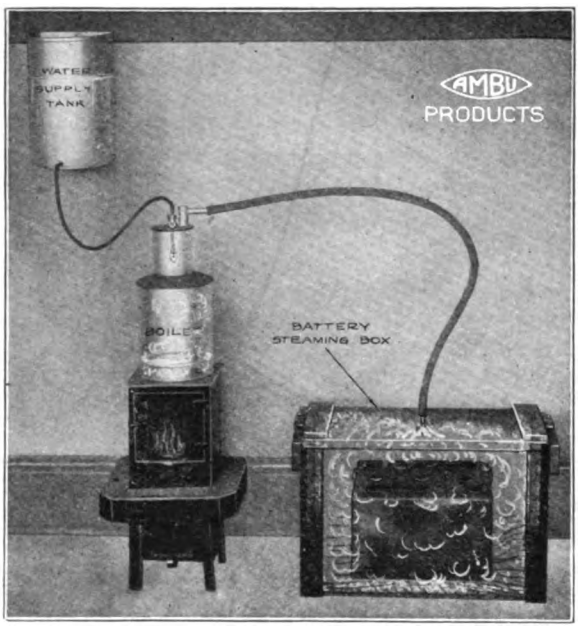
A heavy car which runs between the towns of Smethwick, Dudley and Kidderminster in the Birmingham district is supplied with electrical energy at a low cost. Birmingham is well situated from an electric vehicle point of view. Not only is current cheap, but within a 50-mile radius of the city there are 22 charging stations, apart from the seven stations within the city.

Peers Ambu Battery Steamer.

The American Bureau of Engineering, Inc., 1028 South Wabash avenue, Chicago, Ill., maker of the well known Ambu Electric Trouble Shooter, is introducing a new article termed the Peers Ambu battery steamer. It is an apparatus for softening the sealing compound on starting and lighting batteries by means of steam, so that the battery may be easily and quickly opened and without the use of a gas flame or blow torch.

The use of the apparatus avoids the possibility of damage and insures a clean, quick job in removing the sealing compound. It consists of only three parts, the steam generator, a steaming box and a water supply tank.

When a battery is to be opened, it is placed in the steaming box and steam passed into the box for about 15 minutes. This makes the sealing compound so soft that it can be removed readily. The steam generator or boiler is made of heavy galvanized iron. The amount of water in the generator is so controlled that steam is quickly obtained. The level of the water is maintained constant as long as



The Peers Ambu Battery Steamer for Softening Sealing Compound.

the supply in the tank lasts, and a continuous supply of steam is available in several minutes after the heat is applied to the bottom of the generator. For the average repair shop, the supply tank need be filled but once a day, and the entire apparatus requires absolutely no attention after the gas, oil or gasoline stove is lighted.

The supply tank is also made of galvanized iron and is connected to the generator by means of a small hose. It is placed a foot or two higher than the generator so that the water will flow into the latter by gravity. The steaming box is an acid-proof wooden member. Steam is introduced by means of a hose.

One of the features of the Peers Ambu battery steamer is that old covers, jars or battery boxes may be placed in the steaming box and the compound easily removed with a putty knife. A further advantage of the apparatus is that it loosens dirt, etc., making it a simple matter to clean the exterior of the box.

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MAINTAINING OIL LEVEL.

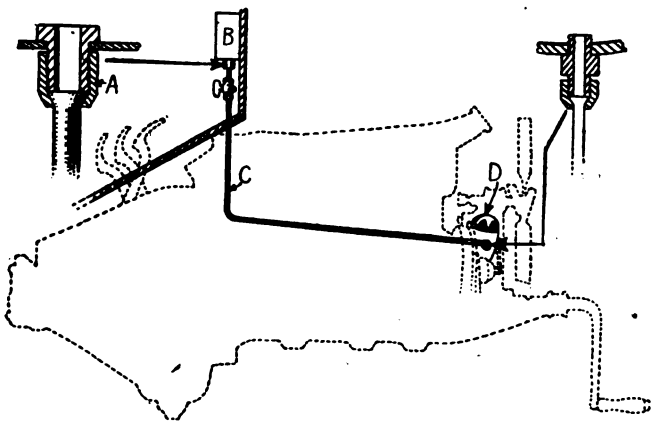
Describing the Effect the Level of Lubricant Has on the Operation of Ford Engine.

An interesting account of a series of tests made by a writer in the Autocar appears in that publication. The tests were made after the writer noticed the operation of the engine with varying amounts of lubricant in the crankcase. The article is as follows:

Oil Gauge Indispensable.

"Before giving the results of these tests let me say that I consider an oil gauge indispensable on the Ford. We are told to keep the level midway between the two petcocks, but without a gauge you can only guess when it is at this level. Some people add oil according to mileage and measure the quantity they put in, but this again is unreliable, because the heat of the engine varies according to engine speed, weather, etc., and a very hot engine, of course, uses up more oil than a cool one. Therefore, I maintain that the only certain way of knowing the exact level is to employ a gauge.

"Before carrying out the first test the engine was



Showing Auxiliary Oil Tank and Bypass for Renewing the Supply of Lubricant in Crankcase.

decarbonized and the sparking plugs thoroughly cleaned. I then put in sufficient oil to fill the gauge three parts full, i.e., a quarter way below the top petcock, and started on a long run. The car altogether lacked "go," and never pulled really well until nearly home, when it began to improve slightly. The sparking plugs were found to be very dirty, and on removing the cylinder head there was a good deposit of carbon on the parts where it is usually found.

The Second Test.

"Starting again with a clean engine and plugs, the second test was begun with the oil level exactly halfway between the two petcocks. This certainly resulted in better running, but after a considerable number of miles I noticed that the engine gradually became more lively as in the long journeys previously mentioned. On examination, the plugs were found to be much cleaner, and there was less carbon deposit.

The Third Test.

"A third test was carried out with the oil level only three-eighths between the two petcocks, the engine and plugs having been cleaned as before. The engine was lively from the start, accelerated quickly, and romped up the hills. The plugs were practically clean, and there was scarcely any carbon deposit, even after some hundreds of miles, the oil level, of course, never being allowed to rise higher than three-eighths. These facts seem to point to this being the ideal level for obtaining the best results, but the question may rightly be asked whether there is not a great danger of running short of oil by starting out with so low a level. The answer is that it entirely depends on the driver. If he is a man who does not do anything to his car till it threatens to go no further (and unfortunately there are many such who handle Fords) there undoubtedly is; but if he is one who will take the trouble to look at the oil gauge a little oftener there is not. Naturally, oil will have to be added more frequently, but the improvement in running alone is well worth the extra trouble involved, to say nothing of the time, trouble and expense saved in not having to decarbonize so often.

Dashboard Oil Gauge.

"In order to be on the safe side, however, if this idea of keeping the level at three-eighths is carried out, I strongly recommend the fitting of a dashboard oil gauge, then the level can at all times be seen from the seat, and there is no fear of melting out the bearings. It also has the additional advantage of being free from the risk of breakage from flying stones, an advantage not enjoyed by the small gauges sometimes fitted in the place of the lower petcock. (By the way, the oil level must never be allowed to get below this lower petcock.)

Auxiliary Tank.

"I also recommend the fitting of an oil tank in some convenient place, say on the dashboard. This could be made for less than a dollar, and is well worth the outlay. A bypass, A, should be fixed in the bottom of the tank, B, with a tube, C, running from it, the other end of which should be introduced into the breather pipe. Then all you have to do when the gauge shows the level is getting low is to turn on the bypass till sufficient oil has flowed from the tank into the engine sump, when the bypass can be turned off again. It can easily be arranged so that this can be done from the seat and whilst the engine is still running—a great convenience. The car should be approximately on the flat when judging the quantity of oil showing in the gauge.

"Let me say in conclusion, lest anyone should think that other features contributed to the marked difference in the running of the car described in the article, that the adjustments of the carburetor and other parts were kept exactly the same during the different tests. Also, on several occasions when filling up in a hurry I have accidentally put too much oil in, and each time I have noticed the liveliness reappear when the oil has got down to the three-eighths level. I may add that the tests were made when gasoline was purer than it is today, therefore the results now obtained are not, of course, the same, but I think the proportionate improvement even now would be identical."

No Fuel Shortage.

According to the Petroleum War Service Committee, of which A. C. Bedford is Chairman, there is no shortage of gasoline for use in this country. As a matter of fact, as a result of the light de-

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mestic demand incident to the winter weather, the stocks of gasoline are increasing and will further increase before the heavy summer demand is encountered.

While there is an increasing demand abroad for gasoline for use by our own army and navy, as well as by our Allies, the limiting factor there is shipping tonnage. All the gasoline is now being forwarded for which ships are available. Experience and inquiry make it clear that the petroleum industry in America can and will supply all the increased demand for oil products for the war, provided sufficient tank steamers can be obtained. It is estimated that in 1917 not over 25 per cent. of the gasoline produced in this country was exported. That fact should be reassuring to anyone who doubts this country's ability to supply the war requirements of our own and our allied governments for this important product.

FAVOR METAL WHEELS.

Warring Nations Discarding Wood for Both Passenger Cars and Trucks.

Wood wheels of all kinds have given such a poor account of themselves under war conditions that it is safe to assume they will cease to exist within a few years. Already wood has been eliminated from wheel construction of about 90 per cent. of European motor vehicles. It does not always follow that a design or type of construction which has proved superior under war conditions will be the best for peace conditions; but in this case the types of wheel which have proved superior in war undoubtedly will be retained after the war.

There are three main types of metal wheel in use at the present time: the wire spoke, the pressed steel, which may be either of the disc or spoke variety, and the cast steel wheel. For heavy loads—above two tons—the cast steel wheel is the only type used by European makers. There are practically no trucks of three, four or five tons capacity now built in England, France or Italy with wood wheels. Italian and French makers prefer the cast steel type. English manufacturers are rather divided between the cast and the disc types. The Fiat Co., which is the largest motor concern in Italy, decided on metal wheels as far back as 1903, and has adopted cast steel to the total exclusion of wood; in fact, this company never has built a commercial car with wood wheels.

There are two types in service, the hollow spoke wheel, which is a rather difficult foundry proposition, and the cast wheel with a transverse section in the spokes in the form of a cross. The advantages claimed of cast steel over wood are: Greater strength, immunity from climatic conditions, longer life, a slightly lower cost of production, a moderate saving in weight, and (this matter is of importance in the war zone) a greater factor of safety when under fire. Shell splinters which would seriously damage a wood wheel do little harm to a cast steel wheel. In case of a truck catching fire, wood wheels are certain to be destroyed, while cast steel wheels are practically unaffected.

A type of wheel which has been very much developed on the Continent since the war is the steel disc. It consists of the usual rim and a steel disc of uniform thickness stamped to the correct shape. The disc is forced into the rim and both electrically welded and cold riveted to this latter. Finally, two steel discs are riveted to the central portion of the wheel, and these three thicknesses of metal are drilled to receive the five, six or 10 studs by which the wheel is held in position.

This type of wheel is used on the one ton and 1½ ton trucks with dual pneumatic tires. Practically the entire Italian aviation service and a very considerable portion of the French aviation and ambulance services are equipped with the type of disc wheel. An attempt is being made to popularize the wheel for heavy touring cars requiring dual tires on the rear. As at present made, a set of steel disc wheels—single tires in front, duals in the rear—is rather heavier than a set of wood wheels with detachable rims. Also the fact that a complete wheel is carried as a reserve increases the total weight compared with wood wheels and detachable rims.

While it is predicted that the wood wheel is destined to disappear from ordinary touring cars, it is doubtful if it will be replaced by any one type. The Fiat Co., which is the only firm in the world using metal wheels throughout its series, from the smallest two-seater to the heaviest tractor, has for a long time employed detachable steel wheels for its ordinary touring models. This is a pressed steel type, but of the spoke variety, stamped in two halves and welded together. Naturally it is of the detachable type, has all the appearances of a wood wheel, but none of its disadvantages.

Up to the present, American makers have remained aloof from the metal wheel development. This is explained by the fact that the United States had a very good supply of second-growth hickory, and that wood wheels have been of better quality than those made in Europe. American military authorities are said to be impressed by the excellent results obtained by all types of metal wheels in Europe and are disposed to favor similar types for their army vehicles.

This Car Has Shower Bath.

An innovation that is meeting with favor in one of the ruined districts of France cared for by the American Red Cross is an automobile having in addition to a dispensary a shower bath. There are over 1,200 under-nourished, unsmiling little French children, many of them refugees from towns inside the firing lines, and some of these children have gone unwashed since winter. Skin diseases are frightfully prevalent. The construction and operation of the automobile shower bath is described as follows:

"On one side of the camionette is a seat large enough to accommodate a nurse and sick child. Over their heads is a rack for medicines and instrument bags, and opposite is a rack for gauze and bandages. On the floor is the shower-bath apparatus of jointed wood and rubber and shiny polished nickel to catch and entertain the children's eyes.

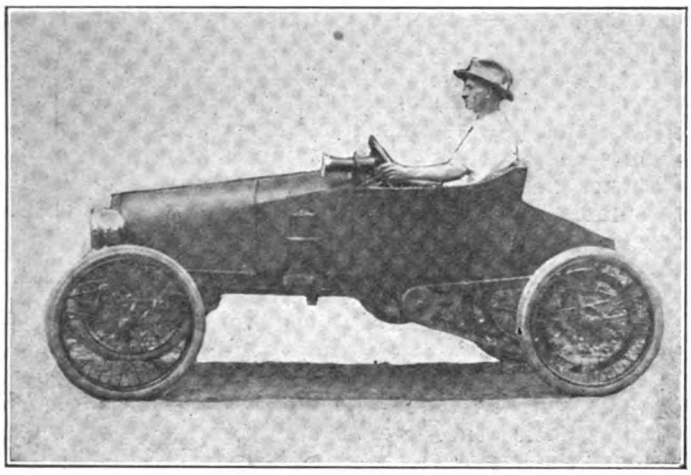
"Warm water is poured into a wooden tub, the child sits in the tub, and while the doctor pumps water through the shower the nurse scrubs. As the child whitens, the water blackens. At the finish, the rubber tube is suddenly shifted into a bucket of fresh cold water and the bath ends with an unexpected douse."

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REBUILDING THE CAR.

How Two Owners Reconstructed and Improved Touring Cars.

Automobilists mechanically inclined frequently redesign or rebuild standard types of cars, incorporating in them individuality. The most favorite method appears to be that of converting a touring type into a roadster, and much originality is shown



Car Designed and Constructed by G. S. Williams and Having Friction Drive and No Differential.

by the owners. It sometimes happens that a standard chassis is not utilized, that the car is constructed entirely from parts by the owner.

Has No Differential.

G. S. Williams of Tunnelton, West Virginia, sends us a photograph of a car he designed and built. The power plant is a 10-horsepower air-cooled engine taken from a cyclecar. The energy of the engine is transmitted through a friction drive, final drive being by two V belts. As may be noted by the accompanying illustration the driving pulleys are attached to a jackshaft which is essential with the friction type of drive. There is no differential used, the outer wheel on the curve is enabled to travel faster than the inner one through slippage of the belt on the small or driving pulleys. The tread of the car is 52 inches, tires 28x2½, and the machine has a speed of 35 miles per hour. The entire work of constructing and assembling was done by Mr. Williams.

Made Numerous Changes.

Guy Hustedde, Caruthersville, Missouri, is another reader of the Automobile Dealer & Repairer who has made a number of improvements to his car which was originally a 1914 Ford touring. He rebored the cylinders, installed oversize aluminum pistons, new connecting rods, Atwater-Kent ignition, Rayfield carburetor, hot air connections between the carburetor and exhaust manifold, shock absorbers, clover leaf body painted yellow, one-man top, rain vision windshield, fuel tank at rear of body, electric lighting and extra large hub caps.

Improves Appearance.

In addition to this equipment extra radius rods were attached and an ammeter to show the amount of current consumed as the source of current supply is a large capacity storage battery. To facilitate entrance and exit from the driver's seat a tilting type of steering wheel was installed, and an accelerator is part of the equipment. Mr. Hustedde states that the car has the appearance of one costing at least $1,200, rides comfortably, has more speed and consumes less fuel than before it was rebuilt. While no figures are given as to the cost of the equipment it is understood that it was not unreasonable.

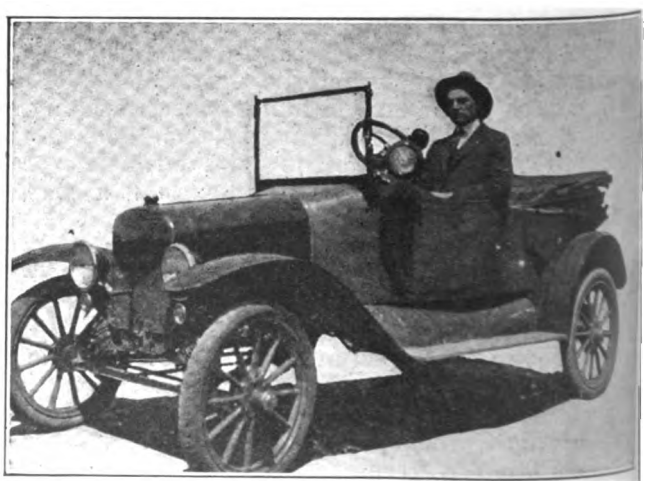
CARE OF THE VARNISH.

When the new owner receives his first car with its beautiful luster, he then and there resolves to keep it in this perfect condition as long as possible. Such a resolve if conscientiously followed out will more than repay him for the additional labor which it involves, provided he adheres in his cleaning process to a method which will not injure the expensive varnish.

Practically, all bodies are finished with at least 18 coats of paint and varnish and some quite a number more. All this fine finish is put there by the manufacturer, not only for appearance sake but to protect the surface underneath from the disastrous effects of the elements. It is most certainly worthy of the greatest care which the motorist can bestow upon it, but from lack of knowledge such care frequently results in harm. It would raise the hair on the head of an ordinary coachman if he saw a man go over a car with hot water and a scrubbing brush as has been done in some instances. Such a procedure mars and dulls the varnish beyond any hope of repair without refinishing.

Use Clean Water.

In the first place one should possess two chamois skins and two flannel cloths, also a plentiful supply of cold, clean water. Rain water is preferred but should none be at hand, the ordinary city supply will do. Use a hose without a nozzle, and direct a gentle stream of water against the body, taking care to have it strike at an angle. The more gentle the stream and the longer time any mud accumulations are allowed to soak, the better, as a heavy flow will tend to drive the grit over the surface so rapidly as to cause scratches. If a hose is not avail-



Illustrating How Guy Hustedde Converted a Ford Touring Car Into a Roadster. The Equipment Effectually Disguises the Ford.

able a garden watering can such as used to water flowers with will serve.

Take one of the flannel cloths and remove the accumulations of dust and mud as the water flows upon the body. Try to float the dirt accumulations

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off as much as possible without rubbing the surface.

Keep separate chamois and cloth for the body and chassis, and always wash the car in the shade. In drying the body wipe it gently with the chamois and let a fine mist remain, as this will notably increase the luster. While there are undoubtedly good soaps on the market for use in washing cars, some do not recommend the continued use of same, except on the chassis. Kerosene should never be used. Plain cold water is the best thing for the varnish, and plenty of it, especially on a new car, as it hardens the finish.

First wash the hood, then the body, fenders, chassis and the wheels last. In washing the chassis, first remove all accumulations of grease or oil with gasoline or kerosene. A brush can be used to good advantage between the spokes. The varnish on the chassis will stand a much stronger stream of water without injury than that used on the body. Care should be taken in lubricating the car not to spill any on the varnish, as it is very detrimental to it.

Tar deposits may be removed with a small piece of rag moistened in turpentine. Do not allow mud spattered on the car to dry on, as it will spot the finish by extracting the oil, and wash off dust as soon as possible. If these directions are carefully followed, the car will retain its original luster for a long period, but when this becomes dulled a body polish will prove very beneficial.

Renting Popular in Manila.

Few Philippine imports have had so good a market during the last five or six years as that enjoyed by motor vehicles. With but two exceptions there has been an increase each year since 1911 in the number of automobiles imported. Motor trucks are classed as automobiles in the figures of the custom house. It is only within the last four years that tires have been segregated from other parts and supplies. There has been a good increase in the importation of supplies and parts, especially in tires. The total value of the tires imported during 1916 was nearly $500,000.

The figures available for the first six months of 1917 show a slight decrease in the total value of the automobiles, parts, and tires imported for that period compared with the first six months of 1916. The indications are, however, that the current year will show no falling off in the imports of automobiles over 1916, provided shipping conditions do not interfere.

At the close of 1916 there were in actual operation in the Philippine Islands 3,013 automobiles, 392 motor trucks and 870 motorcycles. Besides these there were 1,630 machines undergoing repairs or not in operation for some other reason. The greater part of the latter number were automobiles. Of the total number, 1,481 automobiles, 248 motor trucks and 323 motorcycles were being operated in the city of Manila.

Garages for the repairing of automobiles and other motor vehicles have multiplied greatly within the last few years, particularly in Manila, consequently comparatively fewer parts of machines are now imported. Many of the parts that frequently were imported from the factory are now manufactured locally in the repair shops. Considerable valuable repair shop machinery and tools have been imported within recent years.

The trend in the Philippine market has been toward small, lower-priced machines. Filipinos are the principal buyers, and they prefer light cars. Very few of the larger cars are now imported.

Most of the establishments that formerly kept horses for hire now maintain motor cars for rent by the hour. The prices charged vary from $1.50 to $5 the hour. The automobile operating from stands on the streets for hire has entirely driven off the horse vehicles formerly operated. These street cars are frequently owned by the drivers and have no overhead charges to pay such as machines operated from garages, etc., must pay.

Many dealers sell cars on the installment plan. A certain amount is required to be paid down and promissory notes given for the subsequent payments secured by mortgage on the machine. The machine is insured enough to cover the unpaid balance. This method is said to be satisfactory.

Solving the Fuel Problem.

In addition to plans for developing the fuel resources of Ireland, two steps that may have far-reaching effects upon the supply of home-produced motor fuel have just been taken by the British government. They concern petroleum and benzol. As regards the former a bill has been introduced into Parliament giving the government power to develop the latent petroleum resources of that country. At present the production of this fuel is a negative quantity, though for the period 1891-1900 there was an average annual production of 67 tons, this decreasing to a mere eight tons in the ensuing decade, and then ceasing altogether. Experts are satisfied that, given proper development, good supplies will be tapped, since signs of the occurrence of petroleum exist in many parts of the country. For instance, in Staffordshire, which is in the Birmingham district, it occurs in the coal measures of Longton.

The government, too, it is stated, is taking steps to assist in the marketing of benzol after the war through the agency of the Anglo-Persian Oil Co., in which it holds a predominant interest. The proposal is that the British Petroleum Co., formerly a German concern but now a British subsidiary of the Anglo-Persian Oil Co., should actually handle the spirit, of which vast quantities should be available when benzol is no longer required in connection with the production of high explosives.

The government has also decided to investigate the possibilities of Irish peat as a fuel. Peat is one of the many available sources of alcohol. Most engines can be run on a half-and-half mixture of alcohol and benzol, and both of the spirits comprising this mixture are produced in the United Kingdom—the former in unlimited quantities, since it is a vegetable product, and the latter to the extent of about 100,000,000 gallons per annum (after the war). This means that the country ought to be able to produce 200,000,000 gallons annually of an alcohol-benzol motor fuel, or nearly twice of the amount of gasoline that was being imported annually before the war.

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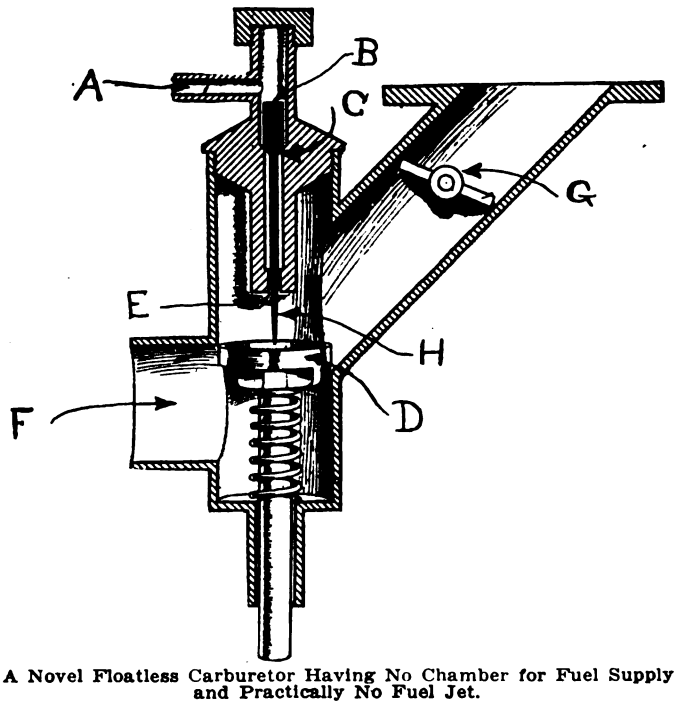
A NOVEL CARBURETOR.

Float and Float Chamber Eliminated and It Is Minus Usual Jet.

A carburetor presenting novel features in that the usual float, float chamber and jet are eliminated, has been brought out by an English engineer. The device, which is shown in an accompanying illustration, consists of a vertical chamber having two branches, one at an angle of about 45 degrees and the other placed horizontally and below the first named member. The fuel feed is located in the vertical chamber, while the horizontal branch is the air inlet and mixing chamber. It also contains the usual throttle or butterfly valve.

Serves a Dual Purpose.

The fuel enters the carburetor at the top of the vertical chamber through the pipe A in the accompanying diagram, and falls by gravity through a passage which serves the dual purpose of a fuel



A Novel Floatless Carburetor Having No Chamber for Fuel Supply and Practically No Fuel Jet.

cut-off and the jet in the ordinary carburetor. In this passage is situated a needle valve B provided with a shoulder which, when the engine is stationary, rests through the action of gravity on a seating in the valve passage; this shoulder and the seating are shown at C in the illustration.

How Fuel Is Controlled.

The needle valve is raised from its seating by the automatic air valve D so as to admit fuel into the mixing chamber. This air valve is situated immediately below what we may call the jet, and through the latter projects a taper extension H of the valve B of such a length that, when the engine is stationary, it just fails to rest on the concave top of the air valve. When the engine is turned, the suction on the air valve D raises it so that it in turn lifts the valve B off its seating at C, and allows the fuel to escape downwards through the fuel outlet E; the fuel thus entering the mixing chamber encounters incoming air, and the mixture is drawn past the butterfly throttle G in the ordinary way.

Supply Automatic.

When the engine is started and the throttle is opened more or less, the air valve is raised correspondingly higher by the increased suction, and automatically raises the fuel admission valve higher off its seating so that more fuel is fed to the fuel outlet at E. As the extension H of the fuel valve is tapered, it allows more fuel to pass through the outlet E, which has parallel sides. Not only, therefore, does increased engine speed involve a greater supply of fuel to the fuel outlet as in the ordinary float feed system, but the outlet itself is automatically increased in effective area, while at the same time the air supply also is automatically increased.

Eliminates Flooding.

The sole air intake of the carburetor is shown at F, and it will be readily recognized that for efficient working it is essential that all the air must be drawn under the air valve. Carburetion depends not so much on the reduction of pressure at the fuel outlet as upon the partial vacuum lifting the air valve, and through it the needle valve, gravity then causing the fuel itself to issue into the mixing chamber. Below the air valve is a cushioning spring, and if necessary another spring may be fitted above the needle valve B to assist gravity in effecting a firm seal at C when the engine is stationary.

For flooding, the air valve has an extension or depending stem, so that it may be raised by hand to lift the fuel valve temporarily. It is claimed that greater power and flexibility are obtained and that the carburetor cannot choke with foreign elements.

Predicts Truck Freight Service.

"Within the next few months we may expect to see regular motor truck freight service between the middle west and the Atlantic seaboard," says Eugene Goldman, vice-president and general manager of Master Trucks, Inc., Chicago's newest truck concern. Mr. Goldman makes the prophecy on the ground that the railroads cannot give adequate service when the bulk of our army is "over there," and we are forced to strain our transportation facilities to keep the soldiers fed, clothed and equipped.

"Even in training at the cantonments each man requires supplies to the extent of ten pounds daily, while in service his needs are greater," says Mr. Goldman. "It will be only a question of a few months until we have several millions of men under arms. That means 10,000,000 pounds of supplies at the minimum for each million men. With such a tremendous flood of tonnage going eastward from the middle west our railroads cannot hope to cope with the situation and motor trucks must come to the rescue.

"It is conceivable that the government may put part of the trucks it is buying into such service and it would not be surprising to learn that a company had been formed to operate large fleets of trucks to relieve the railroads of some of the strain of increased tonnage and shortage of cars.

"Roads will have to be built that will permit all-the-year-round hauling by trucks. Some of the highways between the middle west and the Atlantic coast ports are capable of such service now, but there are many places where improvements must be made."

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URGES CAREFUL DRIVING.

Secretary of New York State Says Number of Accidents Must Be Reduced.

"A careful driver is the best safety device," says Francis M. Hugo, Secretary of State of New York. "Human ingenuity can devise mechanical contrivances such as will go far in lessening automobile accidents, but it is the careful driver who really holds the key to the situation. There are numerous factors which contribute to the accidents of today, factors beyond the control of even the careful driver; the pedestrian whose familiarity with motor vehicles has bred contempt, the child playing in the street. Broadly speaking, however, the careful driver is superior to the best mechanical safety device that has yet been invented, superior to the gates of the railroad crossing, superior to the warning sign, superior to the slogan.

"The careful driver can take care of himself. His very presence on the road insures greater safety to automobilists. There is little need of a word of caution to men of his stamp. But for thousands of others, mechanical devices, words of caution and even arrest become necessities. Something must be done to decrease the number of automobile accidents in this State.

"While there has been a 36 per cent. increase in the number of automobiles this year accidents have likewise gone up in about the same proportion.

"State and local authorities are today doing their level best to lessen the toll, and the railroads, steam and electric, are doing their best, through publicity, and in other ways, yet the columns of Monday morning's papers frequently contain accounts of a dozen or more accidents, a portion of which are generally attended with loss of life. It is safe to say that at least 75 per cent. of these accidents are entirely due to the careless driver, not always is it true, the person who is injured, but to the other fellow who races along at breakneck speed and imperils both himself and those whom he meets.

"During the last six months approximately 350,000 folders urging greater care in approaching grade crossings have been sent out from my office to the motorists of this State, the folders having been furnished by the New York Central Railroad. Whether or not these folders will accomplish much in the way of results can only be surmised, yet if one of the number has been instrumental in saving a life or a limb it has earned the cost of the entire 350,000.

"In these days when there is a car to every twenty-seven residents of this State of ours there is almost as much of a duty devolving on the pedestrian as there is on the motorist. It is up to both to use care and caution, the one bearing in mind that the pedestrian has certain rights which must be observed, the other remembering that the highways are those of the automobilist.

"The grade crossing problem, however, is one of much concern. Last year twelve persons were killed and sixty-one injured in thirty-six accidents to automobiles at grade crossings on the New York Central lines in this State. During the same year 125 persons were killed and 231 injured in grade crossing accidents on all the railroads in this State.

"According to A. J. McMahon, claims attorney of the Delaware, Lackawanna and Western Railroad, four automobilists were struck in 1915 on grade crossings at that road. In 1916 the number had increased to sixteen and during the first five months this year seven cars had been struck. In 1916 twenty automobiles ran into and damaged gates at grade crossings. During the same period there were three cases in which automobile drivers drove their cars into trains which were standing at grade crossings.

"In conclusion the urgent need of caution is perhaps best demonstrated in figures furnished by Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, showing that of 9,000,000 white persons insured in its industrial department in 1916, no less than 795 met their deaths by automobiles, a rate of 8.8 per 100,000, as compared with 486 in the previous year, a rate of 5.7 per 100,000."

Renovating Worn Pavements.

A method of renovating worn pavements is being utilized with success at Cincinnati, O., and it is said that the process affords excellent traction both for automobile tires and horses.

The only new material required by this process is a small amount of cement and sand. The old granite blocks are taken up and thoroughly cleaned of all adhering fillers. The worn out sand bed is removed and wherever necessary the cement foundation is repaired. A new sand bed is laid, using old and new sand indiscriminately, and the blocks are then relaid with about a half-inch space between them.

The relaid paving next receives a thorough flushing with hose, and while it is still wet a mixture of two parts sand and one of cement, with enough water to make it flow readily, is raked and swept into all the interstices. Before this filler dries a finishing coat of sand and cement in equal proportion is spread evenly over the entire surface of the pavement. This surfacing coat makes the street as smooth as newly laid asphalt, and the longer it stands the harder it gets. Four days are allowed for firm setting before the street is opened to traffic.

Experience is that the cement grouting never chips from the granite, but actually becomes better with continued traffic. It affords a non-slippery surface in winter and in wet weather alike. The smoothest tire will hardly skid on it, and, unlike brick and wood block pavings, it does not cause horses to slip.

Streets which were resurfaced five years ago are in as good condition today as when just completed. As fast as the granite pavements need repairing they are being resurfaced by this method until Cincinnati is fast becoming the city of non-skid streets. —Scientific American.

A New Italian Law.

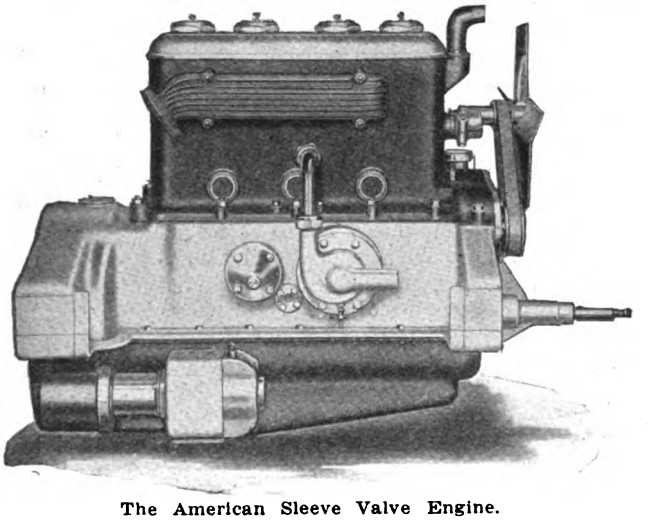
A new Italian law decree concerning reciprocity of treatment as regards auto vehicles owned by foreigners was published September 25. It provided that the application of the regulations in force as to treatment in regard to internal tax for circulation upon public areas, of velocipedes, motorcycles, automobiles and auto craft for private use, imported temporarily from a foreign country and belonging to persons residing in a foreign country, should be made dependent on the existence of reciprocity of treatment on the part of the foreign country in which the possessor of the vehicle that has been temporarily imported resides.

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NEW AND INTERESTING THINGS IN MOTORDOM

The American Sleeve Valve Engine.

This engine is the result of long and careful development work and the expenditure of many thousands of dollars in bringing it to its present point of super-efficiency. It is essentially a sleeve-valve engine, and should not be confused with the various "rotary valve"



The American Sleeve Valve Engine.

engines. It has nearly 100 less parts than the average engine of the poppet-valve type. There are, of course, no valve stems, springs, pushrods or cam shafts. It is a high speed engine. It shows remarkable power at low speed, and also maintains a steady ratio of power increase at the higher speeds. Moreover, its acceleration is held to be exceptionally rapid at all speed ranges, thus affording flexibility.

The revolving cylindrical sleeve (between the piston and the cylinder wall) is the dominant feature—the thing that has made this motor possible. This sleeve revolves in a film of oil. It does not move up or down. Only the one simple rotary movement is required. The revolving sleeve is held to possess highly important advantages. First, it gives perfect valve control and perfect timing at all speeds, with the utmost simplicity of construction. Second, it insures uniform compression by equalizing the wear resulting from piston thrust, an exclusive feature. As the sleeve revolves, its ports alternately register with the ports of the cylinder wall, and form the intake and the exhaust openings. These ports can be made any size necessary to insure the maximum efficiency, and as the passages are absolutely free and unobstructed, the cylinder can be entirely cleared of all burned gas at each stroke.

It is claimed that all the advantages of the original type of sleeve-valve engine are embodied in the American sleeve-valve engine in greatly simplified form. Only one sleeve, instead of two, insures efficient cooling. This engine is made by the American Sleeve Valve Motor Co., Widener Bldg., Philadelphia, Pa.

Silvex Installs Additional Battery of 30 Gridley Automatics.

Coincident with the removal into their new concrete and steel factory, the Silvex Co., makers of the well known Bethlehem spark plugs and other automobile accessories, are installing much new equipment including a battery of 30 Gridley automatics. These, together with those taken from the old plant, will be kept busy turning out shells and glands for Bethlehem spark plugs.

To get these machines at this time, Mr. Schwab, president of the corporation, reports that it was necessary to place the order for them more than a year ago.

Under normal operation the new Silvex plant will now have a capacity of 50,000 spark plugs for each eight-hour day.

Plate Glass Windows for Motor Car Curtains.

A successful method has been developed for installing beveled plate glass into flexible motor car curtains. The Johnston beveled plate glass windows are set into wooden frames and cushioned at every point. They will not rattle, break, pull loose or sag and are water-tight. They do not interfere at all with the folding or use of the top and curtains.

They add to the appearance of the car, replacing the celluloid with glass of crystal clearness. They can readily be cleaned, the same as any ordinary window glass. Some 100,000 cars have been equipped with these windows, over half of which are in use on the Pacific coast, where they were introduced under the name of Hartford windows.

Any shop with tacks, hammer and shears can install Johnston windows. Their introduction has spelt prosperity for the trim shops and local top makers whose source of livelihood dwindled when cars were furnished with tops complete. While the oval and round shapes are the most popular, there are 17 styles in all of Johnston windows, including beautiful diamond and other distinctive shapes.

Prices vary from $2.00 each for round glass windows 4 inches in diameter, to $8.00 for ovals 20x10 inches. They are manufactured by the William R. Johnston Mfg. Co., 359 E. Ohio street, Chicago, Ill.



Illustrating the Johnston Beveled Plate Glass Windows.

The Bearings Service Exhibit.

The Bearings Service Co., Detroit, Mich., is holding shows of its own, in the shape of exhibits, which are being held in 22 different cities as window displays. One of the exhibits is shown this month in our advertising columns, and a great many of our readers will undoubtedly be interested in the illustration, which shows a very attractive exhibit.

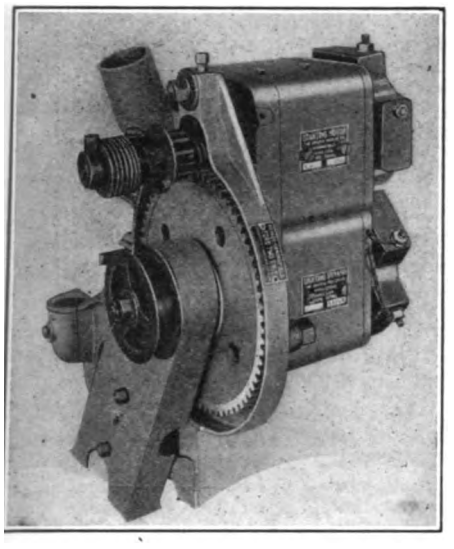
Dayton Airless Tires.

An interesting announcement appears in this issue in regard to the Dayton airless tires. The manufacturers state that these tires have been thoroughly tested by at least 50,000 owners of light passenger and delivery cars. It is claimed that the Dayton airless tires are as easy riding as pneumatics and much more economical. These tires cannot puncture, blow out or rim cut. The manufacturers have testimonials from Ford owners stating that 10,000, 12,000 and even 18,000 miles of service have any live dealer as the agency for these tires is granted to only one dealer in each community and considerable good will has been obtained from these simple tires. An excellent opportunity is offered to territory is still open. Dealers who are interested should write or wire for details of special proposition to the Dayton Rubber Mfg. Co., Dept. A. D., Dayton, O.

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Heinze-Springfield Starting and Lighting System for Ford.

The John O. Heinze Co., Springfield, O., is marketing a new electric lighting and starting system for Ford cars that presents many interesting and practical features. The design is of the build it "into" rather than "onto" type and this has been accomplished by means of a



Heinze-Springfield Starting and Lighting System for Ford Cars.

patented mounting plate which replaces the original timing gear cover of the Ford engine. By bolting securely to the machined surfaces of the Ford engine, a rigid and accurate mounting is secured.

The Heinze-Springfield employs a novel adaptation of the two-unit principle. While the starting motor is independent of the generator, both are mounted on a unit head thus guaranteeing that both the motor and generator shafts are parallel one with the other, and that the distance between them is accurate and fixed. Proper engagement of the automatic Bendix pinion with the large gear is in this way assured.

Drive from the generator shaft to the engine crankshaft is by a silent chain of liberal dimensions and ample strength.

A mechanical cut-out embodied in the combination cowl switch is held to eliminate adjustment, etc.

The switch not only controls the lighting and lighting features, but the Ford ignition as well. It is no longer necessary to shift one's position to use the Ford switch key on the ignition coil case, since this remains in the "On" position at all times. Neither must one hunt around for a heel button when desiring to start the engine. Just turn the lever to any of the "ignition on" positions, and press the button in the center of the switch. The switch lever likewise controls the lighting circuit, and permits of either dim or bright lights while the car is running. When parking, the car may be left with either "lights dim" or "off" as desired. In either of these last two positions the switch may be locked and the key removed. Not only is the switch lever locked, but the starting button as well. The dash equipment includes the H-S switch, a cowl light and an ammeter. These as well as an electric tail light are supplied without extra charge. The system is complete in every detail, even to an all-metal choking device to assure quick and easy starting.

The workmanship and materials employed are of the best. Motor and generator frames are of strip steel of highest electrical quality, bent to shape and welded. The pole pieces are of the laminated type. Four-pole machines are used. The motor is series wound, while the lighting generator is shunt wound, and regulation is obtained by means of the so-called "bucking coil" or reverse series winding.

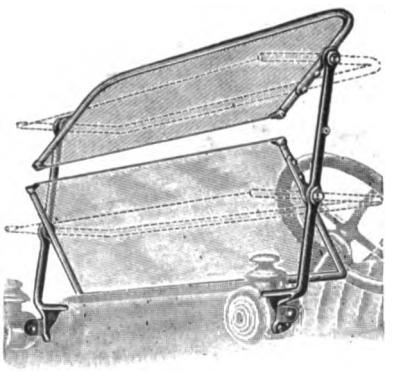
A claim of four hours' time for the installation by one man is made, and complete installation instructions and a complete booklet on the care and operation of the system are furnished with every system. Dealers and garage men interested in electrical equipment may secure complete literature by addressing the Service Dept. of The John O. Heinze Co., Springfield, O. A most efficient organization and quantity production makes possible the sale of this equipment complete in every detail for $85, f. o. b. Springfield, O.

Ospeco Specialties for Ford Cars.

Ford owners and dealers will be interested in the enlarged line of Ospeco products which are being put on the market this year. These articles are offered by the Michigan Auto Products Co., Ford building, Detroit, Mich. This firm was previously known as the Ospeco Mfg. Co. Illustrations of these articles are shown herewith. The Ospeco windshield parts are easy to install and make the regular Ford windshield a full-ventilating, slanting and rain-vision type which adds safety while driving in stormy weather and provides a full circulation of air in front of the driver's seat when desired. The Lawco streamline hood and radiator shell gives old Fords an up-to-date distinctive appearance—a big improvement over the regular late Ford hood.

In addition to these articles, this concern is introducing the Ospeco irreversible steering unit, which makes the Ford steer as easy as the high-priced cars, and it removes road shocks and insures perfect control.

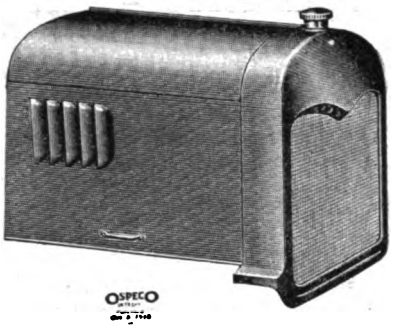
The Ospeco Fill-Thru-Sight-Gauge,



Ospeco Ventilating Windshield.

which has a luminous dial that can be seen at night, is also a welcome innovation, as it enables the driver to determine instantly the amount of gasoline in the tank and enables him to renew the supply without removing the gauge. The gauge fits into the top of the regular Ford tank or it can be furnished fitted onto a regular gasoline filler extension which is placed in front of the seat, directly below the cushion line, eliminating the necessity of disturbing the occupants of the front seat.

The Ospeco automatic headlight control provides convenience for Ford drivers. When the car is turned to the left, the left headlight remains stationary while right headlight automatically turns to the left; or when a right turn is made, the right headlight remains stationary and the left light turns to the right. This makes it possible when



Ospeco Streamline Hood and Radiator Shell for Ford Cars.

turning corners to view the path in which the car is about to go, as well as enables the driver to look straight ahead. Both lights can also be turned to the right, diverting the glare from the eyes of approaching drivers. The Ospeco automatic headlight control does away with the necessity of dimmers, adds safety and complies with traffic laws.

Full particulars regarding the complete line of Ospeco products can be obtained by writing to the Michigan Auto Products Co., Ford building, Detroit, Mich.

Johns-Manville Auto Accessories.

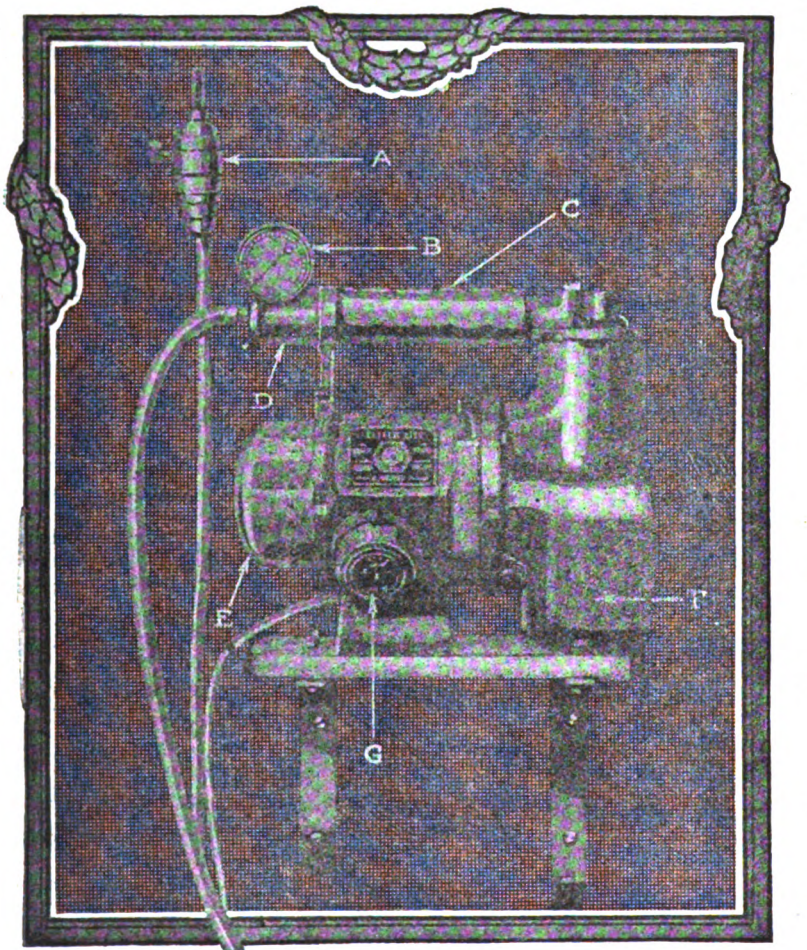
Dealers who are not already handling the celebrated line of Johns-Manville accessories should get in touch as soon as possible with the H. W. Johns-Manville Co., New York City. This line includes Non-Burning brake lining, fire extinguishers and the Johns-Manville speedometers. The quality reputation of these articles must be already known to a great many of our readers. These accessories are only sold by the manufacturers to legitimate jobbers who in turn stock the retail dealer. Generous discounts are allowed on very small orders. This of course means quick turnovers, dealer enthusiasm and more profit for all concerned. H. W. Johns-Manville Co. maintains 10 factories and has branches in 56 large cities in the United States.

New Plant for Williams Foundry and Machine Co.

The new plant of the Williams Foundry and Machine Co., Akron, O., for building tire repair outfits, is nearly complete and will be operated early in February, tripling the capacity of this department and relieving the shortage in Akron-Williams vulcanizing equipment which has been acute for many months. The building is 275x40 feet, three stories high, and its construction is one of several moves in connection with the recent change in management of the company and the increase in capitalization to $2,500,000.

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LECTROFLATER
ELECTRIC AIR COMPRESSORS



A SCIENTIFICALLY CONSTRUCTED SELF-CONTAINED "MOTOR AND COMPRESSOR"

A LECTROFLATER Electric Air Compressor is as scientifically designed, as accurately built and as carefully manufactured as a high grade automobile engine.

That's why LECTROFLATER Pumps wear years longer and give such greater all 'round satisfaction.

They are the most powerful, most capable air pumps of their size in the world.

They are built for hard service, are virtually trouble proof, have an operating expense that is negligible and are guaranteed to pump only cool, clean, dry air.

Note These Features:

A. Operates from any electric light socket, universal windings, uses either alternating or direct current—a big advantage should you ever move where the form of current is different.

B. Accurate automatic air gauge, which shows pressure in tire before, during and after inflation.

C. Condensing chamber, which abstracts all moisture from the air; also serves as handle when pump is carried.

D. Water trap,—the condensed water gathers in this trap and can be withdrawn at will.

E. Patented automatic forced draught air cooling system, ultra efficient. Pump can be run continuously without heating.

F. Lubrication by capillary attraction. Grease—not oil—is used. No oil level to maintain. No oil spray to ruin tires.

G. Handy switch button for starting or stoping motor.

H. The complete unit—electric motor and compressor—is self-contained in a single housing. No exposed working parts, either electrical or mechanical—no exposed gears, shafts, chains or belts. The outfit comes complete—ready for work as soon as unpacked.

THE BLACK &

South Calvert Street, Baltimore, Md.
U. S. A.

Chicago Representative:
V/. MEYER, 1339 S. Michigan Ave.



Look for the LECTROFLATER Exhibit at the Chicago Automobile Show—Armory.

Lectroflater Curb Station. A striking business display that commands attention and holds customers.



No. 2 Portable Tank Outfit. Easy to push around. Very popular in large garages and salesrooms.

DEALERS and JOBBERS

Every garage man, every tire man, machine shop, fleet owner and car dealer needs air service—the better, cheaper and more lasting the service the better for him.

These men are quick to appreciate the superiority of the Lectroflater line. Not only does it permit of a wider selection but the quality of the product plus the many exclusive features insure quick sales and satisfied customers.

We are completing arrangements Now for distribution through established jobbers and dealers. Discounts and catalogue electrotypes will be furnished reputable distributors upon request.

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MILES of COOL, CLEAN, DRY AIR, CHEAP.

Your modern dealer and garage man has learned the value of cleanliness. He has learned to conserve space, to eliminate unnecessary noise, to value his time, to stop leaks that cost money.

That's why LECTROFLATER Electric Air Compressors are displacing so many old-style pumps—cumbersome, unsightly, expensive-to-operate pumps.

LECTROFLATER Pumps *save* space because they are small and compact in size—built on the idea of an electric drill. Yet they are quicker and more powerful and have a greater capacity than most ordinary pumps three times their size.

A LECTROFLATER Pump IS *economical.* It soon saves its cost in current. It will inflate ten tires from 40 to 80 lbs. pressure at a cost of *one cent.* That means 100 tires at a cost of 10 cents, or a thousand tires at a cost of one dollar.

It IS *quick.* It saves time—your time and the customer's time. It will inflate a 33 x 4 tire from flat to full pressure in 2 minutes.

It is *clean.* There is no place for dirt to gather. All working parts are self contained under a single metal housing free of crevices and sharp corners. It is clean cut in appearance. It is clean working and relatively quiet in operation. And what is more important of all it delivers *clean* air to the tire, air that is free from oil spray and moisture.

It is *handy*—since it is small. It can be carried about like a satchel. To operate merely connect the cord to any electric light socket and turn the switch, **that's all.**

It is strong and durable, built for hard continuous service. It is accurately designed and finely constructed of the best materials obtainable. We have yet to hear of a LECTROFLATER Pump that has ever worn out.





DECKER MFG. CO.

Distributors in Canada
Northern Electric Co.
LIMITED
Montreal

WRITE FOR CATALOGUE

LECTROFLATER Electric Air Compressors are obtainable in a wide variety of sizes and combinations.

There are vertical tank and pump combinations, automatic tank and pump combinations, portable tank and pump combinations, De Luxe curb outfits, little units and big units, units small enough to be carried about like a satchel, outfits that can be pushed about like a cart, tire shop outfits that can be mounted on brackets on the wall, out of the way; outfits mounted on light portable tubular frames like an adding machine, with tool tray included; units for indoor use and units for outdoor use, units of almost every kind at prices to fit almost any pocketbook.

Complete descriptive literature on request. Prices range from $50 up.



No. 2 Automatic Stationary Tank Outfit. Ideal equipment for instantaneous service.



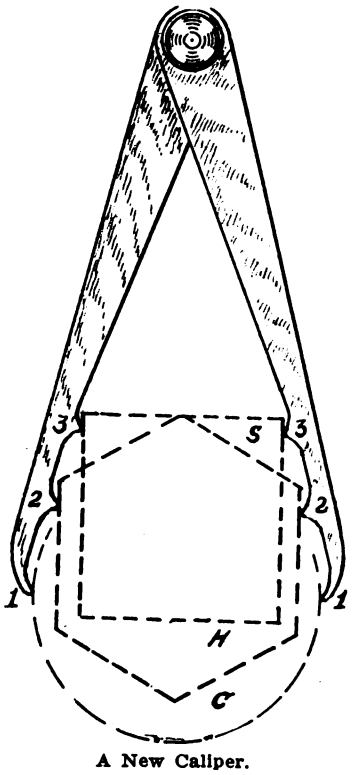
Model No. 2 Garage Pump. Mounted on movable carriage.

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A New Caliper.

An accompanying illustration shows a new type of caliper which has been put on the market by Roy L. Mossman, Humboldt, Tenn.

It is an inside caliper, having in addition the points 2-2 and 3-3, and gives



A New Caliper.

the minimum diameter of circular stock material from which square or hexagon pieces can be made.

Referring to the illustration it will be seen that the distance between the points 1-1 equals the distance across the corners of the hexagon H, or square S. The points 2-2 and 3-3 giving the distance across the flat sides of the hexagon and square respectively. This ratio holds good up to the capacity of the caliper, and whether used as shown, or as an inside caliper.

The Tri-Co Universal Rain Rubber.

This is a very clever device which has been placed on the market for keeping the windshield clear of obstruction to the vision. A light touch works the Tri-Co. It slides like skates on the ice, leaving the glass bone dry. This attachment can be put in position on any two-piece windshield in less than a minute. There are no holes to bore and no adjustments to be made. This rain rubber is very extensively advertised as space is taken twice a month in the Saturday Evening Post as well as in other prominent journals and it is a great seller for dealers at the regular retail price of $1.50. For full particulars, prices, discount, etc., write to the Tri-Continenental Corp., Buffalo, N. Y.

Storm & O'Hair Plant Makes Important Changes.

Because of the great increase of business at their reboring machine factory, it has been found necessary to enlarge the output of the Storm Mfg. Co., Thompson, Ia. (formerly Storm & O'Hair), from time to time to keep up with the incoming orders. So well has this been accomplished, even in their former rather cramped quarters, that at no time have they held up orders more than 10 days, which speaks well for those in charge.

Their new shops have now been in operation since November 15, and even with this increase in capacity they have at present contracts with outside factories for several thousand parts used in the manufacture of the machine. New capital is being interested to provide for further expansion and it is planned to have the new company incorporated as soon as possible. The management is entitled to considerable credit for the wonderful showing already made and with the additional capital and equipment the future will no doubt result in even greater progress.

Corcoran Mfg. Co. at Chicago Show.

The Corcoran Mfg. Co., Cincinnati, O., who had a most notable exhibit at the New York show, will during the Chicago show, exhibit in Parlor N, mezzanine floor, hotel Sherman. This company manufactures the celebrated Peerless products for Ford cars and these are certainly all that the name implies. The latest addition to this large line is the Peerless tool box which is claimed to be the strongest and lightest tool box ever made. It is designed to meet every requirement of a tool box and is long enough to hold a pump. The dimensions of this box are as follows: 22 inches long, 9 wide and 7 deep. The corrugations on the box give it great strength. The hinges are riveted on, not welded, and the box has a lock and two suitcase type of catches. The entire box is finished in two coats of black japan, and it has a neat and stylish appearance. Each box is packed for the trade in individual corrugated carton, facilitating shipment.

The Peerless tool box will certainly be a great seller during the coming season and it is earnestly recommended as a good specialty for dealers throughout the country. The Corcoran Mfg. Co. is equipped to produce 2,000 of these boxes daily and this capacity will undoubtedly be needed to meet the demand.

A New Schrader Specialty.

In addition to the full line of accessories manufactured by them and including Schrader universal tire valves, tire pressure gauges, tire pump connections, tire valve repair tools and automatic shut-off valves for free air stations in garages, the firm of A. Schrader's Son is showing a new tire pressure gauge for motor trucks.

As shown in the accompanying cut the new gauge has a bent foot or base which permits it being applied to the tire valve of tires on heavy vehicles no matter how small the space between the hub and the felloe of the wheel. As the pressure in such tires must be very much higher than in tires on pleasure vehicles the indicating sleeve of the new gauge is calibrated so as to register from 30 pounds of air to 170 pounds. This will accommodate tires up to 8½ inches.

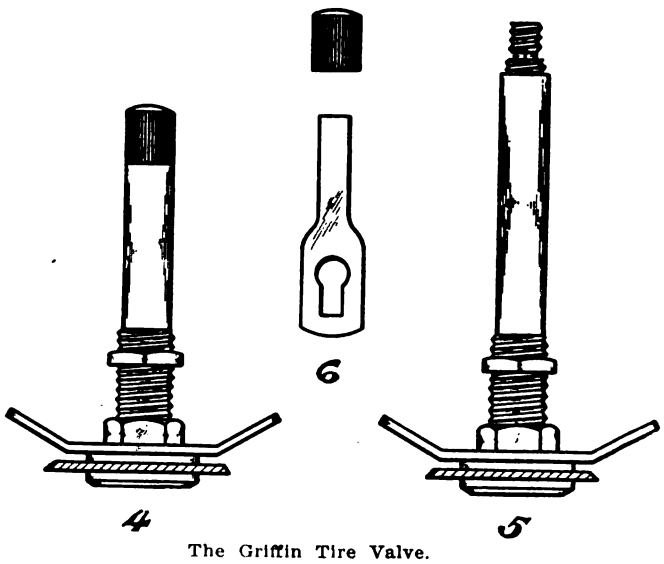


Schrader Tire Pressure Gauge for Motor Trucks.

As the necessity of keeping up tire inflation is even greater for commercial vehicles than for passenger cars the demand for the new Schrader gauge is apparent.

A New Valve for Automobile Tires.

An accompanying illustration shows a tire valve that operates without a plunger. It is held to be absolutely air tight and inflation or deflation is obtained by a simple opening or closing with the fingers. One of the advantages of the design is that it can be transferred to a new tire when the old tube is worn out or discarded. It is claimed the valve will outwear many tubes. Once installed there is no upkeep. All parts are standard, and the usual caps, felloes and nuts can be used. There are no extra pieces to carry or to insert, such as plungers. This new valve is made by the Griffin Mfg. Co., Boston, Mass., which concern will supply complete details upon request.



The Griffin Tire Valve.

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Stops Ford chatter grab and slip

That noisy chat-t-er-ing when you work the Ford brake is more than a nuisance. It means hard, slippery brake linings—waste motion—lost "pull"—car ruining vibration.

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

TRANSMISSION LININGS FOR FORDS

stop the chattering because they stop the grab and slip. The buttons of cork never become smooth or hard. Both corks and fabric wear very slowly. One set outwears three sets of ordinary linings.

Cork Insert Transmission Linings make the Ford brake ***brake***—make the car "pull" better and haul heavier truck loads—get ***instant action*** in response to a mere touch to the pedals—give "pep" in the get-away, put positive action in the brake.



Stops Fan Belt Slipping

The ordinary Ford fan belt soon gets "slippery as an eel." That means as high as 25% to 50% lost power. The fan naturally doesn't fan as it should—the motor overheats because it isn't properly fanned—and there's trouble to pay. ***Most*** motor trouble, in fact, results from overheating.

Cork Insert Fan Belt stops slipping throughout its long service. The buttons of cork hold their ability to grip—not affected by water, oil, grease or dirt. Better service, longer wear, greater economy.

PRICES

Cork Insert Transmission Linings $3 per set of 3

Cork Insert Fan Belts, $1 for 1917 Fords, 85c for preceding models

DEALERS Order Cork Inserts from your jobber. Cork Inserts are one of the biggest successes of the year in the trade. Every Ford has to have transmission linings and fan belts. Cork Inserts do the work better—last longer—save money. They are strongly advertised. They certainly do *move* and keep profits rolling in.

Advance Automobile Accessories Corp.
Dept. A5-1, 58 E. Randolph St.
Chicago, Illinois

Dealer's Coupon Check and mail today

ADVANCE AUTOMOBILE ACCESSORIES CORP.,
Dept. A5-1, 56 E. Randolph St., Chicago.

☐ Send one dozen sets of Advance Cork Insert Transmission Linings for Fords.

☐ Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.

☐ Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford.

(Regular dealer discounts to apply)

Name .....

City ..... State .....

Jobber's Name .....

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H L B Leather.

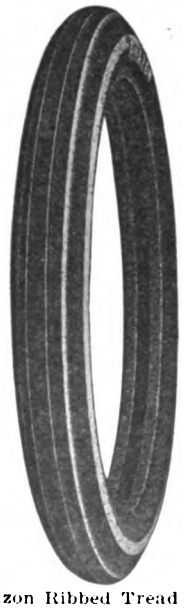
The H L B trade mark on leather goods is the equivalent to sterling on silver, or Tiffany on jewelry. This is the celebrated trade mark of the Hide Leather & Belting Co., 225 So. Meridian street, Indianapolis, Ind. The line of leather goods for motor vehicles manufactured by this company includes flat fan belting, cut lacing, Ford fan belts, V fan belting for grooved pulleys, Leathertax and cone clutch facings, in fact, almost everything in leather which is used around a car. This company also provides an attractive display rack which is furnished free to those dealers ordering the general assortment of H L B belting. This proposition should be interesting to every dealer and correspondence is invited by the manufacturers.

Alcola, A New Product.

The Alcemo Mfg. Co., Newark, N. J., after long experimentation have put a new product on the market called Alcola. It is a substitute for alcohol. It will prevent radiators freezing, even in as cold a temperature as 20 degrees below zero. It is chemically neutral, will not corrode, rust, or injure rubber, leather or other material. It is instantly soluble in cold water. One package is enough for a winter's service. The necessity of keeping practically all delivery cars and a great many passenger cars running during the winter has developed an enormous demand for such a preparation as Alcola.

The Amazon Ribbed Tread Tire.

A graceful and distinctive type of ribbed tread tire is announced by the Amazon Rubber Co., Akron, O. The tire has a glossy jet black body with a circling snow-white stripe on the sides giving it a touch of ultra-distinction and adding character to any car. The new



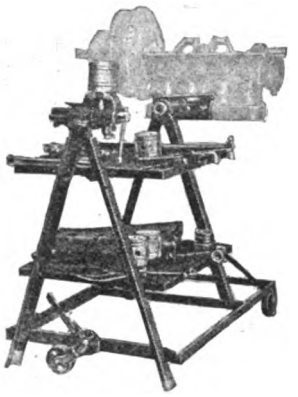
Amazon Ribbed Tread Tire.

tire has the same wear-resisting tread as the regular non-skid produced by this company and is also reinforced on the side walls with extra fabric breaker strips, affording protection against blow-outs. This anti-blowout feature is held to be exclusive in Amazon Tires.

Ekern's Portable Work Bench and Engine Stand.

The outfit shown in the accompanying illustration is the latest production in the way of work benches and embodies the features of a work bench and engine stand combined. It is especially designed for use in Ford repair shops, although there are many uses it can be put to in general repair shops as well.

It is provided with two large trays



Ekern's Work Bench and Engine Stand.

22x24 inches, where the workman can place tools and parts. The stand is mounted on three 4-inch diameter wheels. The rear castor wheel is so constructed that by pulling the plunger jim, the castor will swing up off of the floor and the stand will then rest firmly on its legs. By kicking the castor lever down, the stand will go back on its wheels and lock automatically.

A Ford assembly can be fastened to the stand by the two cap screws which hold the water inlet connection on the side of the engine block. The part fastened to the engine will revolve in the clamp on the stand, throwing the engine in any position or angle, where it can be retained by tightening the clamp screw.

The bench is also equipped with a machinist's vise which has a 3-inch jaw with a 4-inch opening. This will handle any work required in overhauling a Ford engine or axle or other work of similar nature.

The Portable work bench and engine stand is 36 inches high, occupies 27x42 inches of floor space and weighs 120 lbs. The list price is $40. Usual discounts are given to dealers and jobbers. An axle attachment can be used on this bench. This very handy device is marketed by H. G. Paro, 1410-12-14 So. Michigan blvd., Chicago, Ill.

The Stadco See-Safe Windshield Wiper.

This is the time of year when drivers have trouble with steam, vapor, frost and snow on the windshield. The Stadco windshield wiper is a device for remedying this trouble. Due to its inexpensive construction, this windshield wiper sells at the low retail price of 50 cents. A distinctive feature is that it can either sweep straight across the windshield and clean the entire shield or can be pivoted in one spot as desired. An item of interest to the dealer is the fact that this windshield wiper is packed in a neat counter display box holding 12 which materially helps in its sale. Readers who are interested should write direct to the manufacturers, Stadeker Metal Specialty Co., 19 So. Fifth avenue, Chicago, Ill.

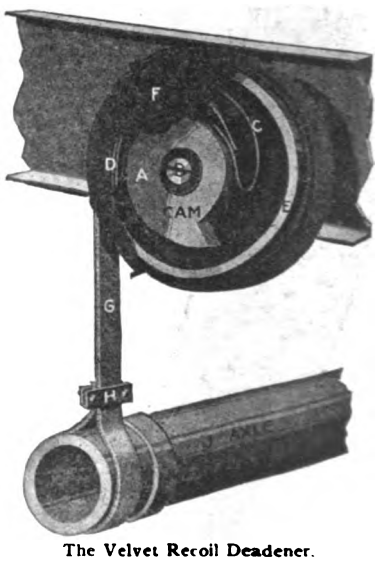
Stik-Tite Windows.

These windows can be attached to any back curtain of a car in 10 minutes by anyone and it is stated that they will stick to the curtain as long as the curtain sticks to the car. They are even stronger than the original windows because there are no stitching perforations to weaken the celluloid. The Stik-Tite windows are made in sizes and shapes for all of the more popular cars and sell at retail from 60 cents apiece to $2.50. Dealers are especially urged to see the Stik-Tite exhibit on the mezzanine floor of the Hotel La Salle during the Chicago Automobile show. A unique and practical souvenir will be given to every visiting dealer. If you cannot conveniently visit the Chicago show, write for prices, full particulars and terms to dealers to the manufacturers, the Cincinnati Auto Specialty Co., Elm street, Cincinnati, O. This company also manufactures the Frost King asbestos insulated radiator and engine covers, also a line of top and seat covers.

The Velvet Recoil Deadener.

Illustrated herewith is a new device called the Velvet recoil deadener. It is made on an idea new in shock absorbers. It works positively and quickly and yet it gradually deadens the shock on the recoil of the spring. This device answers an entirely different purpose from the cushion-type Velvet shock absorber, which the John W. Blackledge Mfg. Co., 341 East Ohio street, Chicago, Ill., have been making for several years past, the function of which is to make a stiff main spring ride soft and easy. The Velvet recoil deadener checks the upthrow of the car and makes the car ride easy.

The drum revolves on the pivot bolt B. The cam A is fastened stationary on the pivot bolt B. The drum E revolves on pivot bolt B. The spring C is fastened on the inside of the drum E and when the car goes upward the drum E revolves on pivot A and the spring C



The Velvet Recoil Deadener.

travels uphill on cam A and immediately gradually stops the upthrow of the car.

On the opposite side of the device, another spring winds the drum up and the spring C slides down hill immediately on the cam as the body of the car returns to normal position.

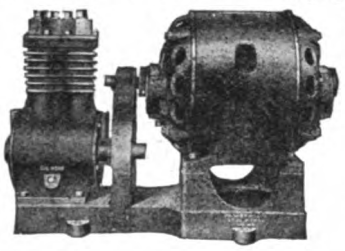
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THE BRUNNER GARAGE AIR COMPRESSOR EXHIBIT

AT THE CHICAGO SHOW WILL OCCUPY SPACES Nos. 203, 204, 205, 206, 207 and 208.

A competent force of engineers and sales representatives will be in attendance to explain our line to the visiting Jobbers, Garagemen and Motorists, and whether or not you are selling or using Brunner equipment our representatives will be glad to assist you in solving your compressed air problems. We extend you a cordial invitation to visit our Exhibit at the Chicago Show.



We also wish to thank our friends who displayed so much interest in our exhibit at the New York Show.

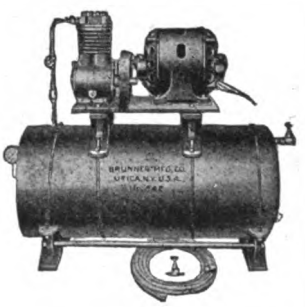
Proper tire inflation means more mileage and smoother riding—Brunner Service insures proper tire inflation.



The Brunner Sign is a sure sign of prompt and efficient compressed air service—are you Brunnerwise?

INVESTIGATE THE BRUNNER AIR COMPRESSOR

Every Jobber, Garageman and Motorist who is not Brunnerwise should investigate the Brunner Garage Air Compressor—he should give the compressed air problem more thought—he should know just as much about the air that goes into the tire as he does about the oil that goes into the motor—it is just as important.



Our new No. 15 Catalogue is ready for distribution—send for it today—and let us send you the name of the Brunner Jobber covering your town.



The Brunnerwise Garageman

BRUNNER MANUFACTURING COMPANY

Main Office and Plant:
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Cincinnati Branch:
Cincinnati, Ohio



The Brunnerwise Motorist

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Will Make BIG MONEY For You

Present War Conditions Make Old Motors Valuable

They all need reboring and rebuilding sooner or later. Hundreds of these are in your locality and need your attention.

Equip to do this work and it will come to you. Get in the game while it is highly profitable.

Don't deliberately send this work, which is rightly yours, out to others; do it yourself and **put the profits in your own pocket.**

STORM & O'HAIR CYLINDER REBORING MACHINES

Are practical and highly efficient equipment with which any repair shop can handle this profitable work.

No shop, large or small, complete without one.

It will save you time and money; keep your shop busy and make extra profit for you.

Make second-hand cars valuable. Don't handle them at a loss. Make a real profit.

Our Machines Cover All Requirements

Hundreds are in daily use in all parts of the United States and foreign countries.

The Storm Reboring Machine

Rebores all types of motors, automobiles, trucks, tractors, motorcycle and stationary engines of all sizes now in common use.

THE STORM & O'HAIR MACHINE FOR FORDS

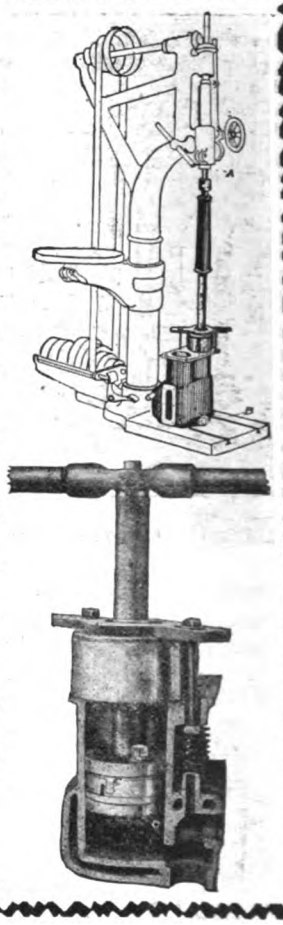
The most popular and successful Reboring Machine for Fords now on the market. Put out especially for Ford repair shops but will rebore other 3¾ inch detachable head motors, and being adjustable, can be made suitable for other work should occasion require, by the addition of extra parts. Our machines will increase the popularity and prestige of your shop. Equipped for operating by hand but can be furnished for operating by drill press as shown.

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We furnish pistons for all makes of motors.

Write Today for Literature and Prices

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Ten Thousand Questions Answered.

A very important work devoted to the mechanical part of motoring bears the title "Automobile Engineering." This book consists of five volumes, flexibly bound in genuine morocco leather, gold stamped. In the five volumes there are 2,400 pages with 2,000 illustrations, tables, diagrams, etc. The publishers state that these books will answer 10,000 questions about automobiles. Automobile Engineering is published by the American Technical Society, Dept. A-7551, Chicago, Ill. In an advertisement published elsewhere in this journal a coupon is printed which will enable our readers to order this book confidently. It is sold on the easy terms of 50 cents per week and with each set the purchaser receives free a year's consulting membership in the American Technical Society. As practically all of our readers are interested in the mechanics of motoring, many will no doubt be glad to cut out the coupon and send in an order for the book.

Cassidy Co. Becomes Sales Department of Rajah Spark Plugs.

The trade will learn with considerable interest of the arrangements just made between the Edward A. Cassidy Co., New York, and the Rajah Auto Supply Co., Bloomfield, N. J., manufacturers of Rajah spark plugs and Rajah spark plug terminals, whereby the Cassidy organization is to act as the sales department for the Rajah Auto Supply Co. and have entire charge of the selling end of the Rajah business hereafter.

Rajah plugs, one of the best known plugs in the trade, have been manufactured for 16 years, and were one of the first on the American market. They are used extensively by airplane manufacturers and by the Government in their army and navy planes. The majority of all racing cars are Rajah equipped. The winner of Pike's Peak hill climb and the winners of the 20, 50 and 150-mile races at Sheepshead Bay Speedway all used Rajah plugs.

Both the Cassidy organization and the Rajah Auto Supply Co. are to be heartily congratulated upon this connection. The Cassidy Co. enjoys a prominent place and a splendid reputation in the accessory field, and their remarkable selling ability combined with the recognized quality of Rajah plugs should make one of the most successful connections in the industry. A progressive sales campaign is being inaugurated to back up a nation-wide advertising campaign.

An Interesting Prize Contest.

The United Engine & Mfg. Co., Hanover, Pa., inaugurated during the New York Show in their exhibition space a very unique and interesting prize contest. Four prizes were offered to the four contestants who would give the best reasons why they wanted certain machines manufactured by the United Engine & Mfg. Co. The prize to be the machine itself. One prize was offered for the best reasons for wanting a Manley portable crane and similar prizes were also offered with reference to the Manley engine stand, Manley 22-ton press and the Manley 2-tank oil service. This contest will close January 26, 1918, and all reasons must be received at the main office of the company in Hanover, Pa., not later than midnight on the date named. Grammar, composition and spelling will not be taken into consideration by the judges of the contest, but the prizes will be awarded according to the practical character of the papers sent in. The judges of the contest will be Herbert L. Towle of J. H. Cross Co., Philadelphia, Pa., member of the S. A. E.; Louis F. Stoll, representative Class Journal Co., and J. W. Richley, president Richley Automobile Co., York, Pa. This contest is open to all garage owners and repairmen throughout the country and no doubt a very large number of competing essays will be presented to the judges for consideration.

Interesting Engine Catalogue.

We wish to acknowledge the receipt of an interesting new catalogue which has just been brought out by the Witte Engine Works, Kansas City, Mo. This catalogue is entitled, "How to Judge Engines," and contains valuable information which ought to be in the hands of every one of our readers. This book tells you what kinds of work an engine should do and the kind best adapted for general use and using all kinds of fuel. We understand that this valuable book will be sent free to any of our readers who will take the trouble to ask for it, and in writing, correspondence should be addressed to Ed. H. Witte, president Witte Engine Works, 2490 Oakland avenue, Kansas City, Mo.

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Two Ways of Travelling-Protected

The traveller feels better protected and safer on a railway journey if he purchases an accident insurance policy. It is that feeling of security, that insurance against danger, which increases the joy of the journey when you are riding in your motor car fortified by Tuthill Titanic Springs. The Tuthill Titanic gives you a 37 year, Old Line, Gibraltar-like insurance against accident or possible injury—because they are guaranteed for life against center breakage.

Tuthill Titanics insure easy riding, constant no-squeak lubrication, and the uninterrupted use of your car. Best of all, they insure against constant worry—giving you true peace of mind when motoring with friends and family.

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In their construction only high-grade steel is used. They are made with our patented center-arch—no weakening center bolt hole—no center nib. With such reinforcement there is no possibility of breaking under strain. They are covered by the broadest guarantee ever placed on automobile springs.

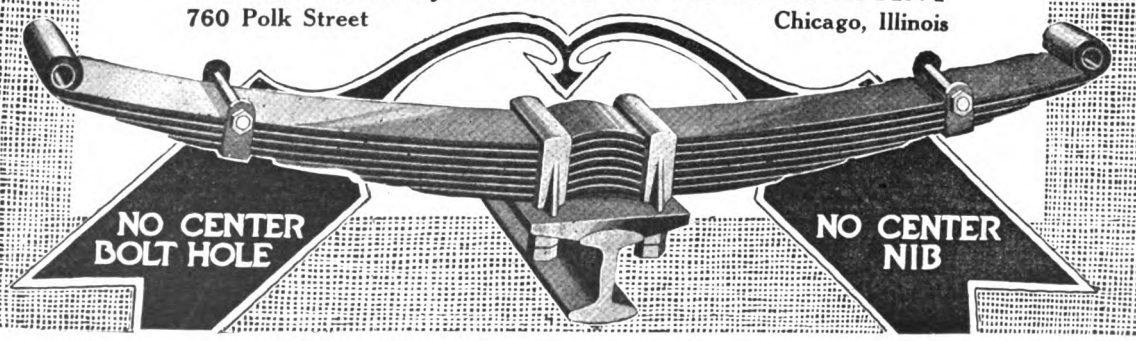
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More Tuthill Titanics are used for replacements than all other makes combined. There is a Tuthill Titanic for every make of car. See them at the Chicago Auto Show. Dealers everywhere know the advantage of selling these quality springs. If you are not supplying your customers today with Tuthill Titanics—write at once for our complete new price list. Sell a spring you can guarantee and which will bring you the business. Your trade appreciates the business. For your nearest Tuthill Distributor, see Chilton's Automobile Directory or Automobile Trade Directory.

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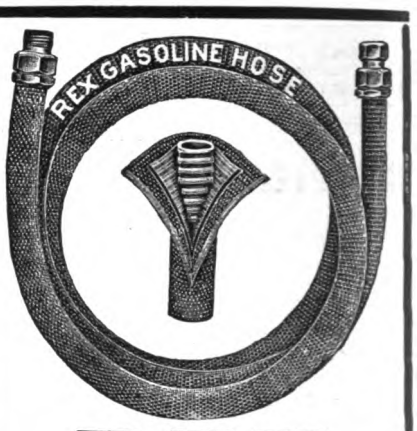
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30x3½	6.60	7.15	2.50
32x3½	7.15	7.70	2.75
34x3½	8.25	8.80	3.00
30x4	7.70	8.25	2.75
32x4	8.80	9.35	3.00
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35x4½	11.00	12.10	4.10
36x4½	11.00	12.10	4.25
37x4½	12.10	13.20	4.35
34x5	11.00	12.10	4.50
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34x3½	3.50	5.50	6.54
31x4	3.25	6.25	7.24
32x4	3.25	6.25	7.24
33x4	3.75	6.75	7.75
34x4	4.00	7.00	8.00
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32x3½	6.50	36x4½	10.00
32x4	7.00	36x5	10.00
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34x4	8.00	37x5	10.50
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32x3½	7.00	7.70	2.55
34x3½	7.70	8.25	2.70
31x4	7.70	8.25	3.15
32x4	7.70	8.25	3.35
33x4	8.80	9.50	3.45
34x4	9.90	10.50	3.60

Size	Plain	Non-Skid	Tubes
35x4	$9.00	$10.00	$3.70
36x4	9 00	10.00	3.80
34x4½	10.00	11.00	4.40
35x4½	10.00	11.00	4.50
36x4½	10.00	11.00	4.60
37x4½	10.00	11.00	4.75
35x5	11.00	12.00	5.35
36x5	11 00	12.00	5.45
37x5	11.00	12.00	5.55

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This is a jack which has recently been placed upon the market and which ought to be of interest to every garage owner and repairman. With this jack, it is not necessary to crawl under the car in the dust and mud to place it in position, as it is operated by a long, folding, detachable crank handle. The mechanism rests on an end thrust ball-socket which carries entire weight of car. The efficiency and absolute safety of this jack is bound to make it a big seller, especially as it retails for only $7.50. Dealers who are interested should write or wire for dealers' proposition direct to the manufacturers, the Gibraltar Jack Co., Inc., 1902 Broadway, New York City.

Stegeman Motor Car Co. Reorganized.

A complete reorganization of the Stegeman Motor Car Co., Milwaukee, Wis., is in progress, Oscar Stegeman having resigned as president and general manager, his place as president being filled by Adam J. Mayer, treasurer of the Mayer Boot and Shoe Co. L. G. Schertl resigned as secretary and treasurer in favor of Lynn S. Pease, who is well known as an expert on industrial organization. The new organization will continue to manufacture 6-cylinder trucks but will confine the line to 2, 3½ and 5-ton capacities eliminating the 3, 4 and 7-ton sizes.

Master Trucks Show Fuel Economy.

Inquiry among users has been made by Master Trucks, Inc., Chicago, Ill., to find what its internal gear drive trucks show in the way of fuel economy. "With everyone urging economy of gasoline," says Eugene Goldman, vice-president and general manager, "the showing made by Master trucks in gasoline consumption is such that it sells trucks for us every day.

"A Pittsburgh user, a dealer in coal, stone and builders' supplies, writes that he has worked his first convoy of Masters every day under most severe conditions, in nearly every instance hauling an overload of from 25 to 75 per cent. The streets over which the hauls are made are the steepest in Pittsburgh, most of them being rough and unimproved, as the district is one that is just being built up. These two-ton Masters are averaging from 8½ to 9 miles per gallon. He has just ordered another Master.

"There have been instances brought to our attention where Master two-ton trucks have shown a fuel economy of over 10 miles per gallon under capacity load."

Mason Earns Twenty Per Cent. on Common Stock.

The annual report of The Mason Tire and Rubber Company for the year ending October 31, 1917, as read at the annual meeting recently held, shows gross sales exceeding $1,200,000 and total net profits amounting to $181,504.36. Deductions for income tax reserve, preferred stock dividends paid during 1917, and preferred dividend reserve, leave a balance to be put into the surplus account of $104,330.22. This surplus for the year amounts to within a fraction of 20 per cent. on the common stock.

The following directors were elected at this meeting: O. M. Mason, D. M. Mason, D. N. Mason, M. B. Mason, John H. Diehl and R. W. MacKinnon. The officials were re-elected, namely O. M. Mason, president; D. M. Mason, treasurer and general manager; R. W. MacKinnon, secretary. The stockholders voted unanimously to increase the par value of the preferred stock from $10 to $100 per share.

The New Hotel Bingham.

Visitors to Philadelphia, Pa., will find in the New Hotel Bingham on Market street a hotel which is centrally located and containing large, well lighted and comfortable rooms. This is the only hotel in Philadelphia having direct subway connections with all railroad stations and ferries. In the summer season the guests enjoy a beautiful roof garden. The table is noted for its excellence. A club breakfast is served and special luncheons. Rooms without bath may be obtained at $1.50 and with bath, $2.00 per day and up. Rooms may be engaged by writing to Frank Kimble, manager.

MECHANICAL DRAWING.

By ERVIN KENISON, S. B., Instructor in Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 140 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price.....$1.00

Sent to any address postage prepaid, on receipt of price. Address

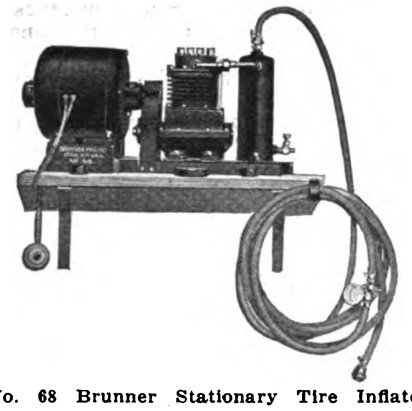
M. T. RICHARDSON CO., Publishers,
71-73 MURRAY STREET, NEW YORK

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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The No. 68 Brunner Stationary Tire Inflater.

This new Brunner outfit, designed for installing on a wall bracket in a small public or a private garage for pumping direct to the tire, has just been put on the market and the manufacturers claim



No. 68 Brunner Stationary Tire Inflator.

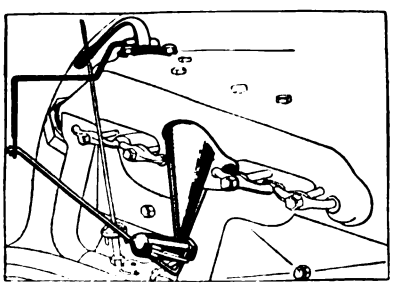
this to be the most efficient and the best constructed air compressor of its type manufactured. The compressor has two cylinders having a bore of 1⅝-inch and a 1½-inch stroke. The compressor will deliver 1¾ cubic feet of free air per minute and 125 lbs. pressure.

The lubrication arrangement is very simple and effective and the net weight of the outfit is 90 lbs. The length is 20½ inches, width 15 and height 12. The motor is geared to the compressor by means of a compressed cloth pinion gear and the compressor is piped to the oil separator with a heavy copper pipe, making a very compact and substantial unit. The compressor has three metal rings on each piston and the motors used are ¼ horsepower compound wound direct current and repulsion-induction type alternating current.

The Brunner Mfg. Co., Utica, N. Y., makers of this outfit, will be glad to supply descriptive bulletins and prices upon request and the outfit will be found with the balance of the Brunner line at their exhibits at the Chicago and Boston shows.

Ford Owners Stop Wasting Gasoline.

The above is a very striking heading which is used in the advertising announcements of the Foot-Air Accelerator Co., 1834 Broadway, New York City.



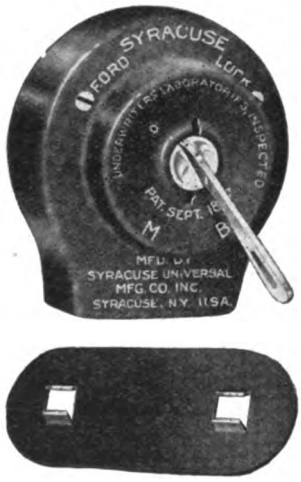
The Foot Air Accelerator.

This device is illustrated herewith and Ford owners who have used this invention state that it is certainly a great fuel saver. The manufacturers claim that this specialty will give the Ford car more speed and power, eliminate to a great extent carbon and obtains a cooler engine, also affords greater flexibility and ease in driving. The saving in gasoline is estimated to be from 25 to 33⅓ per cent. for those who use this device. Address all orders and inquiries direct to the manufacturers, the Foot-Air Accelerator Co., 1834 Broadway, New York City.

The Syracuse Lock for Fords.

The new five-tumbler Syracuse Ford lock which has just been endorsed by the Underwriters' Laboratories, is of a design that is interesting and in many ways new in Ford switch locks. One of its novel features is the fact that when the car is locked, the common contact strip through which the current must pass in order to get to the coils, is "grounded." This, the manufacturers claim, absolutely prevents a spark reaching to the spark plugs by rewiring, installing a separate battery, or by any other means without the key.

Another novel feature is the method of connecting up the coil box with the steering wheel column in forming the "ground." This is done by the "ground plate" which, after removing the nuts, is slipped over two of the bolts that help fasten the coil box and the steering



Syracuse Ford Lock and Grounding Plate, Showing Method of Connecting.

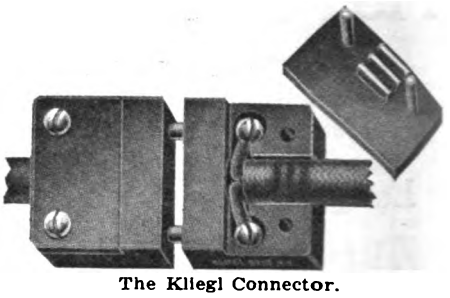
wheel column to the dash. When the nuts are again screwed on the bolts, they force the turned up portions of the "grounding plate" into the threads of the bolts, making a permanent "ground" between the coil box and the frame of the car. The common contact strip is "grounded" to the coil box only when the car is locked, by a spring which is a part of and is operated by the lock.

The lock when in neutral, is securely locked to the switch, independent of the lock casing screws, by a large screw which is made like a tap and is screwed into the key guide hole of the regular Ford switch.

The coils are locked into the coil box by wedging. This allows them to be adjusted but not removed without the key. The lock has five tumblers, allowing many thousand different keys. It can be installed by anyone in five minutes. It fits both the old and the new Ford switches. Three nickel-plated keys are given with each lock. It is manufactured by the Syracuse Universal Mfg. Co., 312 West Fayette St., Syracuse, N. Y. It will sell for $2.50.

Kliegl Electrical Connector.

This device is suitable for making rapid, frequent electrical connections when charging storage batteries in garages, for example, this connector is made of hard fibre, having brass split pins, that fit tightly and make good contacts. The connector is provided at each end with an approved cable clamp with teeth for biting into the cable to hold it firmly by its outer insulation, prevent-



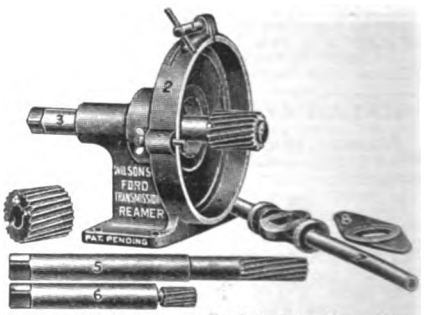
The Kliegl Connector.

ing any mechanical strain upon the connection. It is held to be superior to any other make and is approved and listed by the Underwriters' National Electric Association.

The Kliegl connector is designed for 15 amperes, 125 volts, and is sold at $1.37. Kliegl two-wire connectors are made from five to 200 amperes and 125-250 volts, and three-wire connectors from five to 100 amperes. It is manufactured and sold by the Universal Electric Stage Lighting Co., Kliegl Bros. proprietors, 240 West 50th street, New York City.

Wilson's Ford Transmission Bushing Reaming Machine.

Readers who are doing repair work on Ford cars will be interested in the machine herewith illustrated which is manufactured by K. R. Wilson, 1018 Main street, Buffalo, N. Y. The manufacturer states that this is the only machine or tool made that will ream bushings in all three drums and triple gears. The work done by this machine is absolutely true, giving a perfect fit and alignment. Only two minutes' labor is required to set up and ream one bushing and 25 minutes to complete the overhaul of the transmission. All work done by this machine is absolutely uniform. The manufacturer claims that this machine in any shop will save 75 per cent. of labor costs. The price



Wilson's Ford Transmission Bushing Reaming Machine.

of the machine complete with the triple gear attachment as shown in the cut is $60 or $50 without the triple gear attachment. Write for further description and terms to K. R. Wilson at the address above named.

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HUDSON MOTOR SPECIALTIES



HUDSON
UNIVERSAL JOINTED VALVE GRINDER

Do it right! Clean and grind your valves uniformly—no grinding on one side only - this is a perfect worker — not an awkward, rigid, unhandy tool.

The Hudson Valve Grinder is especially useful in grinding the valves on the fourth cylinder of the Ford engine, which is very difficult to reach with the unwieldy solid grinder.

When the shank of this tool is being revolved between the palms of the operator the entire valve is ground ACCURATELY—let this one fact stick!

Price, $1.50

HA-MAA
HUDSON AUTOMATIC MANIFOLD AIR ADJUSTER



Automatically adjusts the air feed through the manifold, at all speeds from idling to highest speed of motor. A motor saver and a gasoline saver.

PROOF FOR THE SKEPTICAL: Adjust carburetor before attaching and you will then find it necessery to cut down carburetor to prevent motor racing. Proof positive that consumption of gas is cut down for same number of revolutions of engine.

GO FURTHER! Place finger over inlet of the HA-MAA and motor stops when idled down, showing that without automatic feed of air the supply of gasoline through carburetor is not sufficient to turn motor over.

THE HA-MAA is so simple of construction that it is hardly believable it is so capable. This permits us to offer the very low

List Price of $1.50

HUDSON CRANK CASE
REPAIR ARM FOR FORD CARS
AN INDISPENSABLE TIME SAVER



Crank case repairs are difficult, expensive and time consuming. The engine must be taken out of the chassis, torn apart to make the repair, and then have a new arm riveted on.

All this is now done away with. In its place you have a simple, quickly executed action, and you are ready for work in a tenth of the time. All you need do now is to loosen three bolts, slip the Hudson Repair Arm in place and tighten!

Who would bother with the old, cumbersome method when he can get the time and labor saving Hudson Crank Case Repair Arm for

Only $1.50

HUDSON
DEMOUNTABLE HUB
A LONG STEP IN ADVANCEMENT



NEITHER A MAKESHIFT NOR A SUBSTITUTE for demountable rims, but superior! It is possible to change four Demountable Hub Wheels while one demountable rim is being changed.

CLAIMS: Lighter—less complicated — fewer parts to wear. No parts to rub or squeak, easily changed and more quickly. Last, but not least—CHEAPER.

NO BOLTS OR NUTS to loosen up or remove. No clamps. Just turn the hub cap and off comes the wheel.

Attachable to any Standard Ford Wheels.

List Price of Set of 5 is $12.50

Will Exhibit at CHICAGO SHOW and at 1456 South Wabash Avenue, Chicago

BOSTON SHOW EXHIBIT Will Be at Booth of Motor Car Equipment Co.

Hudson Motor Specialties Co.

1606 REAL ESTATE TRUST BUILDING

PHILADEPHIA, PA.

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Bearings Service Exhibits in Twenty-two Cities

We're having an "Auto Show" all our own—and not merely one, but twenty-two of them—one at each of our twenty-two branches.

There's much of interest at these exhibits for every automobile dealer, garage-man and motorist. You'll find here for inspection, Timken, Hyatt and New Departure bearings of every size ever used in motor vehicles—besides valuable books and literature to assist you in getting a maximum of service out of the bearings in your own motor car.

These exhibits will continue during the entire month of January. Don't fail to attend the one at our branch nearest you—and get your souvenir.

Branches In These Cities

New York	Los Angeles	Kansas City	Indianapolis	Omaha
Detroit	Atlanta	Dallas	Philadelphia	Pittsburg
Chicago	Seattle	Cleveland	St. Louis	Portland, Ore.
Boston	Minneapolis	Denver	New Orleans	Toronto, Can.
San Francisco				Rochester

BEARINGS SERVICE COMPANY

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BEARINGS SERVICE COMPANY

Detroit, Michigan

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DREADNAUGHT TIRES



TOUGH, strong, gripping and enduring is the DREADNAUGHT TIRE, and like the grim Dreadnaught of the sea it has the ability to take care of itself.

DREADNAUGHT TIRES are chuck full of vitality and live to a ripe old age. In addition they lengthen the life of the car itself. Dealers and consumers alike are gratified with the hundreds of uninterrupted miles which DREADNAUGHT TIRES deliver in excess of their Guarantee which is for 5,000 miles. Two famous treads—DREADNAUGHT Reinforced Vacuum Tread and the DREADNAUGHT Ribbed Tread.

The Dreadnaught Tire and Rubber Company
Baltimore, Maryland

We have an exceptional proposition for dealers and assure excellent service and territorial protection with intensive co-operation from our organization. Write or wire, Department "1".

CHAS. F. U. KELLY, Inc., *Sales Department* 1834 Broadway, New York

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—Contributing to the Spring Scrapheap—

RUMMAGE around in any scrap iron heap and you'll find broken auto springs—and nine out of ten broken in the center. That gives you a clear-cut clue to where the greatest breakage danger lies—right in the center. Shows you, too, that elimination of center breakage is essential to greatest, safest spring service. But in side-stepping weak-centered springs be careful that you don't jump from the frying pan into the fire.

Higgins Quality Springs

FOR REPLACEMENT

have abolished the center breakage trouble. Not only that, they've mastered practically *all* spring deficiencies. True—other springs have greatly lowered center breakage. The hump has done that. But, in doing it, it has stored up other trouble. They break outside the malleable that holds leaves together in center. Bolt construction—the boring of a hole where strength is urgently needed no longer has any excuse for existence—it has no redeeming feature.

Higgins Quality Springs are "nibbed" together in the center—one leaf dovetails into another—preventing slipping and lending increased strength where it is most needed. Notice the illustration—see the flat back at center. There's *spring* there—there's *resiliency* that sponges up the jars and strength that will "give" and "take" with the hardest going and heaviest loads.

That same durable resistance dominates every point and part of Higgins Springs. The best that scientific skill, care and quality of material have to offer are built into Higgins Springs.

They are right from the beginning. Made only of best grade of motor car spring steel of a special Analysis—properly heat treated—lubricated before assembled with the best squeak and rust prevention known—handsomely finished in black—thoroughly tested before shipping. They "*arrive*" right and they stay *right* on the road—right up to the last minute of use. **Guaranteed the same at all points**

Tell Your Dealer

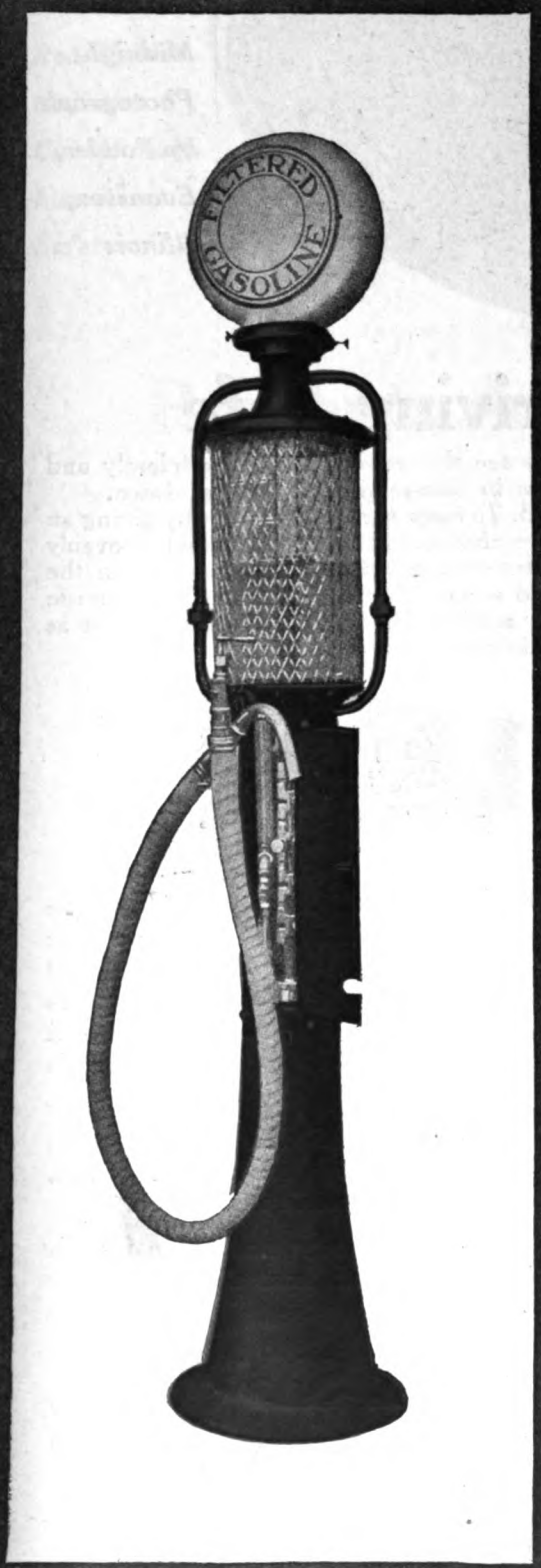
you want Higgins Quality Springs—insist on having them. Don't be satisfied with a substitute. A "just as good" is *never* as good.

Dealers *Send for discounts, attractive proposition and Catalog C 1917, listing 500 different styles.*

Higgins Spring & Axle Co.
Dept. 514
Racine, Wis.

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GUARANTEE
VISIBLE PUMPS



GUARANTEE

For Garages and Filling Stations Where Speed, Accuracy and Satisfied Customers Are Desired.

See Our Exhibit At Chicago Show

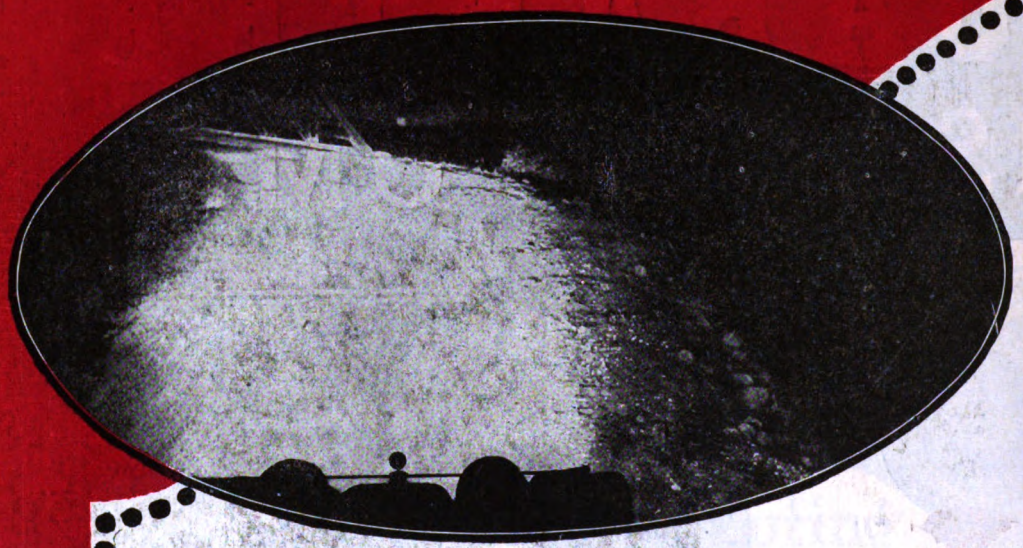
HEPBURN WALKER

DISTRIBUTOR

Guarantee Liquid Measure Co.

Farmers Bank Bldg., Pittsburgh, Pa.

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Unretouched Midnight Photograph by Fowler, Evanston, Illinois

Makes Night Driving Safe

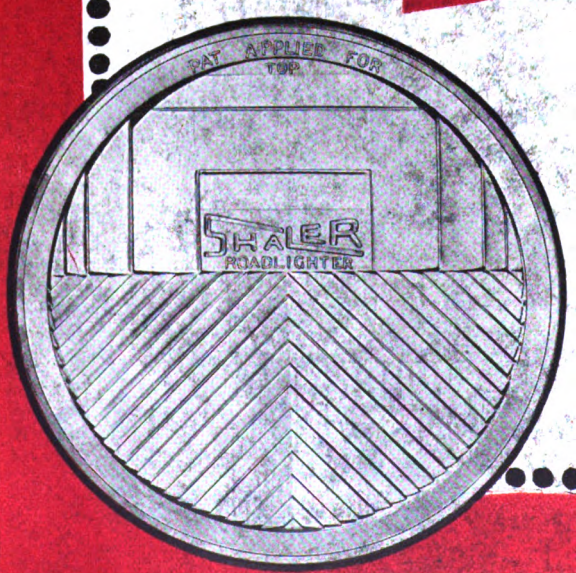
The motoring public has been waiting for a headlight front that performs three distinct functions:

1. To prevent glare from the lights on your own car.

2. To give you a *strong* driving light—so strong that no matter how intense the glare from the approaching car, you will not be blinded but can see the edge of the road clearly and pass in safety without slowing down.

3. *To make night driving safe*—by giving an intensified bright white light which is evenly distributed by prismatic refraction on the road where you need it, so that you can see the road, ditches and danger spots just as plainly as in daytime.

SHALER



The SHALER Roadlighter concentrates the light—which with an ordinary lens is wasted—as extra light on the road. At a distance of 200 feet ahead of the car the light on the road is approximately twice the intensity of that from a bulb of the same candle power, projected through a clear glass headlight.

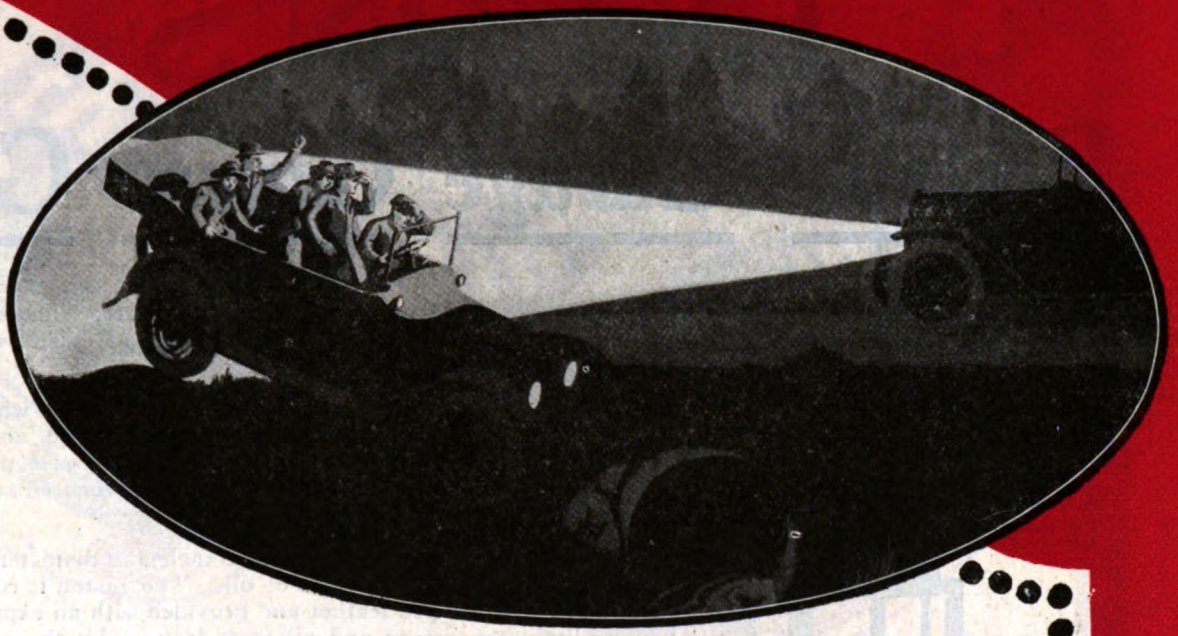
It obviates the need of dimmers, spotlights, auxiliary headlights and high candle power bulbs, which drain the batteries and impair ignition.

It pierces fog farther than you could see through it by daylight. Its smooth front does not collect mud, snow or dirt.

C. A. Shaler Co.
Waupun

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SHALER Roadlighter on Either Car Would Insure Safety



Prevents Accidents Like This

The danger of night driving is banished because *the other fellow's glare can't blind you* and your light cannot bother him, if your car is equipped with SHALER Roadlighters. You have intense light from fence to fence that enables you to pick the best part of the road and drive at daylight speed in perfect safety.

The SHALER Roadlighter throws concentrated beams on the edges of the road such as could only be obtained by using a spotlight on each side of the car. This beam is so strong that it counteracts the glare from approaching headlights and enables one to keep a clear view of the edges of the road while passing.

ROADLIGHTER

Pierces the Glare of Approaching Headlights
Illuminates the Ditches
Accurate Focusing Unnecessary
Easy to Keep Clean

Shoots the Light Far Ahead
Legal Everywhere
Rays Penetrate Fog and Dust
Easy to Install

Limited Offer to DEALERS ONLY

Regular retail prices of the SHALER Roadlighter are $2.75 per pair for Ford size and smaller; $3.50 for larger sizes. Packed ten in a carton.

We want every automobile accessory dealer in the United States to try out a pair of SHALER Roadlighters on his own car—*at our expense.*

Mail the coupon for full particulars regarding this big offer. There is no obligation—don't put it off—clip and mail coupon *now.*

9801 Fourth St.
Wisconsin

Dealers' Offer Coupon

C. A. SHALER CO., 9801 Fourth St., Waupun, Wis.

Gentlemen: Send me full particulars about your offer to let dealers try out a pair of SHALER Roadlighters at your expense. This obligates me in no way.

Name.....

Address.....

City and State.....

My Jobber's Name Is.....

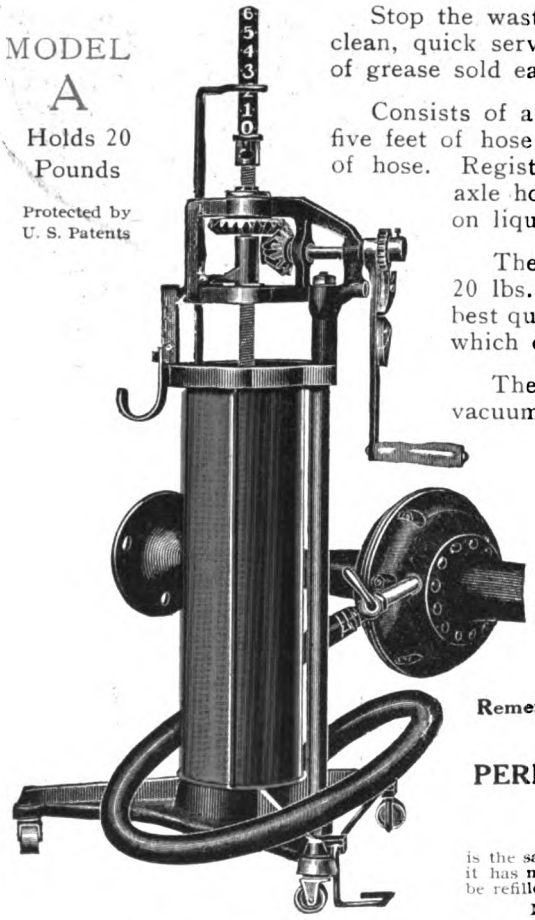
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EKERN'S

Portable Garage Grease Guns

MODEL
A
Holds 20
Pounds

Protected by
U. S. Patents



Stop the waste! Get paid for all your oil and grease. These guns give clean, quick service. They are strong and durable. Register the amount of grease sold each customer.

Consists of a heavy seamless steel cylinder mounted on wheels. Has five feet of hose attached to bottom with shut-off valve and nozzle at end of hose. Register measures accurately the amount of grease put into the axle housing or transmission case, and will work equally as well on liquid oil as on hard grease.

The cylinder is 20 inches long by 6 inches in diameter; capacity, 20 lbs. of grease or 2½ gallons of oil. The piston is covered with best quality cup-shaped leather and provided with an expansion ring which eliminates grease and oil from leaking by the piston.

The piston also has an automatic air vent to release the vacuum in the cylinder when cranking the piston up for refilling. The base is provided with a locking device which lifts the castors up from the floor when cranking.

Every up-to-date garage should have an **Ekern Grease Gun.**

Quick Service

Saves Time & Money

Order One Now

Remember That Every Ekern Gun in Use is Giving

PERFECT SATISFACTION

MODEL "A"

is the same in every way as Model "B," only it has not the quick return gears, and can be refilled in five minutes.

Model "A" weighs 90 pounds.

List Price, $45.00

MODEL "B"

is provided with a set of quick return gears and can be refilled in one minute. Model "B" weighs 95 pounds.

List Price, $47.50

Write for Full Information

H. G. Paro

Dept. C

1410-12-14 Michigan Boulevard

CHICAGO, ILL.

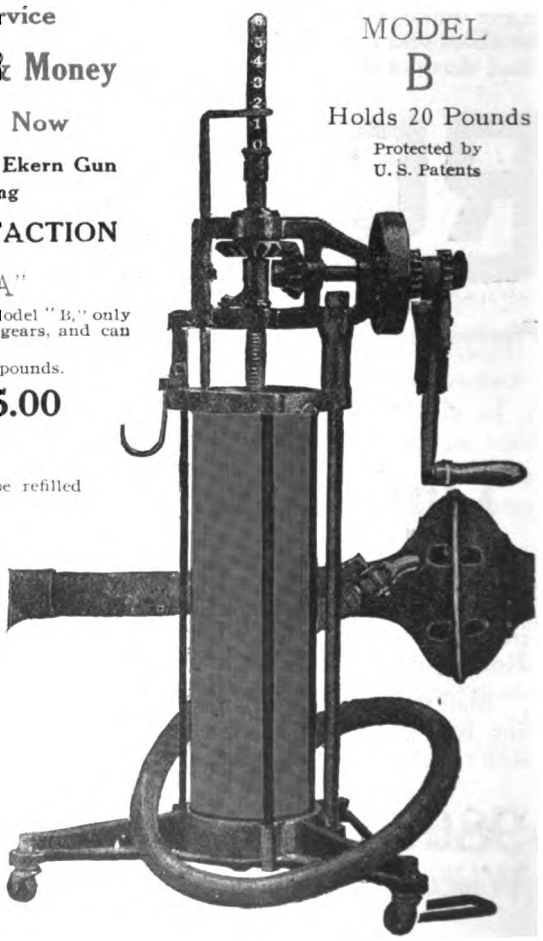
Factory: Ekern Bros. Mfg. Co., Flandreau, S. D.



In Position for
Refilling

MODEL
B
Holds 20 Pounds

Protected by
U. S. Patents



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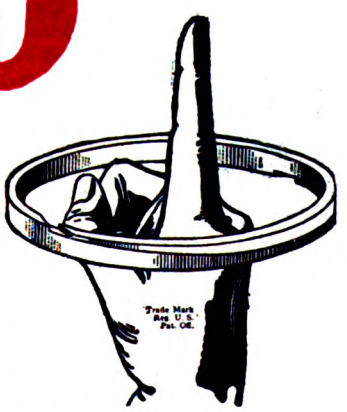
This is "A Most Prosperous New Year" for garage men who handle Inlands. They are ringing out old piston rings and putting in hundreds of new Inlands.

The dealer who handles Inlands has *three special* advantages that no other piston ring proposition offers. He knows that the Inland is *mechanically* perfect—absolutely gas-tight and strongest and most durable.

He *knows* he can get *more* car owners to install Inlands, because with Inlands he can save $5 to $10 per set over any other type of gas-tight piston ring.

He *knows* that Inland's big advertising is convincing thousands of car owners of the economy of installing gas-tight piston rings and of the *double* saving that Inlands offer. If you are not an Inland dealer now make a New Year's resolution to handle Inlands, and get the full business building benefit of Inland advantages and Inland advertising

INLAND
1 PIECE PISTON RING



Strike while the iron is hot.

Send today for *complete free material* which is specially prepared for your local use. It will link *your* place right up with the car owners in your vicinity and bring *you* their overhauling business. Write today.

Ask your jobber for terms to you on Inlands.

Inland Machine Works, 802 Mound Street, St. Louis, U. S. A.

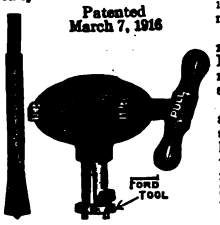
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SPECIALTIES

The Mosco Valve Grinder

This tool differs radically from others in several respects. It is really more of a machine than a hand tool, as it renders valve grinding an accurate mechanical operation rather than a guesswork hand job.

Patented March 7, 1916



It has been found that a much more rapid motion can be obtained with the Mosco Grinder than with the ordinary tool, resulting in a very superior finish on the seats.

The device is made of the best materials and is thoroughly guaranteed in every respect. At the low price at which it is listed there should be one in every kit, when it is considered that it is offered not only as a tool, but as a QUICKER, SAFER and BETTER METHOD of valve grinding.

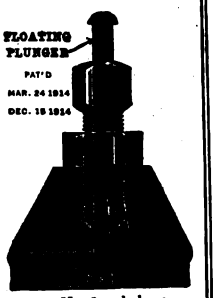
PRICE $1.75.

SIZE (IN CARTON), 3⅝x6¼x3⅝. WEIGHT, 30 OZ.
SHIPMENTS PACKED TO ORDER.

Mosco Floating Plunger Wheel Puller

Starts a "Frozen" or "Stuck" wheel instantly. Strike the plunger; turn the screw, strike again and the wheel comes off without injury to hub-threads, spokes or axle.

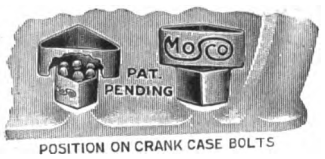
Made for 200 models of 40 popular cars.



No. 3 and above

Mosco Socket Nut and Bolt Holder for Ford Car

A REAL TIME SAVING DEVICE. Takes the place of that other man whose help is usually required for this operation. Simply slip MOSCO Nut and Bolt Holder over the top of each engine or Transmission nut or bolt head, the wings protruding above the hex socket engage wall of crank or transmission case and prevent nut or bolt head from turning while the man underneath the car unscrews the bolts.



POSITION ON CRANK CASE BOLTS

When replacing put head of bolt on top, slip on the MOSCO socket and proceed as in taking out.

Made of heavy pressed steel, with reinforced wings welded to body of socket. All case hardened and finished bright.

PRICE 15c EACH.

Mosco Anti-Rattling Ball Socket for Steering Rod of Ford Car

AN ENTIRELY NEW DESIGN. For taking up the wear and eliminating the rattle on worn ball sockets on both ends of steering gear connecting rod. An occasional packing of hollow hex plug with grease insures proper lubrication, smoother working and reduces wear. Tension of flat spring, which is held in position by head of bolt, prevents the hex plug in end from unscrewing. Slotted in hex end so that adjustment can be ma le with screw driver or wrench. Made of high grade semi-steel.

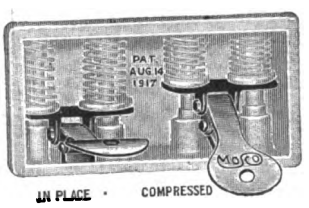


No. 2

PRICE 20 CENTS EACH.

Mosco Valve Spring Compressor for Ford Car

The use of the MOSCO Valve Spring Compressor eliminates what is usually a troublesome operation, viz., the compressing and replacing valve of springs. By using this simple device springs can remain in position until grinding of valves is completed.



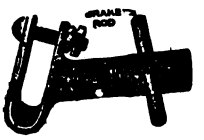
IN PLACE COMPRESSED

It compresses two valve springs at one operation and permits removing of pins. Should the pins be crosswise turn valve around until they are in position to pass through slots in compressor. After grinding valves reverse above operation. Made of heavy pressed steel.

PRICE 50c EACH.

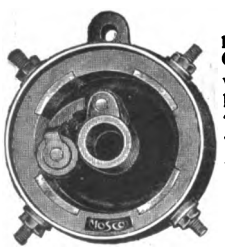
Mosco Brake Rod Guides for Ford Car

Will positively silence the objectionable rattle of the Ford brake rod, without impeding its full movement. The ends of these guides are provided with bayonet lock slots so that they may be slipped over the brake rods without removing same from the car, also the slot is so designed that the rods cannot shake out. The grease cup prevents wear of the rods and permits easy action. Made of semi-steel and very easily applied.



PRICE, PLAIN, 40 CENTS PER PAIR.
PRICE, WITH GREASE CUP, 60 CENTS PER PAIR.

Mosco No. 200 Timer for Ford Car



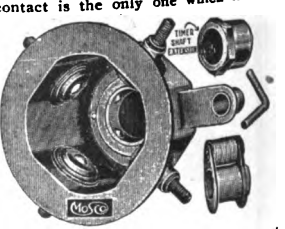
Patented Oct. 31, 1916

The case is made of extra heavy pressed steel, finished in aluminum. Gray bone fibre is used for raceway, with steel inserts dovetailed in and all lathe finished to a polished surface. The threaded terminals are insulated by fibre washers all the way through to contact points, thus removing cause of short circuiting common to this style of Timer.

Price, complete with brush, $1.50 each. Brush assembly only, $0.40 each.

Improved Bemus Ball Contact Timer for Ford Car

The BEMUS is an IDEAL TIMER for the FORD high speed, short stroke engine, because form of contact is the only one which is correct both electrically and mechanically. This is made by a hardened tool-steel brush, mounted on eccentric cam, engaging spring - pressed steel balls with glancing impact, both the brush and the balls turning each time so that fresh contact surfaces are continually made. The brush comes in contact only with the four balls, touching no fibre or insulation.



MOUNTING is direct on the time shaft by means of an extension piece which is screw threaded on to shaft, and runs in ball bearing placed in recess of timer shell. This means that each of the balls is equi-distant from the brush. RESULT—absolute precision of timing.

SIZE (IN CARTON), 3¾x3x2. WEIGHT, 9 OZ.
PRICE $2.25.

Your Jobber Has Them in Stock

MOTOR SPECIALTIES COMPANY, WALTHAM, MASS.

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Blankets won't help much if—

if the oil you are using does not flow freely at Zero.

SUPREME AUTO OIL flows freely at Zero.

STARTS WITH THE ENGINE

THIS is most important during the Winter months. You should know whether the oil you are using "flows freely at Zero." All oils do not possess this feature—notably the paraffine-base oils, which thicken up under cold and often cause great damage to the motor.

The safe way is to ask for SUPREME AUTO OIL—it "Flows freely at Zero" and leaves less carbon, owing to the fact that it is a Southern Asphalt-base oil containing no paraffine to gum, stick or thicken.

MANUFACTURED BY

GULF REFINING COMPANY

The Largest Independent Refining Company in the World

General Sales Offices: Pittsburgh, Pa.

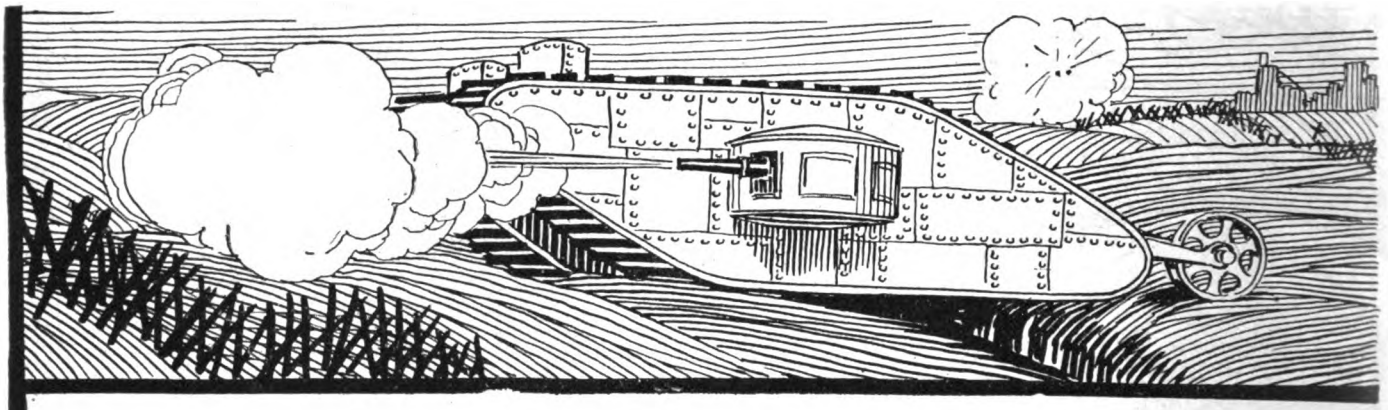
District Sales Offices:
New York, Philadelphia, Boston, Atlanta, Tampa, New Orleans, Houston



There is MORE POWER in
THAT GOOD GULF GASOLINE
AND SUPREME AUTO OIL
MANUFACTURED BY
GULF REFINING COMPANY
PITTSBURGH, PA., U. S. A.

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LIKE THE TANKS IN FRANCE-



Superior PRODUCTS

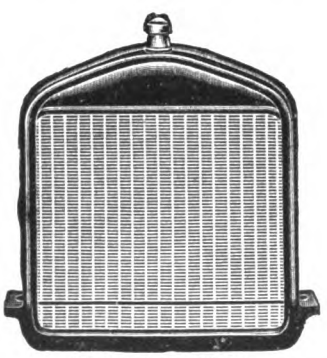
GO OVER THE TOP AND LEAD DEALERS TO SUCCESS!

MR. DEALER: THE BIG 1918 DRIVE IS ON—SELL THE Superior PRODUCTS LINE OF PROFIT-PRODUCING-PRODUCTS

The steady and ever increasing demand for the big line of Superior PRODUCTS for Ford and other cars is evidenced by continual repeat orders received from hundreds of satisfied live dealers everywhere.

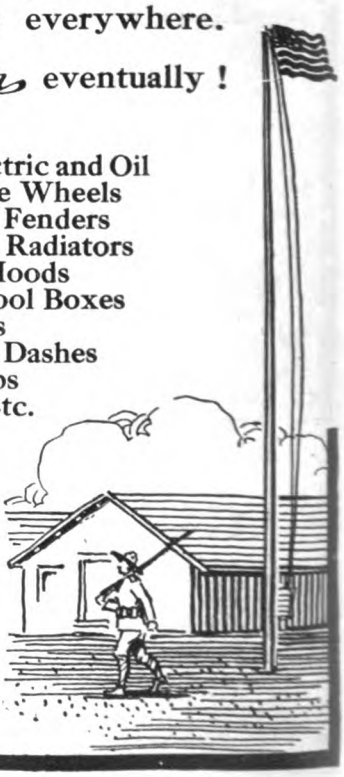
If you're not already one of them—you will buy Superior PRODUCTS eventually!

Tubular Radiators
Crown Fenders
Running Boards
Electric Fittings
Wire Wheels
Windshields
Lamp Brackets
Hand Horns
Lamp Parts
Bumpers, etc.



FOR FORD CARS

Lamps—Electric and Oil
Demountable Wheels
Commercial Fenders
Honeycomb Radiators
Streamline Hoods
Jacks and Tool Boxes
Tire Carriers
Commercial Dashes
Electric Bulbs
Floor Mats, Etc.



"SUPERIOR" AUTOMOBILE PRODUCTS

"When You Buy From Us, You Deal With Headquarters"

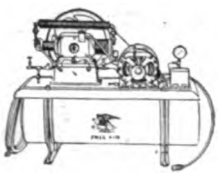
UP-TO-THE-MINUTE DEALERS CAN HAVE CATALOG FOR THE ASKING! WRITE TODAY—YOU'LL NEED IT!

Superior Lamp Mfg. Company

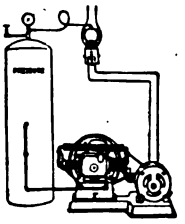
(Wholesale Accessory Division)

136-140 West 52nd Street New York, U. S. A.

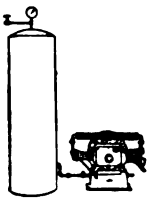
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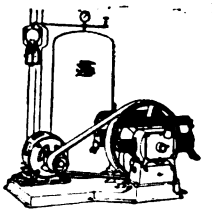
De Luxe Two-Stage Complete Automatic Unit
Capacity, four cubic feet per minute. Self-contained. Runs from lamp socket.



Complete Two-Stage Automatic Unit
Equipment 34—capacity, four cubic feet per minute. Equipment 44—capacity, ten cubic feet per minute.



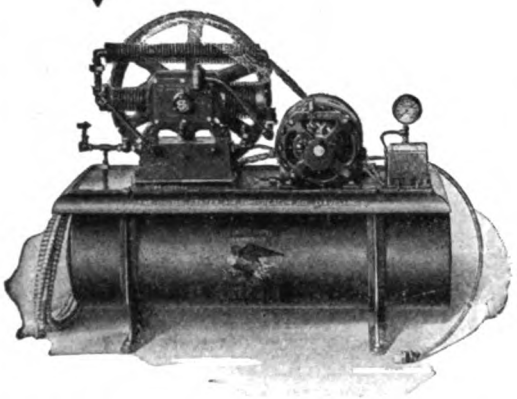
Two-Stage Units with Tight and Loose Pulley
for line shaft drive. Equipment 31-T — capacity, four cubic feet per minute. Equipment 41-T — capacity, ten cubic feet per minute.



Two-Stage Duplex Automatic Air Plant
Equipment 48-capacity, twenty cubic feet per minute.



Portable Two-Stage Compressor
Equipment 35—capacity, four cubic per minute.



The U. S. Two-Stage De Luxe Automatic Air Unit

This is a garage and free air station compressor De Luxe, incorporating more improvements and refinements than any unit ever produced.

It exactly meets the demands of a large majority of garages as proved by the fact that more of this number are sold than all our other compressors combined.

The De Luxe is uneqalled in all 'round features. It maintains high pressure in great volume, is extremely quiet in operation, handsome in appearance, entirely automatic in operation, self-oiling, and requires only a minimum of attention.

To buy a De Luxe compressor means to obtain the best and be assured of long continued satisfaction. This outfit has been tried for you and found not wanting by thousands of garagemen thruout the country and by several corporations of international prominence who have found them so superior as to be adopted as standard equipment for all their installations.

The Leader of a Complete and Remarkably Successful Line

THE Two-Stage principle of operation as utilized in United States Air Compressors has been proven absolutely unequalled and the perfected compressor combined with various tank equipments until the line is now as complete as can be desired, incorporating units for every requirement.

The leading number of the United States line is described at length on this page and several of the other units referred to briefly. The De Luxe Unit is ideal for a majority of requirements; Equipment 48 Duplex suited for garages having unusual conditions, while Equipment 31-T or 41-T are of interest to those who wish to use line shaft drive. Several other units are manufactured and compressors without any equipment whatever may be purchased if desired.

In addition to U. S. Two-Stage Compressors a complete line of Single-Stage Compressors is manufactured as briefly described below. These are as efficient and highly refined as it is possible to produce under the Single-Stage principle.

Send for Our New 32-Page Catalog
Just off the Press

See Us at the Auto Shows

CHICAGO—Space 3, Coliseum Basement, January 26th–February 2nd.
BOSTON—Space 518, Mechanics Bldg, March 2nd–9th.

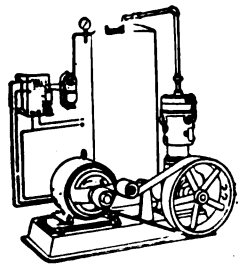
The United States Air Compressor Co.
Cleveland, Ohio

Gentlemen:
Please send us your Catalog as advertised in The Automobile Dealer and Repairer.

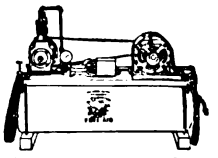
NAME .....
ADDRESS ..... CITY.....
DATE..... .....

The United States Air Compressor Co.

6542 Carnegie Ave., Cleveland, Ohio



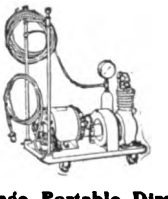
Single-Stage Water Cooled Complete Automatic Air Plant
Equipment G-15—capacity, twenty-one cubic feet per minute.



Single-Stage Complete Automatic Air Unit
Equipment D-22—capacity, two and one-half cubic feet per minute.



Single-Stage Air Unit
Equipment G-11—capacity, one and one-half cubic feet per minute.



Single-Stage Portable Direct Inflation Air Unit
Equipment G-12—capacity, one and one-half cubic feet per minute.

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SUNDERMAN
Vacuum Carburetor

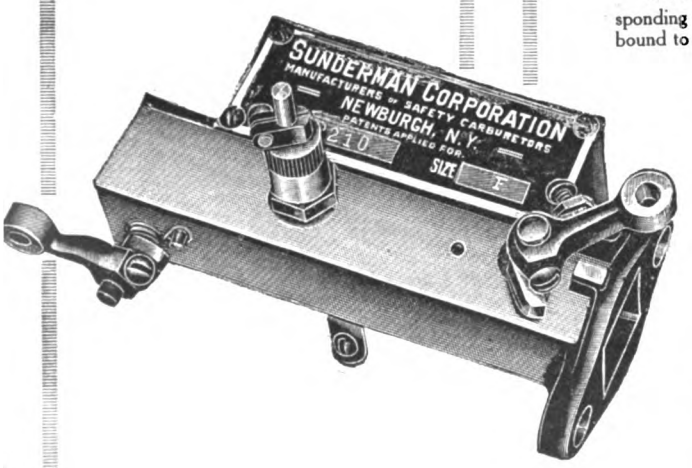
$6

F. O. B.
Newburgh

For FORD and METZ
and SAXON 4 Cylinder

For all other cars the prices are $8 and $10, depending on the fittings required. Its service is supreme on all makes and models of cars.

See us at the Chicago Show— Armory Balcony, Booth 5.



Your Carburetor Is Leaking

unless you've already equipped your car with a Sunderman.

You'd sew up a hole in your pocket, or else buy a new pair of trousers, wouldn't you?

Every time you turn your motor over, you're letting some good, hard-earned coin of the realm slip away from you without getting anything for it, unless you have a Sunderman Carburetor.

You Can Stop This Leak With a Postal Card

Just tell us to send you a carburetor (give the make and model of your car) and prove to yourself what the Sunderman will do.

It will positively save from 30 to 50% in your gasoline or other fuel consumption—that means it will give you from 43 to 100% mileage increase. We're proving it every day.

It will give your motor more power than it ever had—unless it is ready for the junk pile. Even then it will give it more pep, punch and pull than it has had in a long while.

It will give you better hill-climbing—the surest claim we make—an absolute, unfailing certainty. It will give your engine greater flexibility—a wider range of speeds, low, high and intermediate, taken without "bucking"; a smooth, swift acceleration or slowing down that has hitherto belonged only to the sixes, eights and twelves.

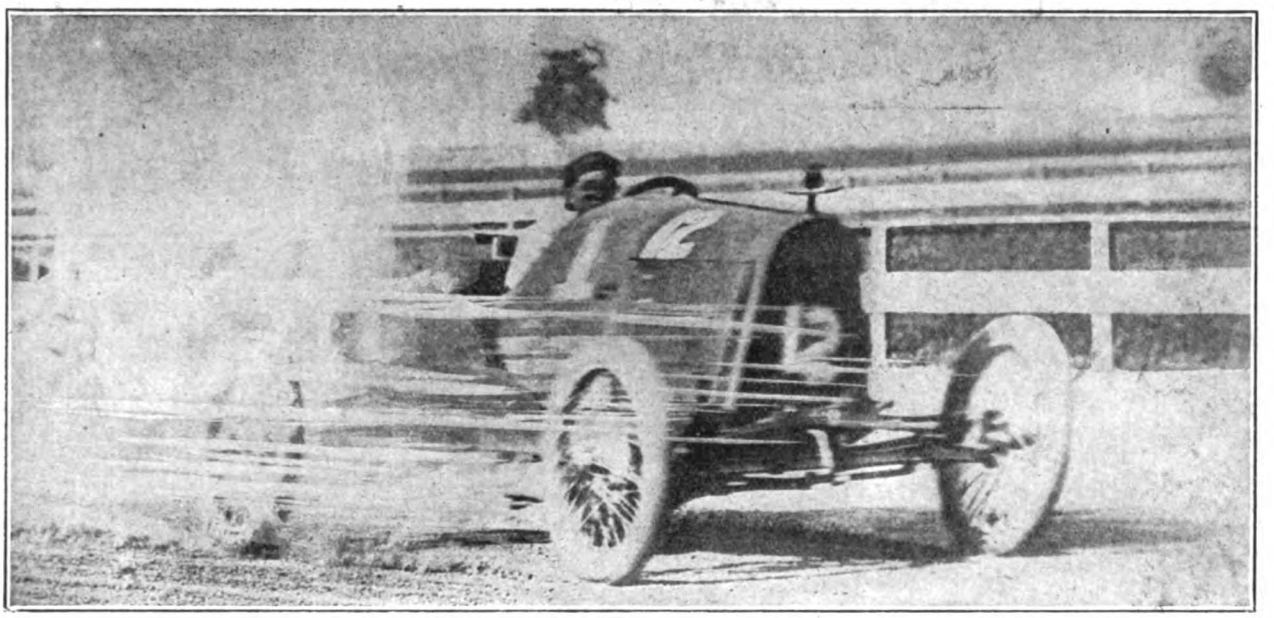
It will give your car a livelier getaway, a quick, sure pick-up, responding to the motor's demands like a great-hearted athlete who's bound to win.

We get in every day's mail testimonial letters from car owners who are elated with the Sunderman Carburetor's performance in power and economy. They know—and we know—what the Sunderman will do. We want you to know—you have ten days to prove it. Send us an order today.

Dealers: There is no better or more favorably known carburetor on the market today. We back it with consistent advertising. We make fine selling arrangements with the right people. See us at the Chicago Show, or write at once.

Sunderman Corporation
13 Chambers Street, Newburgh, N. Y.
Western Office: 403 Kresge Building, Detroit

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Ben Lawell of Columbus, Ohio, winning 50 mile race at Cleveland, on a one mile dirt track going at the rate of a mile in 53 seconds. His Ford car is equipped with ROOF 16 Overhead Valve equipment.

In every official race for Ford cars in 1917 where entered, one of the drivers with ROOF-PEUGEOT CYLINDER HEADS on his Ford won. And it was common custom for others with Roof 16 Overhead Valves to follow second, third and fourth.

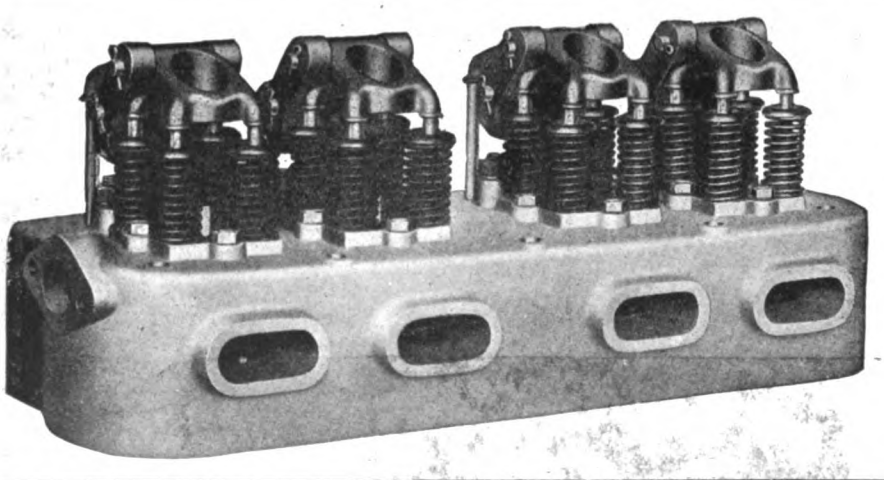
Our special equipment for racing cars and fast road speedsters include special gear speed range to over 80 miles per hour. The regular gear speed range normal being up to 57 miles per hour.

TOURING CARS AND TRUCKS—For regular Ford touring cars and converted trucks our regular equipment gives the most phenomenal hill climbing ability, pulling power and general road service. There could be no more happier car or truck owners than the Ford owner with our equipment.

DEALERS—GARAGEMEN—REPAIRMEN—THE ROOF-PEUGEOT TYPE CYLINDER HEAD FOR FORDS IS AN ALL WINTER SELLER. THEY ARE QUICKLY AND EASILY INSTALLED—SET RIGHT IN PLACE OF THE OLD CYLINDER HEAD. ROCKER ARMS OPERATE FROM THE REGULAR CAMSHAFT. Every Ford owner is a likely prospect, every Ford truck owner is a SURE SALE. If you want a steady stream of business throughout the year and winter business that pays, get our agency terms. Send for free illustrated literature of the greatest selling specialty for 1918. Place one equipment in your territory and it will bring every Ford owner to your door.

WRITE TODAY.

COMPLETE EQUIPMENT $95.00



Roof Auto Specialty Co.

Union Bldg.

Anderson, Ind.

"The Puncture Proof City"

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A Wise Man Never Questions Success

Only the fools do. And when a man or a corporation goes big be wise and admit it.

Do you suppose the great Maxwell success was "the work of the wind" or ability?

Can you question figures like these:

Maxwell dealers	MADE	*in 1913-1914 over*	$2,500,000
Maxwell dealers	MADE	*in 1914-1915 over*	$4,700,000
Maxwell dealers	MADE	*in 1915-1916 over*	$8,000,000
Maxwell dealers	MADE	*in 1916-1917 over*	$12,000,000

Then question not what is in store for Chalmers dealers since Maxwell has taken over the Chalmers business.

For like makes like, and they who have the rare skill of making money for one set of dealers are sure to make money for another set.

Already the Chalmers sales curve has begun to climb. Today it is the highest in Chalmers history at this time of the year. And since the Maxwell policies began to operate the increase in Chalmers business has been just 200 per cent!

A good many wise dealers are taking on the Chalmers line.

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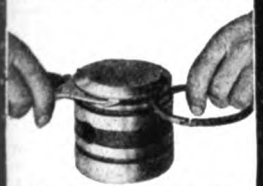


Make your pistons gas tight

The MUNGER "ALWAYS TIGHT" PISTON RING OUTFIT—

for **FORDS**
8 "Always Tight" Rings (Regular Size)
4 "Always Tight" Rings (Over Size)
1 Regrooving Tool
1 Ring Insertion Tool


Ready to insert the Munger Re-grooving Tool to true-up a worn piston groove


The Munger Re-grooving Tool in position for cutting. Testing width of groove with an over-size ring


A Munger "Always Tight" Piston Ring being slipped over the Munger Ring Insertion Tool


Showing how easily Munger "Always Tight" Piston Rings can be placed in the piston grooves with the Munger Ring Insertion Tool

MUNGER "Always Tight" Piston Rings


The MUNGER ALWAYS TIGHT EXPANSION JOINT

When piston grooves become slightly worn, i. impossible to fit any rings in them gas-tight without first truing-up the grooves. With each complete set of Munger "Always Tight" Piston Rings is one over-size ring for each piston (to be used in worn grooves) and a Munger Re-grooving Tool with which worn grooves can be straightened quickly and accurately without resorting to expensive lathe work and without even disconnecting the piston from the connecting rod.

All other piston rings begin to lose compression as soon as they begin to wear.

Munger Piston rings *always* remain compression-tight.

These unique rings quickly conform to the shape of any cylinder and retain their perfect fit until completely worn out.

The wonderful compression-holding power of these simple one-piece rings is due to their scientific design and their accuracy of manufacture. The Munger Expansion Joint, so simple yet so efficient—the patented process of peening, which makes these rings fit the walls of any cylinder—the minute oil grooves, which cause these rings to seat themselves almost immediately—are distinctive features that make Munger "Always Tight" Piston Rings superior to all others.

They are the easiest of all rings to install. With the Munger Ring Insertion Tool even a novice can place them in the piston grooves without breakage or the slightest trouble. And Munger Rings are the most inexpensive, because they are practically wear-proof.

SPLITDORF ELECTRICAL CO., Newark, New Jersey

Get Them from Your Accessory Dealer or Garageman

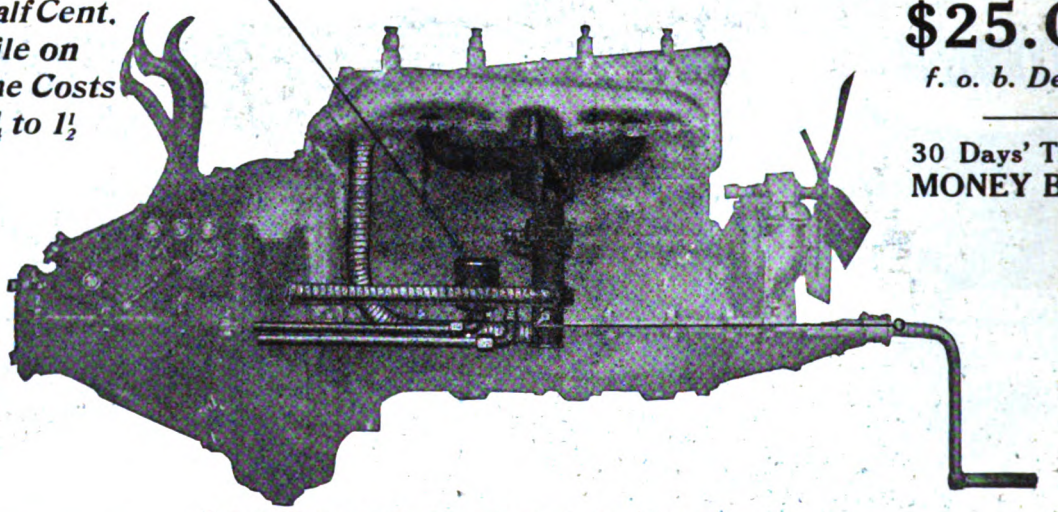
List price for all sizes up to 3½ in. diameter, $1.25 per ring.

With each complete set of rings a *Munger Piston Regrooving Tool* and a *Munger Ring Insertion Tool* are supplied without extra charge.

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Detroit *Kerosene* Equipment For Fords

One Mile on Kerosene Costs Less Than One-Half Cent. One mile on Gasoline Costs from 1¼ to 1½ Cents.



Price
$25.00
f. o. b. Detroit

30 Days' Trial or
MONEY BACK

Detroit Kerosene Equipment attached to Ford Engine showing the entire installation except the Gasoline tank located under floor board.

Use Kerosene
(*Coal Oil*)

A Ford car or truck is a daily necessity. It proves a daily economy.

By using Kerosene instead of Gasoline you can affect a *further economy of 60 per cent.*

Act Promptly! Buy a

Detroit Kerosene Equipment For Fords

Save 60 per cent. of mileage cost

These Are Days of Strict Economy

The Kerosene Equipment ready to be attached to Ford engine consists of:

1. The Detroit Kerosene Carburetor (patent pending) with only one float chamber (for kerosene); the three way valve admits the gasoline for starting.
   Is non-adjustable—throttles down smoothly—idles without loading—increases mileage—is a positive fuel and money-saver—makes no condensation in cylinders and reduces speed changing.
2. Intake Manifold with drying chamber.
3. Flexible tubings.
4. Gasoline tank, tube and couplings.

INSTALLATION

1. Drill a 7/8-inch hole into center of exhaust manifold.
2. Remove intake manifold.
3. Clamp on new manifold.

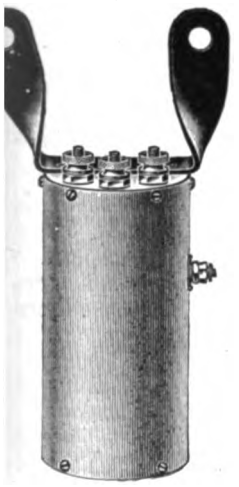
DETROIT KEROSENE CARBURETOR CO., DEPARTMENT 61 Kresge Building **Detroit, Mich.**

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What You Always Have Longed For Is At Last Accomplished

NEW YORK Vibrator-Les Coil IGNITION FOR FORDS

Uses One Powerful Transformer Coil—





Entirely devoid of Vibrators, which in connection with our new Distributor, takes current from the regular Ford Magneto, giving you for the first time since the advent of the Ford car, an opportunity to equip with the same efficient, simplified single unit, non-vibrating Coil Ignition used on all modern, present day cars, with the still further advantage that no storage or dry cell battery is required.

The present bulky coil box is discarded and panel containing switch is fitted in its place—giving a "clean" dash, and much additional room.

We supply Coil, Distributor (containing our new circuit breaking mechanism), elevating gear bracket, wires, cables, and full instructions—no drilling or tapping is required to install.

VIBRATOR-LES COIL IGNITION enables cars to be driven through dense traffic at a snail's pace, and instantly accelerates with a smoothness and power you never believed possible.

Entire absence of sticking contact points, vibrator adjustments, coil replacements, and all ignition trouble, together with easy certain starting, are but a few of its advantages.

Full details given in our booklet.

Price complete as described—$20.00.

Sold with a money back guarantee.

Indispensable to Owners of Ford Delivery Cars and Ford Trucks—because the driver has no Vibrators to "adjust" or other delicate parts upon which valuable time may be wasted.

NEW YORK COIL COMPANY

337-340 Pearl Street NEW YORK, N. Y.

Western Distributors: GRAY-HEATH CO., 1440 Michigan Ave., Chicago, Ill.

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THAT valve grinding job is a hard one at best—but you can make it easier—do it quicker and get better results if you use

Carborundum Valve Grinding Compound

A mixture of Carborundum, the hardest, sharpest, fastest-cutting material known, and a high-grade grease.

Clean and free cutting, it quickly and easily cuts away the carbon and pit marks.

Absolutely uniform, it leaves a true, clean, unscored valve seat.

Saves Time—
Saves Work—

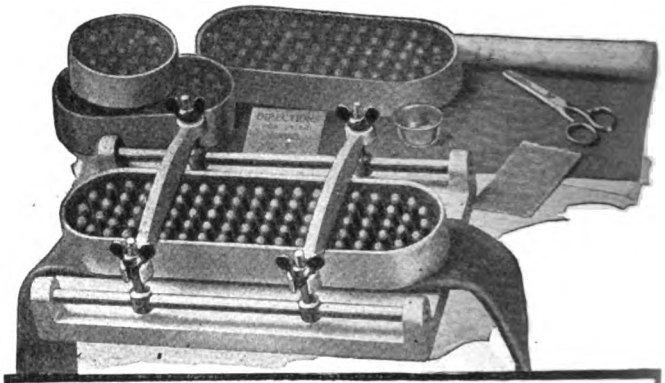
Put up in one and five pound tins, coarse, medium and fine.

Sample Can sent on request.

Sold by your supply dealer, hardware dealer or direct



The Carborundum Company
Niagara Falls, N. Y.



12 inch Tube Repairs

Can Be Quickly and Easily Made with the

ADAMSON

TYPE "S"

VULCANIZER

This vulcanizer enables the repairman to give his customers a perfect repair at a low cost and net him a handsome profit for his time. It enables the private garage owner to cut his repair bills to the bone.

The Type "S," like all Adamson Vulcanizers, is entirely automatic and anyone can operate it. There is no waiting to get up steam. No slow, expensive electricity. It's a gasoline vulcanizer — the most convenient and practical vulcanizer made. There are thousands in daily use.

It absolutely will not injure tubes as will many vulcanizers — the temperature being automatically and positively regulated. Its scientific design insures a quick, permanent repair ***always.*** Even a 12 inch repair can be made in fifteen to twenty minutes—that's speed.

There is money for repairmen and garage owners who use an ADAMSON Type "S." More tubes will be repaired next year than ever before because today they cost more. The Type "S" costs but $12, complete as shown here, and soon pays for itself. It will last a lifetime.

There is a type of ADAMSON Vulcanizer for tube and tire repairs of every kind. Priced from $1 to $12. If you don't know the ADAMSON dealer, write us.

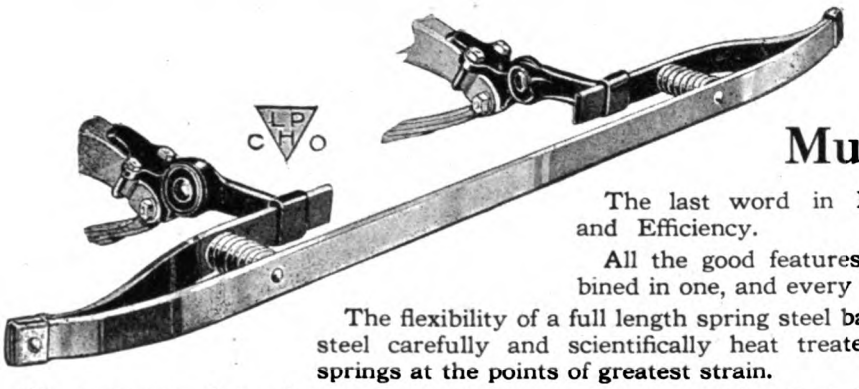
THE ADAMSON MANUFACTURING CO.,
EAST PALESTINE, OHIO.

DEALERS—No other manufacturer can offer you a complete line. Tie to ADAMSON — Adamson dealers have sold over one million ADAMSON Vulcanizers, and they all made good. If your jobber can't supply you, write for details, prices, etc.

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L P H C O HALLADAY BUMPERS

TWO BIG LEADERS FOR 1918



The New Halladay Multiple Spring Bar

The last word in Bumper Bar Strength, Elasticity and Efficiency.

All the good features of any other bar ever made combined in one, and every weakness eliminated.

The flexibility of a full length spring steel bar of highest grade Swedish spring steel carefully and scientifically heat treated; reinforced by two heavy coil springs at the points of greatest strain.

No matter at what point on the bar the impact is received, the shock is distributed throughout the entire length of the bar and the least possible portion transmitted to the car frame.

The ends of the bar and the two supporting members are secured by a flexible connection that entirely eliminates breakage at that point.

We supply this bar as a complete bumper as shown above or we can furnish it with any of our regular or special fittings either front or rear.

To the man who wants the best that can be made we specially recommend and thoroughly guarantee this bumper.

The Halladay Standardized Bumper Units

In these four fittings we offer the trade the best bumper line ever placed on the market.

It is not an attempt at a universal fitting, but a combination of parts from which may be made up a bumper to fit the front or rear of practically every car on the market except those of extremely specialized design, such as Franklin, Saxon, Ford, Briscoe, and others without front spring extensions.

Fitting A may be used on any frame on which there is room between the fender apron and the spring connection.

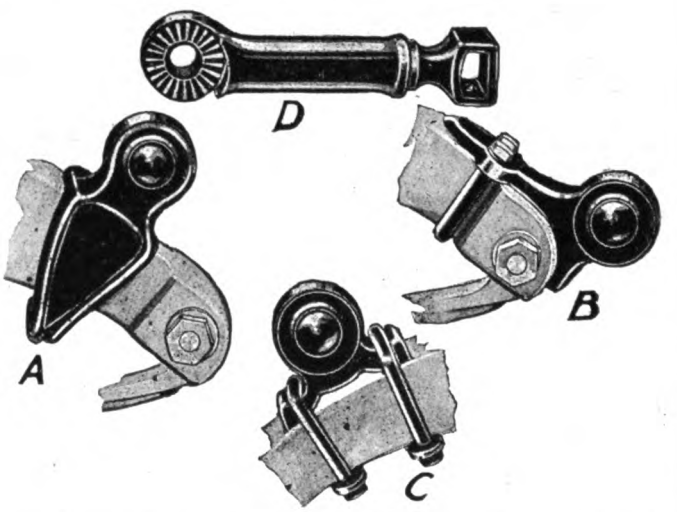
Fitting B may be used on any frame in which there is room for the single clip directly back of the spring connection.

Fitting C is specially designed as a rear fitting and works equally well on three-quarter elliptic springs and rear frame extensions.

On rear frame extensions placed so closely to the gasoline tank that no room is allowed the clip bolts of fitting C, fitting A will often be found to work perfectly.

The bar support D fits all these frame connections and being pivoted may be adjusted to any frame angle. Furnished in 8 or 16-inch extension as desired.

The small dealer supplied with these four fittings and an assortment of bars is in position to meet the requirements of practically all medium or big car trade at the least possible nvestment in stock.



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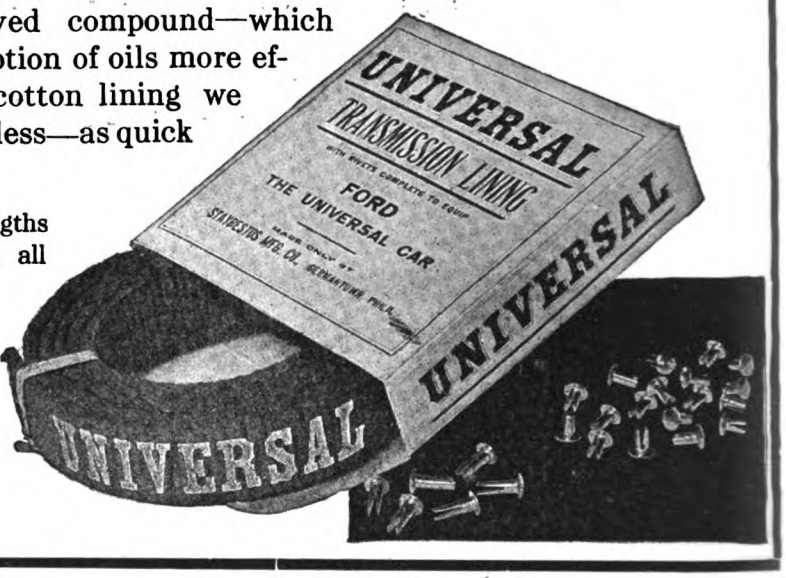
Trade Mark Registered U. S. Patent Office.

TRANSMISSION LINING for FORDS

Made by the manufacturers of the celebrated S-M-C Asbestos Brake Lining. Compactly woven like S-M-C—dependable gripping assured.

Treated with improved compound—which protects it against absorption of oils more effectively than any other cotton lining we know of. Absolutely chatterless—as quick as it is quiet.

$1 package contains three proper lengths for Ford transmission bands, and all rivets required.



At the best dealers, or by mail from

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"The Modern Factory"

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'TWAS TEA—THE BOSTON BOYS THREW INTO THE HARBOR—NOT SUGAR—

Anyhow Don't Throw Away This Opportunity To Get into the Big

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AUTOMOBILE DEALER AND REPAIRER

Is your business important enough to have people know that you are of this age and not merely in it? What you accomplish will depend wholly upon the vigor of the determination that is back of your ambition—even then you'll need help—

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Clears the Windshield Clean Across—Top and Bottom

One Glance and It's Sold. Will You Help Supply the Demand We're Creating?

Show a customer a Tri-Co—show him how simple it is—how practical—how easily applied—and in five minutes you're ringing up the cash register.

Here's the Evidence—And We've a Lot More

Trade Buys Readily
"It might interest you to know that the Tri-Co is the best windshield cleaner we have ever sold, and we find our trade taking to it very readily. It certainly does the work."
Mutual Motor Stores Co., Chicago

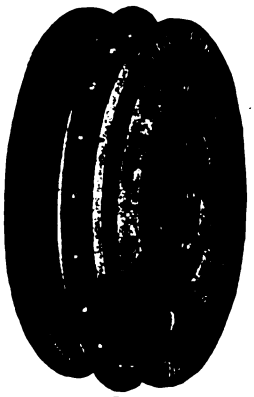
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"We sold approximately 6 or 7 dozen Thursday and from one to four dozen the other days. We are glad to co-operate with any live manufacturer on a good proposition the same as yours."
Chapin-Owens Co., Rochester, N. Y.

Sells 36 in an Hour
"We have had a remarkable sale for the past 6 months. On Nov. 1st, '17, we sold 74—36 were sold in one hour. We had no window display or newspaper ad. on this day."
Walbridge & Co., Buffalo, N. Y.

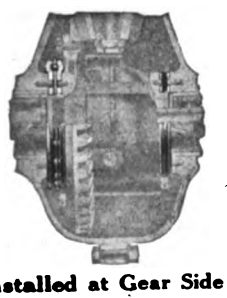
The Tri-Co attaches to any two-piece windshield—it cleans clear across with one stroke.
Users say it's the simplest, most effective windshield cleaner ever devised—and they know. That's why they tell their friends—that's why you'll get repeat orders and new customers for other goods.

Consistently advertised in the Saturday Evening Post. Valuable Sales aids furnished. Order now thru your jobber. Retails for $1.50

TRI-CONTINENTAL CORPORATION - - - BUFFALO, N. Y.



B. B. T. SELLS AT $3.75



Installed at Gear Side of Ford and Chevrolet 490 Differential.

Ford Owners Will Soon Be Asking for the

BAILEY BALL THRUST

To Replace Flat Thrust Washers (2528) at Differential—and Advertised in "Literary Digest" and "Saturday Evening Post"

Every dealer or repairman knows that plain washers (2528) having sliding instead of roller contact wear thin, cause unmeshing of gears and rear axle breaks. But the Bailey Ball Thrust, replacing plain washers to a 1000th part of an inch and containing eighteen ¼ inch micro-chrome balls cannot wear, will keep gears in proper mesh, make them run smoothly and last indefinitely — thereby eliminating axle breakage.

Easier to Sell Than Washers

Car owners have been quick to realize the decided savings in power and freedom from axle breakage with the installation of the Bailey Ball Thrust. Mere explanation of the outstanding features of this bearing is creating easy, profitable sales for dealers and repairmen everywhere. No car owner wants plain washers after having seen the Bailey.

Guaranteed to "Stand Up"

Bailey Ball Thrusts have a capacity for six times the maximum thrust and so will stand up under any strain or hardship. Dealers and repairmen, write your nearest jobber or to us for discounts. Car owners, see your dealer or send coupon for further details.

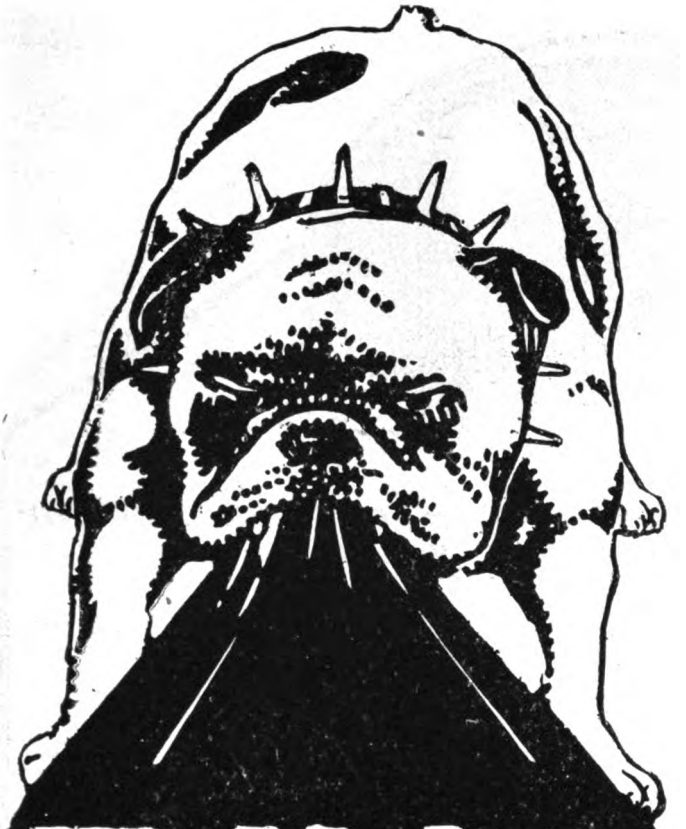
Price - - - - - - $3.75

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POWERFUL
PERSISTENT

GREATEST improvement ever scored in puller construction. Gives direct—mighty pull that jerks off wheels, bearings, gears, or pulleys—**quick—easy.** Does away with need of special pullers—sweeps aside all their multitude of bothers. Pushes work through in jig time. Lessens labor. Increases garage earnings.



"LITTLE GIANT"
Gear and Wheel Puller

is amazingly simple. Instantly adjustable up to 13 in. Practically indestructible—drop forging and hardened steel throughout. Gives maximum pulling power at minimum effort. Never twists or slips. The principle is right—

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In tight places—on delicate jobs—for heavy work—**anything** that demands pulling—it's there. A necessity in the garage, machine and repair shop.

Price, $10.00

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Premier Electric Co., 4033 Ravenswood Ave., Chicago



"TRIPLEXD"
GASOLINE HOSE

A gasoline hose that's proof against wear, tear, chemicals and weather. It's guaranteed.

Specify This Lasting Hose on Your Next Pump Outfit

METAL HOSE & TUBING CO. INCORPORATED
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THE
ARMSTRONG MFG. CO.

BRIDGEPORT, CONN., U. S. A.

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like their products, need no introduction to the experienced steam or gas fitter.

To others, our Catalogue No. 14 will show why we are so popular.



"Makers of Genuine ARMSTRONG Stocks and Dies."

—EACH ONE SPECIALLY CAST—

The one-piece tight ring with the wonderfully planned joint.

No leakage of gas or oil — more power—less expense.

Don't just try a set — get a set — put them on and feel the "pep" in your motor.

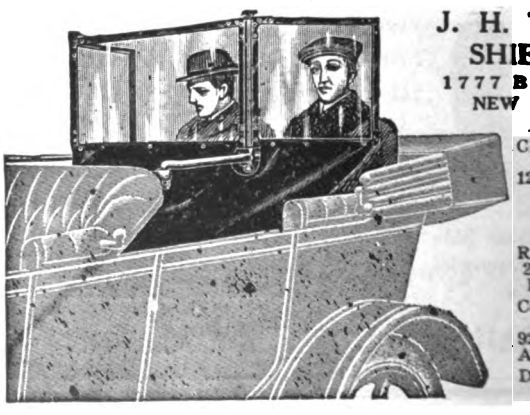


Dealers everywhere.

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REAR SEAT SHIELD

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MOSSBERG TOOLS

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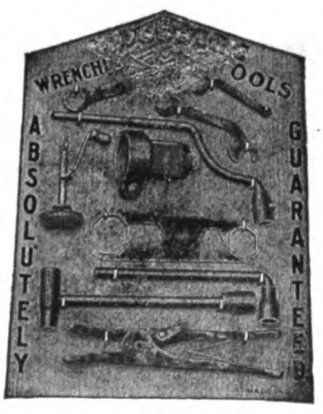
CATCHING OPPORTUNITY WITH THE LID OFF

That's what the Dealers' Display Boards mean to the individual purchaser. Nothing covered up—all tools right out before your eyes. Take your pick, Mister——the Dealer's cash register rings again—quick turnover.

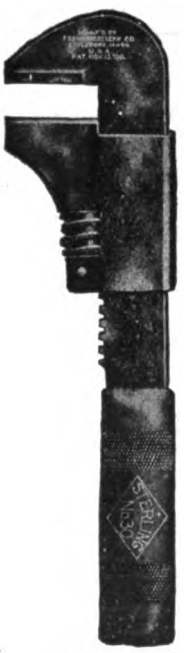


This "T" Board, with 23 Small Adjustable Wrenches presents a dandy counter appearance. The board has a natural wood finish, highly polished.

"T" DISPLAY BOARD



"R" DISPLAY BOARD



"R" Board for Fords displays 29 Tools for Ford adjustments. Each Tool does a particular job well.

Send for Catalog 191-B

FRANK MOSSBERG CO.

Attleboro, Mass., U. S. A.



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CHICAGO SHOW

Coliseum Basement 1-B

and our representative will meet you to explain

FREZALENE

The only Anti-Freeze that will not injure a Sleeve-Valve motor, will not corrode aluminum or metal, or gum the rubber.

Frezalene is **Harmless** under all circumstances and cheaper than alcohol. Make us show you why Frezalene is better, safer and surer than any other.

WILL NOT FREEZE AT 50° BELOW ZERO

We have sold hundreds of jobbers and are the only Anti-Freeze people that have their unqualified endorsement.

FREZALENE MFG. COMPANY

32 So. CLINTON ST. CHICAGO

CALL MAIN 2042

We want High Class Sales representatives—exclusive territory—who recognize the seasonable advantages of Frezalene—and can give us responsible jobbers' references.

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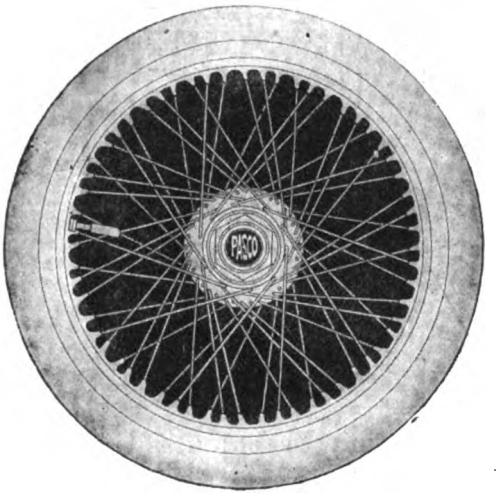
Three Exclusive Patented Features

PASCO WIRE WHEELS

1. THE PASCO WIRE WHEEL has a PATENTED FOUR series method of Rim Punching and Spoke Lacing which makes it stronger than any other wire wheel and 60% stronger than wooden wheels. All spokes cross four others in both the front and rear rows forming a strong double web in the spoke lacing of the wheel hub and rims. Previous methods allow but two or three crossed spokes.

2. THE PASCO HUB CAP is made of a strong, indestructible metal that stands up in crowded traffic collisions, where aluminum, brass and other soft metal compositions will strain or break.

Unusual care has been taken to make it sturdy, massive looking, yet attractive.



3. THE PASCO PATENTED SAFETY LOCKING DEVICE locks the hub cap and wheel on to the threads of the inner fixed hub and axle with a vise-like grip. The device absolutely cannot work loose and allow the wheel to come off from a moving car. It is positive insurance against accident from such a cause. The only way to remove a hub cap is to loosen the locking device and use a Pasco wrench.

Set of 5 Wheels, complete, in Black Enamel for Ford, $75.00.
Other standard colors, $5.00 per set additional.
In black and white for Maxwell, $100.

Write today for particulars. Our Dealer Proposition is Most Liberal

National Wire Wheel Works

(Incorporated)

Dept. R, Geneva, N. Y., U. S. A.

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250 Pages. Price, $2.00

—and—

THE AUTOMOBILE DEALER AND REPAIRER

$1.00 a Year

BOTH FOR $2.00

A great many of our subscribers will be glad to know that we have made arrangements with the Bullard Co., of Boston, publishers of the "RED ROAD BOOK," on such favorable terms that we can offer this admirably arranged book, size 9¾ x 9¾, and comprising 250 pages, in connection with the Automobile Dealer and Repairer for a year, for $2.00, which is the regular retail price of the book.

In other words, by subscribing to the AUTOMOBILE DEALER AND REPAIRER, the subscription rate of which is $1.00 a year, you get the "RED ROAD BOOK" AT HALF PRICE.

We don't know of any better book than this on the market. It is bound in flexible cloth, and comprises road maps of the following states:

All of the New England States	Pennsylvania	Virginia
New York	Maryland	West Virginia
New Jersey	Delaware	District of Columbia

These states are largely patronized in the Summer by tourists from all over the country, who like to visit the Catskills, the Adirondacks, and the White Mountains. The "RED ROAD BOOK" also gives maps of that portion of Canada reached by routes from Northern New York, Northern New England and Northern Maine.

It further gives 153 city street maps, to which are added road distance tables, ferry tables, and the necessary population and location indices for all towns.

Reading route matter in connection with the principal routes is tersely told, and will be printed in black, and their reverse routes printed in red, to avoid confusion.

The aim in the production of this work is simplicity. Too many automobile route publications attempt so much, that in their efforts to be "complete" they become "confusing." The publishers of this work say that many years of motor travel and the observations of others lead them to the opinion that once out of the confusion of a city's streets, on the broad highway, the need is less for the detailed, must-be-closely followed printed words, comments and instructions of the path itself, but rather the need is for the accurate knowledge that the road to town A and thence to town B is of "automobile goodness," and that it proceeds via this and that village, this or that side of a lake or a mountain, with crossing railroads, or paralleling trolley lines, as a check on location.

Thus is one free to carry out his original purpose; namely, to see the country, with this instruction book.

If with such maps as are shown in this road book, one sees that they are to pass within a few miles of a well-known and picturesque lake, or historic hamlet, or perhaps desire to go "across country," a good road map is the best aid for this free lance mode of travel.

A new edition of this road book is now being prepared, and will be corrected right down to date, and will contain much new material. The book will be ready for delivery from the first to the fifteenth of April.

All orders sent to us will have prompt attention just as soon as the book is issued. In case you have already renewed your subscription, a Red Road Book will be sent on receipt of One Dollar Address:

MOTOR VEHICLE PUBLISHING COMPANY

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HORSEY'S
DOLLAR VULCANIZER



Anyone can use this nifty one pound pocket size vulcanizer—it is made of steel in one unit.

EXPERIENCE IS NOT NECESSARY

You can do perfect work at all times, in any climate, at home or on the road. All you need is a match to light the "HEAT UNIT TABLET" that is furnished with each patch.

This process does not require gasoline or alcohol for vulcanizing or cleaning the tube—neither can the inner tube be burned—the insulator heating plate keeps body of vulcanizer cool.

There's nothing mysterious about it—simple as A-B-C. It is efficiency itself and efficiency is—"doing the right thing first."

It is the most likeable little proposition you ever shook hands with.

With the HORSEY DOLLAR VULCANIZER you can vulcanize all punctures and small blowouts in Inner Tubes.

HORSEY DOLLAR VULCANIZER is packed in a substantial box with

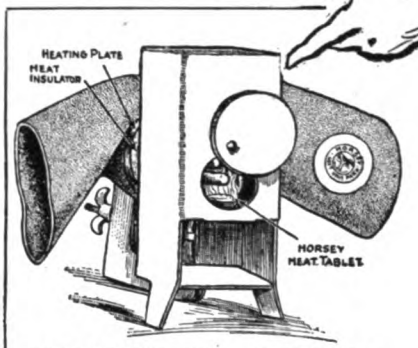
8 Horsey Heat Unit Patches.
8 Horsey Heat Unit Tablets.
Tube of cement, sand paper and instructions, all complete

PRICE $1.00

Send along the dollar or you can write for more detailed information if you wish—suit yourself.

Note: Extra Box, containing 8 Patches and 8 Tablets, Cement, etc., only costs 50 cents.

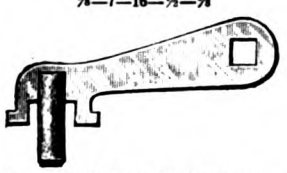
Manufactured by **HORSEY PRODUCTS CO.,** CLEVELAND, OHIO



Patent No. 1204021-Nov. 7-1916. Other Patents Pending



Pump Hose Bands
⅛—7—16—½—⅝



Ford Switch Keys Fit Ford Cars, 1914 to 1918 models, inclusive.



IDEAL CLAMP MFG. CO., Inc.

200-202 BRADFORD STREET

BROOKLYN, N. Y.

No. 1—180-Clamps
No. 2—100-Clamps



B-W DIRECT CURRENT



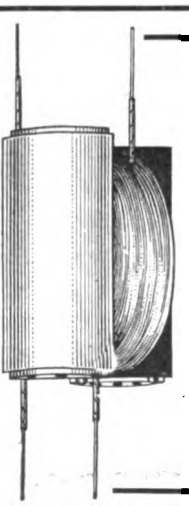
STURDILY CONSTRUCTED to retain accuracy under the most severe conditions. Handsome in appearance. Made in both flush and surface types. Finished in bright nickel or black rubberoid as desired.

Better Ammeters Cannot Be Purchased, PRICE.....**$1.90**

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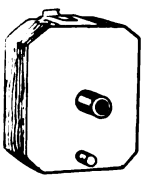
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These departments we have greatly enlarged—which is the best proof that we satisfy our customers.

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Drowning the Magazines

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By a Reader

I live in a tiny town in the mountains of Vermont. The nearest railroad station is twelve miles away. The population of my town is about four hundred, scattered over a number of square miles, and there is not one of that four hundred who could be referred to as well-to-do. My husband is not well-to-do. He is a rural mail carrier with a route which gives him time to work a little farm.

We have no public library. We are too small and poor a community to afford that. Few books are owned in our homes, and those not offering a variety of reading. But one thing we do have which gives us something fresh to read and which enables us, even in that remote village, to keep some account of the world, and to satisfy that hunger for knowledge which seems to increase as the opportunities for it diminish. We have our reading club, of which I am secretary.

With the sum of our dues we subscribe for all the magazines the money will buy. These magazines are our theaters, our concerts, our lecture courses; they enable us to travel in foreign countries and to know and to understand distant parts of our own countries. They are our art museums. They make it possible for us to talk intelligently to strangers about places we can never hope to see, about the finer privileges of life in which we can never hope to share.

Ourselves and our whole village are the better for articles we read. We have learned the meaning of sanitation; we know why the fly is dangerous; we have compelled the Selectmen to enforce sanitation that we would never have heard of but for our magazines.

Our kitchens are not the same. Our food is better prepared and more tasty. Instead of being backwoods housewives, we try to be as up-to-date as our city neighbors. Perhaps we try harder than they—and we know how, because our magazines tell us.

Twenty years ago the infant mortality among us was an agony. A baby born was received with both love and terror, for we saw how few were his chances for surviving his first three years. Today the love is there, but the terror is gone. We have been taught how to guard our babies, not only to guard them after they are in our arms but before. For this one thing the magazines are precious to us.

Our education is not altogether on the practical side, either, but in those things which make life more beautiful and livable. We cannot know the music of the world, for we have not yet been able to afford a phonograph. But we are saving for one. At least we have learned that if we have not heard it we must hear it. But we do know about pictures and about statues and about architecture. The magazines have shown us those things and explained them to us—and have developed in us an appreciation for beauty.

I could write to you for hours about what changes the magazines have brought about in the lives of myself and my family, in my neighbors, in our whole village. We are not the same. And because the magazines were almost our sole source of information and of encouragement and of inspiration, I place the credit for these changes where it belongs. I do not overstate the fact.

Now I am writing because I am afraid. We have heard that Congress does not understand the place the magazine has in the lives of such as myself, and has passed a law which threatens to interfere with our receiving them as we have. Father and I have studied that law and it doesn't seem just to us. It seems as if Congress, unwittingly, had set out to punish us and to deprive us of the thing that has made us what we are. We are afraid that some of the magazines which are so necessary to us will not keep on in business because they cannot afford to pay the increase in postage that Congress has enacted.

We are afraid that those who do keep on will be obliged to raise their rates of subscription. Do you know what that will mean? Eighteen of us contribute twenty-seven dollars a year. That twenty-seven dollars buys us all I have told you about above. We cannot afford more than twenty-seven dollars, and increased subscription means we must take fewer magazines. We cannot get along without them.

I believe if Congress understood that; if Congress knew about us and how we need the magazines, they would repeal that law. Father has written to our Congressman and our Senator. Once he would not have dared to do that. He asked their help for us. Every family of our eighteen has written. Don't you believe that when Congress understands; when Congress knows about us back here in the mountains, and about our like on distant prairies, it will look at this thing from another direction, and work to give us more of what is so necessary to us, instead of depriving us of it? There must be some way to make them understand.

Will you not write your Congressman urging a repeal of this measure which will deprive many homes of a source of enjoyment and inspiration? If you do not know his name, ask your Postmaster and then write him and address your letter House of Representatives, Washington, D. C. Also write the two Senators from your State, addressing them Senate Chamber, Washington, D. C.

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FORD OWNERS

That rattle means steering trouble

STOP IT!

by investing

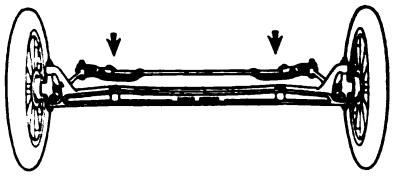
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in a pair of

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(SPRINGS)

They will save you money and ward off danger. You can install them in a minute, for all you need to do is snap them in place. They weigh only two ounces—last forever.



Little Giants

Pay Big Dividends

They insure

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100%	"	" Rod Rattle

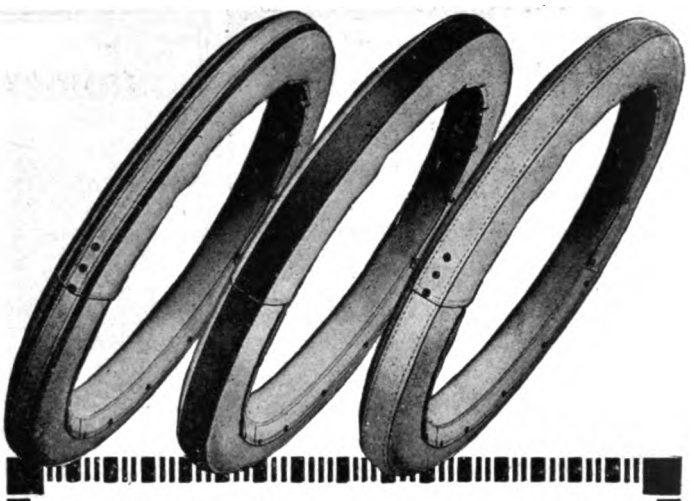
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Every dealer is instructed to return your purchase price if you are dissatisfied. The **Little Giants** do the same work when installed on Dodge, Maxwell and other cars.

Order Through Your Dealer If he does not carry **Little Giants** in stock he will get them for you. Should there be no dealer available, we will fill your order if you remit direct to us.

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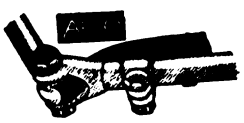
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The ALLEN TIRE CASE

FOUR NEW TRADE APCO MARK NEEDS FOR FORDS



SPINDLE ARM ANTI RATTLERS

The best selling repair part for Ford Cars is without a doubt the spindle arm bushing No. 2714, as this wears out quicker than any other part of the car. It is cheaply replaced, but the steering rod commences to rattle as soon as wear starts, and when you consider that one-sixteenth of an inch play in the bushing means an inch play at the wheel, the necessity of keeping the bushings in condition is doubly apparent. The slightest play in this bushing also causes a disagreeable rattle, and causes the wheels to wobble, which means excessive wear on the tires, besides making the car harder to steer.

The Apco Silencers consist of two heavy formed springs which can be put on the car in a minute with no tools but the hands. With these on the car, one set of bushings will last two years, and at no time will there be a rattle or play in the steering wheel.

Finished in black enamel, packed one pair in a box, weighing 2 ounces.

40c Pair



TIMER

The Apco Timer gives a hotter, quicker spark, an easier start, more power and speed, smoother running, longer life to the platinum points, more miles to the gallon of gasoline, fewer short circuits and freedom from all those troubles that the regular type timer develops besides being the only renewable Timer on the market. The shell is heavy pressed steel with a single piece steel advance arm riveted on. The contacts are clock spring steel, easily and cheaply replaceable, the insulation is high grade bone fibre. The roller is hardened steel, running on a hardened steel bushing held in a die-casting, which practically eliminates wear. The finish is natural steel. Each Timer is packed in a box weighing eight ounces, and one hundred in a carton weighing fifty pounds.

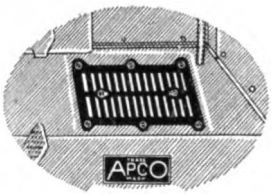
$1.00 Each



BRAKE ADJUSTER

When the Ford emergency brake shoes are half worn out they must be thrown away, as the brake shoe cams do not open the shoes wide enough to engage the drums. The Apco adjusters are driven over the cams when the shoes are worn and this extends the life of the shoes at least fifty per cent. When new shoes are installed the adjusters can be removed and used again. They are made from high grade steel and will last indefinitely, as they are subject to practically no wear.

25c Pair



HEATER

The Ford owner has never been offered a Heater at a price in keeping with his car, and several months ago we decided that it was up to us to produce a real one and at a price that would bring it within reach of all Ford Owners. The APCO heater utilizes the heat that is blown by the fan over the exhaust manifold and this heat is produced in volume sufficient to heat the entire car in the coldest weather, and in moderate weather the heater can be closed with a slight touch of the foot, or adjusted in the same way to any desired point. The installation is simply a matter of cutting a hole in the floor board and fastening the Heater in place with four screws.

$1.50 Complete

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Write for "New Facts About Piston Rings" and special dealer proposition.

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Summer or Winter



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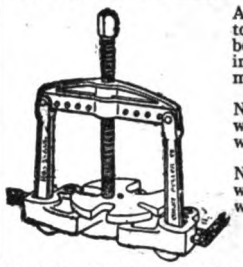
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All that is necessary is to bolt the base to a bench, insert the legs into it, the 2 set screws make a fine Arbor Press.

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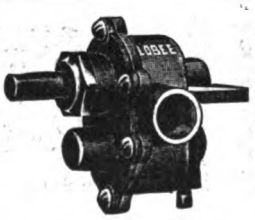
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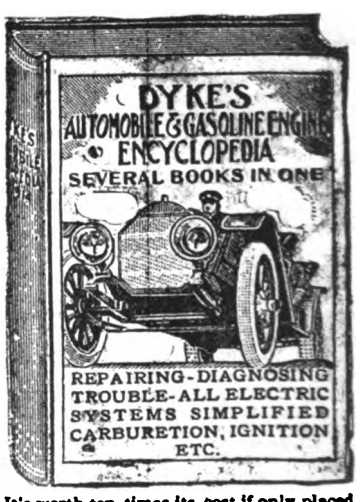
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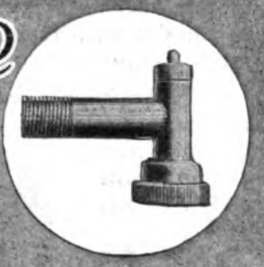
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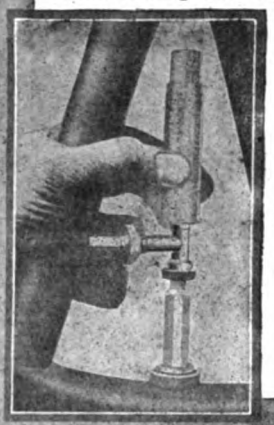
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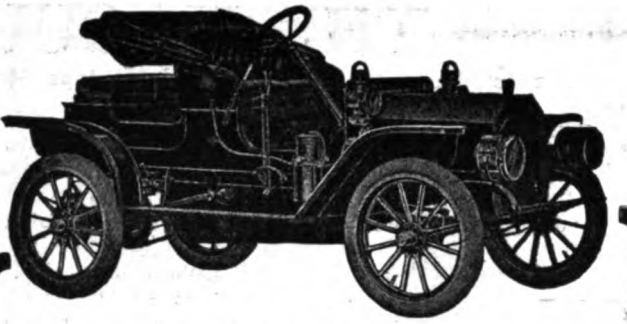
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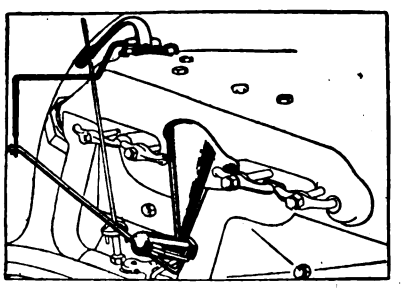
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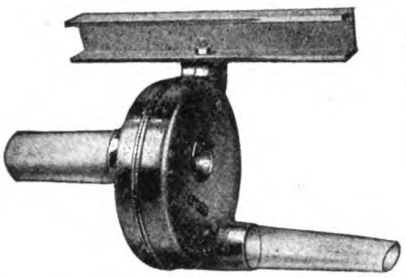
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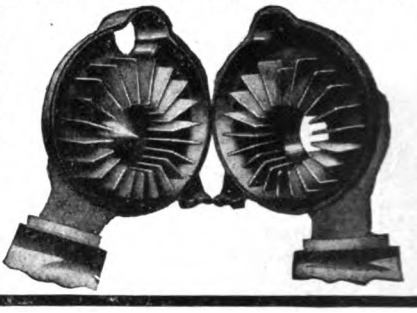
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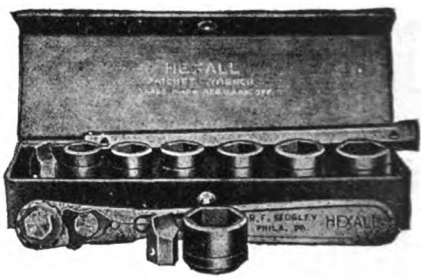
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We make all kinds of Patches, all Sizes and Prices.

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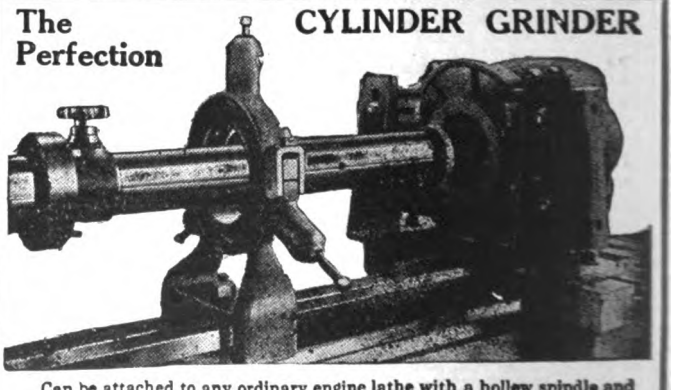
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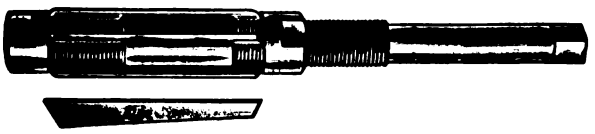


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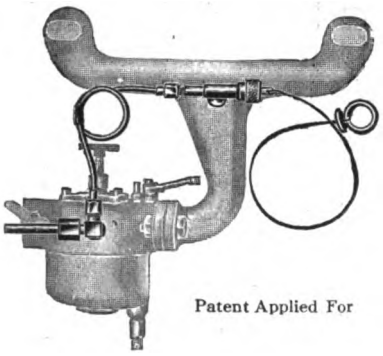
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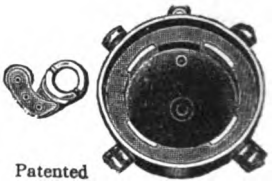


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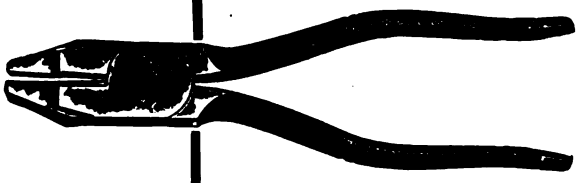
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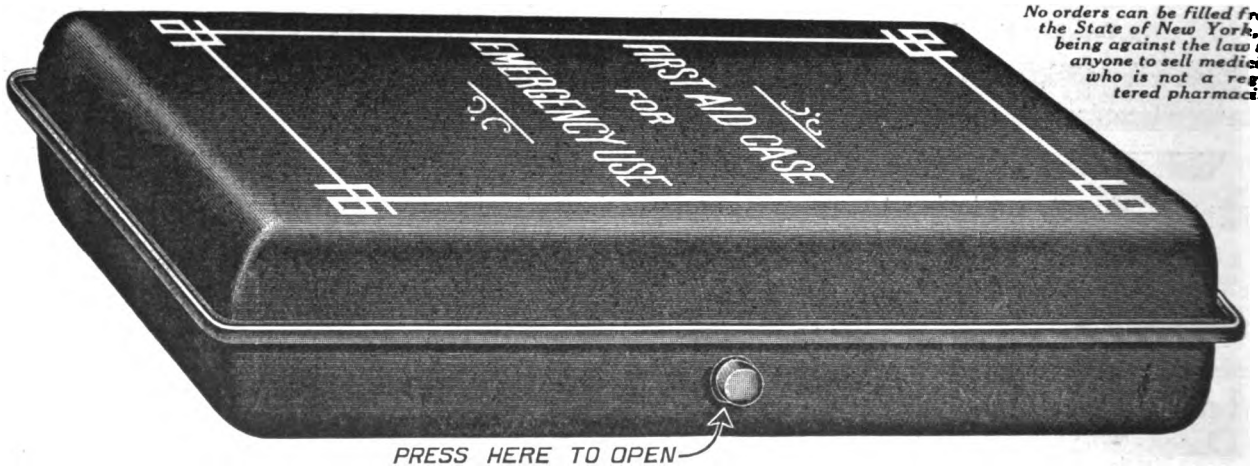
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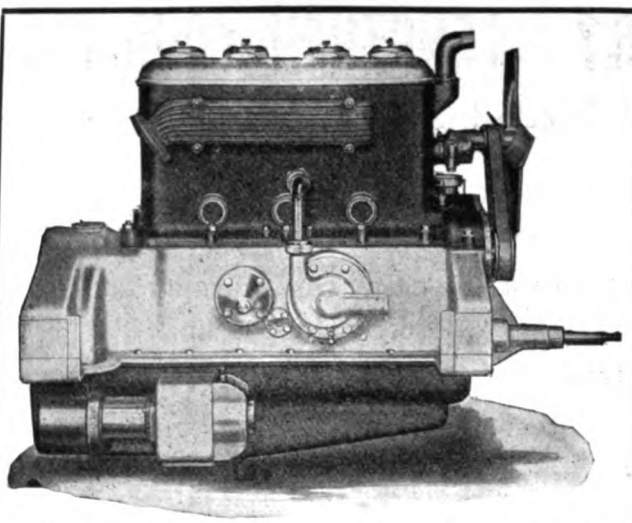
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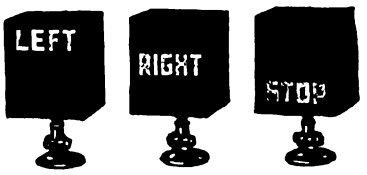
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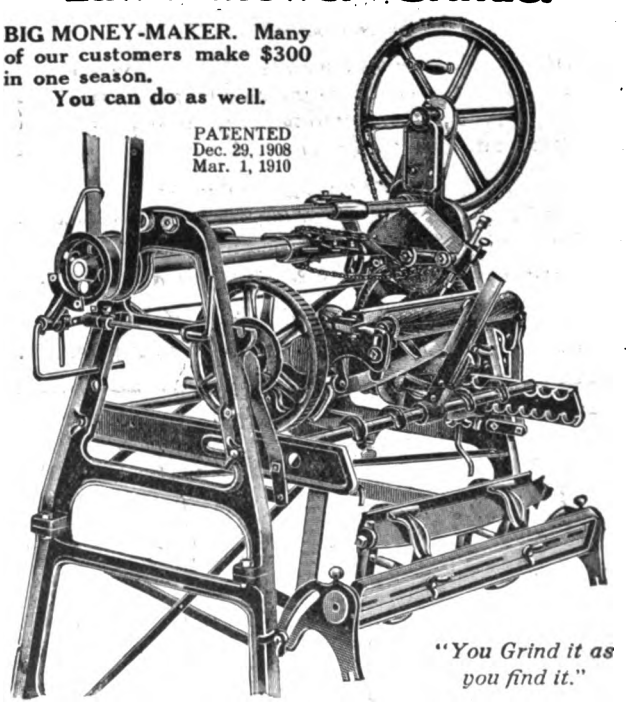
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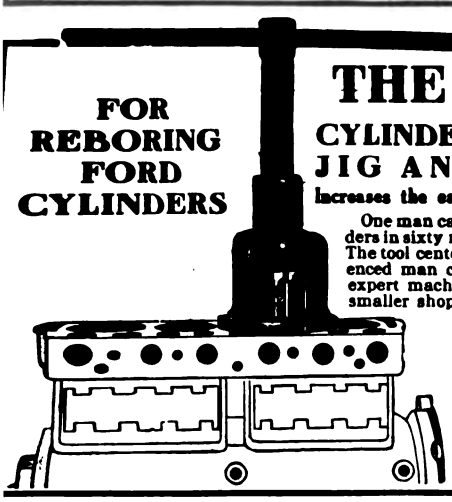
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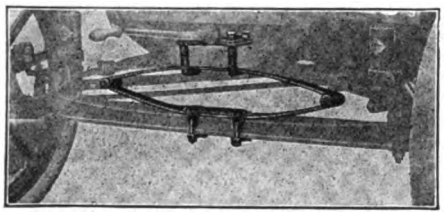
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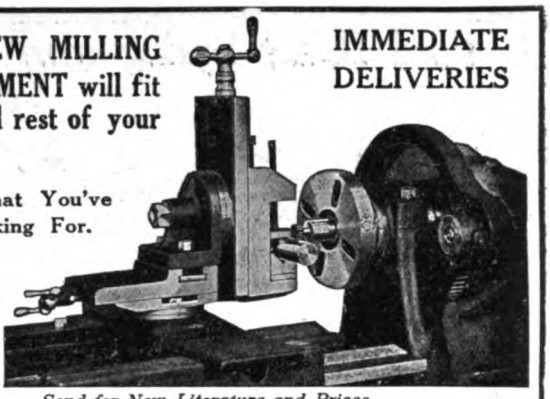
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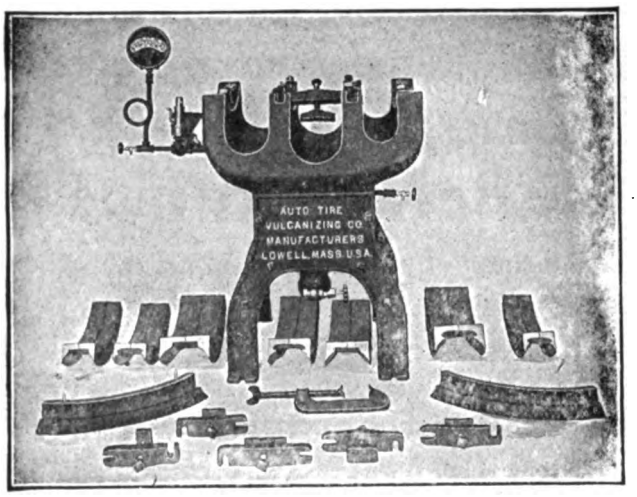
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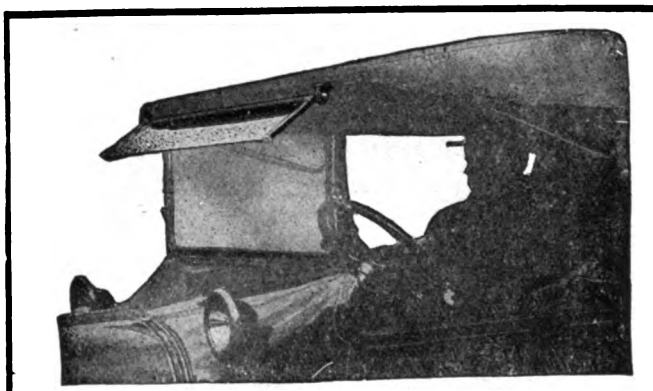
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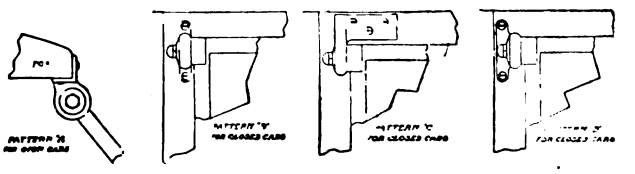
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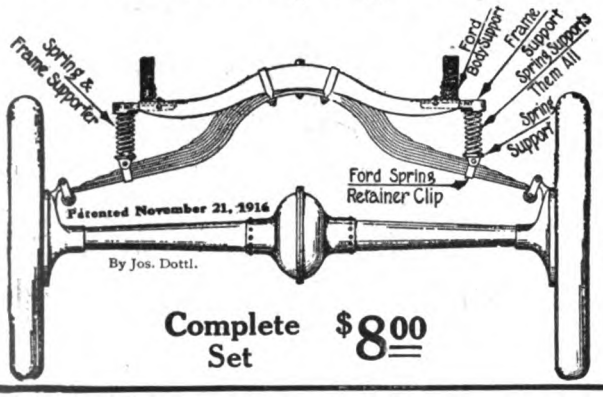
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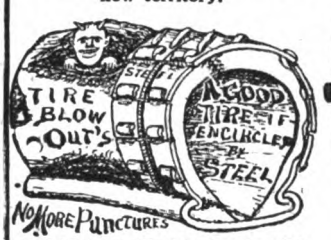
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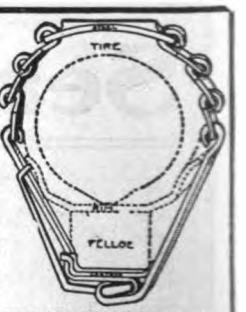
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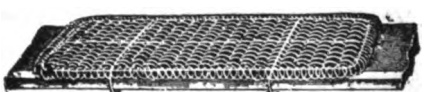


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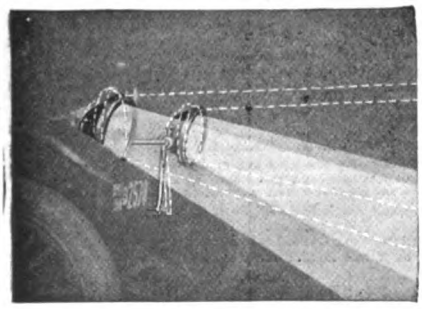
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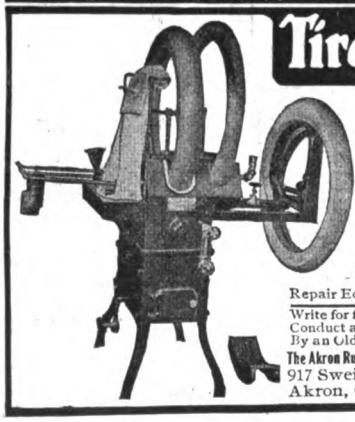
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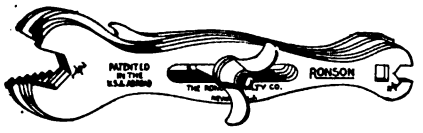
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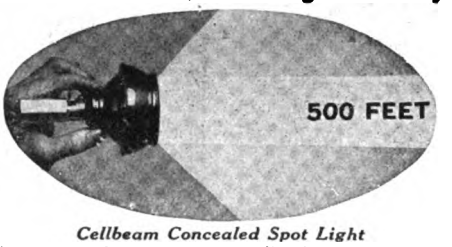
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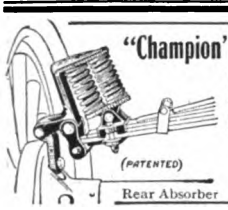
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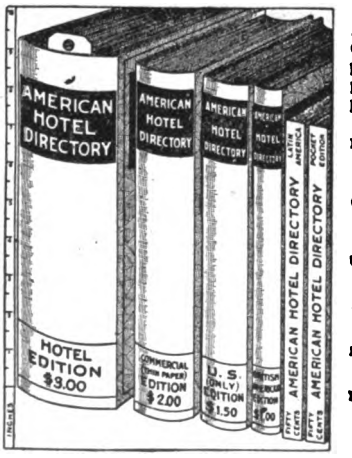
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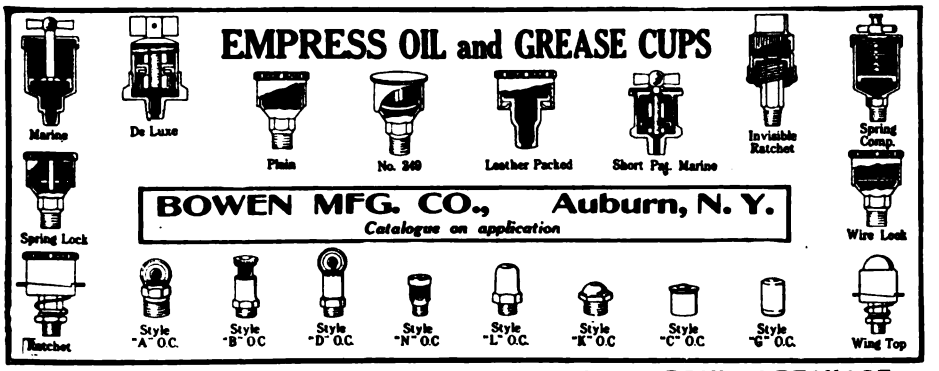
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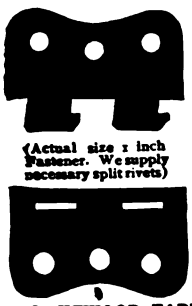
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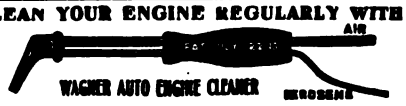
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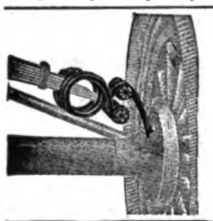
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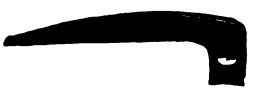
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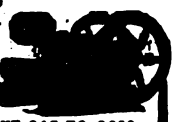
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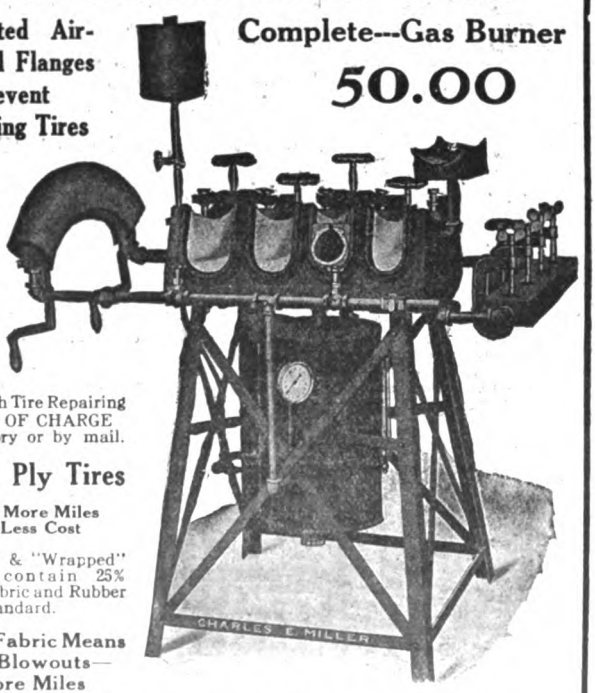
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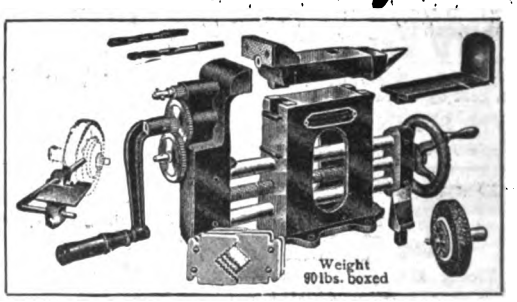
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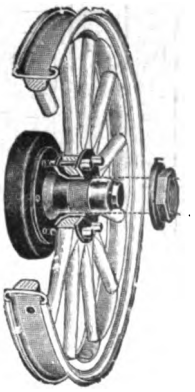
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___	Vitrolac Varnish	___	Commercial Acids
___	Vitrolac Stain Finish	___	Alums
___	Flowkote Enamel	___	Saltpetre
___	rid geport Wood Finishes	___	Wood Pulp
___	Antoxide Iron Paint	___	Pigment Bases
___	Auto Enamel	___	Tar Distillates
___	Rayntite Top Material	___	Dyes and Bases

Name _____

Address _____

City _____ *State* _____

VISIT THE DU PONT PRODUCTS STORE
1105 Boardwalk Atlantic City

Du Pont Chemical Works

Owned and Operated by
E. I. du Pont de Nemours & Company
Equitable Bldg. New York

The du Pont American Industries are:

E. I. du Pont de Nemours & Company, Wilmington, Delaware. . . Explosives
Du Pont Chemical Works, Equitable Bldg., N.Y. Pyroxylin & Coal Tar Chemicals
Du Pont Fabrikoid Company, Wilmington, Delaware. . . Leather Substitutes
The Arlington Works, 725 Broadway, N. Y. . Ivory Pyralin and Cleanable Collars
Harrison Works, Philadelphia, Pa. . . Paints, Pigments, Acids and Chemicals
Du Pont Dye Works, Wilmington, Delaware. . . . . Dyes and Dye Bases

DU PONT

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DEARBORN TRUCK UNITS
Make Any Car a Truck

One Ton—Two Ton



Dearborn Two-Ton Unit attached to Packard Chassis



Dearborn One-Ton Unit attached to Overland Chassis



Dearborn Two-Ton Unit attached to Mitchell Chassis



Dearborn One-Ton Unit attached to Dodge Chassis



Dearborn Two-Ton Unit attached to Cole Chassis



Dearborn One-Ton Unit attached to Hupmobile Chassis



Dearborn Two-Ton Unit attached to Glide Chassis

Dearborn Truck Units can be attached to any make of car, converting it into a motor truck of one or two-ton capacity. You are no longer confined exclusively to the Ford.

The demand for trucks this spring will be beyond the ability of truck builders to supply. This means a big business for dealers in converting pleasure cars of all types into motor trucks.

Dearborn Truck Units are time-tried and proven. They have been successfully attached to over 60 different makes of cars. They are not an experiment. The Dearborn Truck Company is a sound, successful company operating its own plant.

Dealers—Write Now

Dealers should write at once for proposition, full particulars and specifications. The Dearborn offers you a wonderful opportunity for a large truck business in 1918.

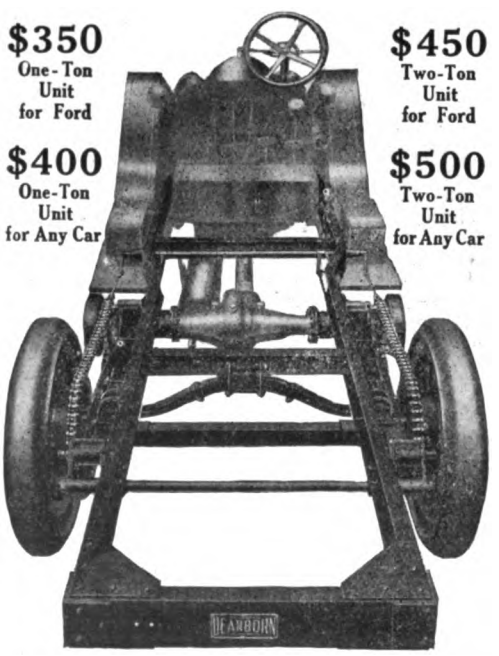
The Dearborn Truck Company
1252 S. Campbell Avenue
Chicago, Illinois

$350 One-Ton Unit for Ford

$450 Two-Ton Unit for Ford

$400 One-Ton Unit for Any Car

$500 Two-Ton Unit for Any Car



Rear View, showing Dearborn Universal Two-Ton Truck Unit attached to Mitchell Chassis



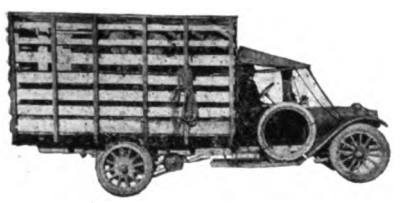
Dearborn Two-Ton Unit attached to Cadillac Chassis



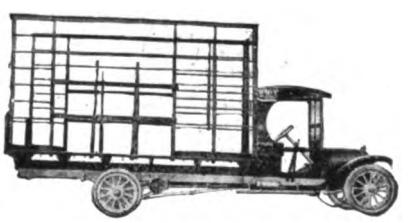
Dearborn Two-Ton Unit attached to Chalmers Chassis



Dearborn Two-Ton Unit attached to Hudson Chassis



Dearborn One-Ton Unit attached to Buick Chassis



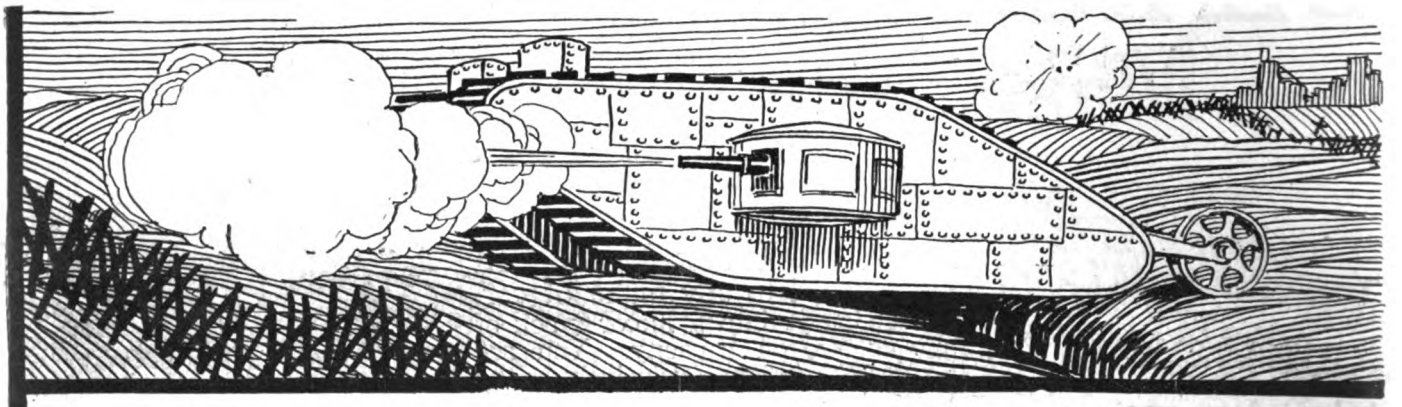
Dearborn Two-Ton Unit attached to Buick Chassis



Dearborn One-Ton Unit attached to Maxwell Chassis

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LIKE THE TANKS IN FRANCE-



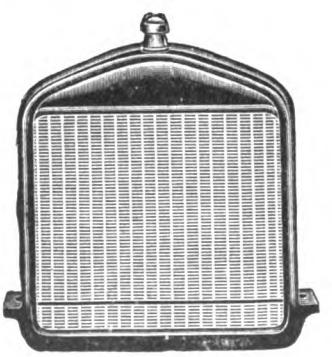
Superior PRODUCTS GO OVER THE TOP AND LEAD DEALERS TO SUCCESS!

MR. DEALER: THE BIG 1918 DRIVE IS ON—
SELL THE Superior LINE OF
PROFIT-PRODUCING-PRODUCTS

The steady and ever increasing demand for the big line of Superior PRODUCTS for Ford and other cars is evidenced by continual repeat orders received from hundreds of satisfied live dealers everywhere.

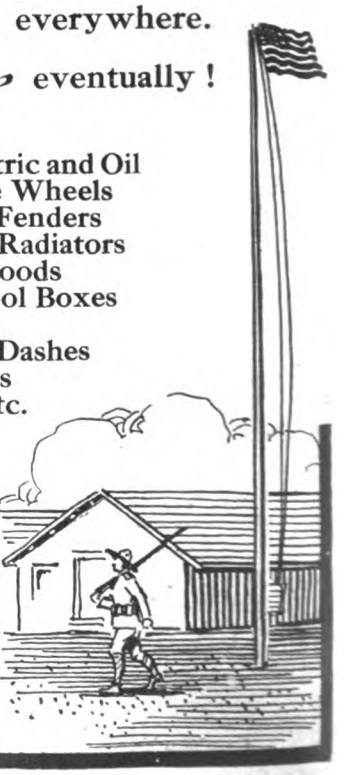
If you're not already one of them—you will buy Superior PRODUCTS eventually!

Tubular Radiators
Crown Fenders
Running Boards
Electric Fittings
Wire Wheels
Windshields
Lamp Brackets
Hand Horns
Lamp Parts
Bumpers, etc.



FOR FORD CARS

Lamps—Electric and Oil
Demountable Wheels
Commercial Fenders
Honeycomb Radiators
Streamline Hoods
Jacks and Tool Boxes
Tire Carriers
Commercial Dashes
Electric Bulbs
Floor Mats, Etc.



"SUPERIOR" AUTOMOBILE PRODUCTS

"When You Buy From Us, You Deal With Headquarters"

UP-TO-THE-MINUTE DEALERS CAN HAVE CATALOG FOR THE ASKING! WRITE TODAY—YOU'LL NEED IT!

Superior Lamp Mfg. Company
(Wholesale Accessory Division)
136-140 West 52nd Street New York, U. S. A.

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Many Kinds of Economy With Firestone Tubes

ONE of the strongest factors for extra measure of tire mileage is the protection given the casing by the enduring liveliness of the Firestone Red Inner Tube. It is built, layer on layer, by the laminating process, into one integral unit of endurance against heat and grind. This tube means for the man who sells it, the lasting economy and long-time dividends of good will.

Firestone Red Tubes sell best because they serve best. The prices are eye-openers on all the Firestone values. The facts will be plain to any motorist who buys Tire Accessories. If a Firestone Tube, which anybody can judge on sight, can be so good and yet sold so low, Firestone Tire Economy must be a fact.

Write for the Firestone sales-helps.

FIRESTONE TIRE AND RUBBER COMPANY, AKRON, OHIO
Branches and Dealers Everywhere



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An accessory line distinguished by trade protection and user satisfaction

MORE than ever this year Johns-Manville will depend on the trade for the distribution of accessories, which is the reason why we again emphasize our trade protection policy. We sell only to the recognized jobber. He stocks the retail dealer—and the margin he allows even on very small orders is liberal. This means quick turnovers, frequent re-orders and more profit for all concerned.

Because Johns-Manville accessories are of a satisfying quality—consistently advertised—they are easy to sell to the ultimate consumer. To prove this it is only necessary to point to Johns-Manville Non-Burn Brake Lining, the Johns-Manville Fire Extinguisher and the Johns-Manville Speedometer. Each excels in its own field through perfection of design and dependable quality. And this year we will again advertise these advantages consistently. Ask your jobber or our nearest dealer for complete information.

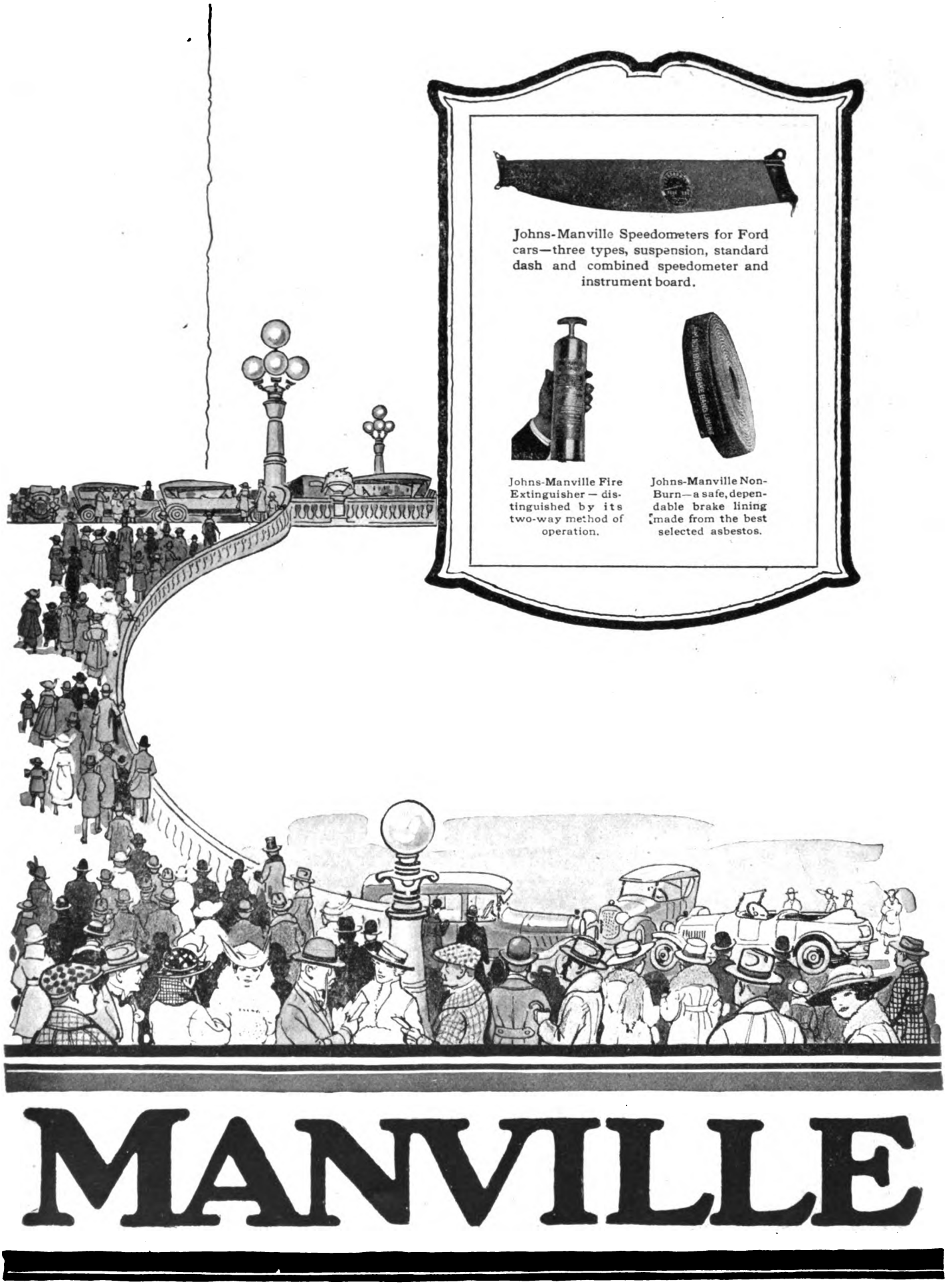
H. W. JOHNS-MANVILLE CO.
NEW YORK CITY
10 Factories—Branches in 60 Large Cities



JOHNS-MANVILLE SERVICE
COVERS THE CONTINENT

JOHNS-

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easiest to install

MUNGER "Always Tight" Piston Rings

List price for all sizes up to 3¾ in. diameter, $1.25 per ring.

With each complete set of rings a *Munger Piston Re-grooving Tool* and a *Munger Ring Insertion Tool* are supplied without extra charge.

The MUNGER ALWAYS TIGHT EXPANSION JOINT

Even a novice can install Munger "Always Tight" Piston Rings without breakage. Slip them over the Munger Ring Insertion Tool and they slide easily into the groove. These unique rings quickly conform to the shape of the cylinder and remain *always* gas- and oil-tight because with the Munger "Always Tight" Expansion Joint they retain their perfect fit until completely worn out.

The MUNGER "ALWAYS TIGHT" PISTON RING OUTFIT—

for FORDS
8 "Always Tight" Rings (Regular Size)
4 "Always Tight" Rings (Overwidth)
1 Regrooving Tool
1 Ring Insertion Tool

Accessory Dealers and Garage Men!

Any jobber will supply you with Munger "Always Tight" Piston Rings. Order them now.

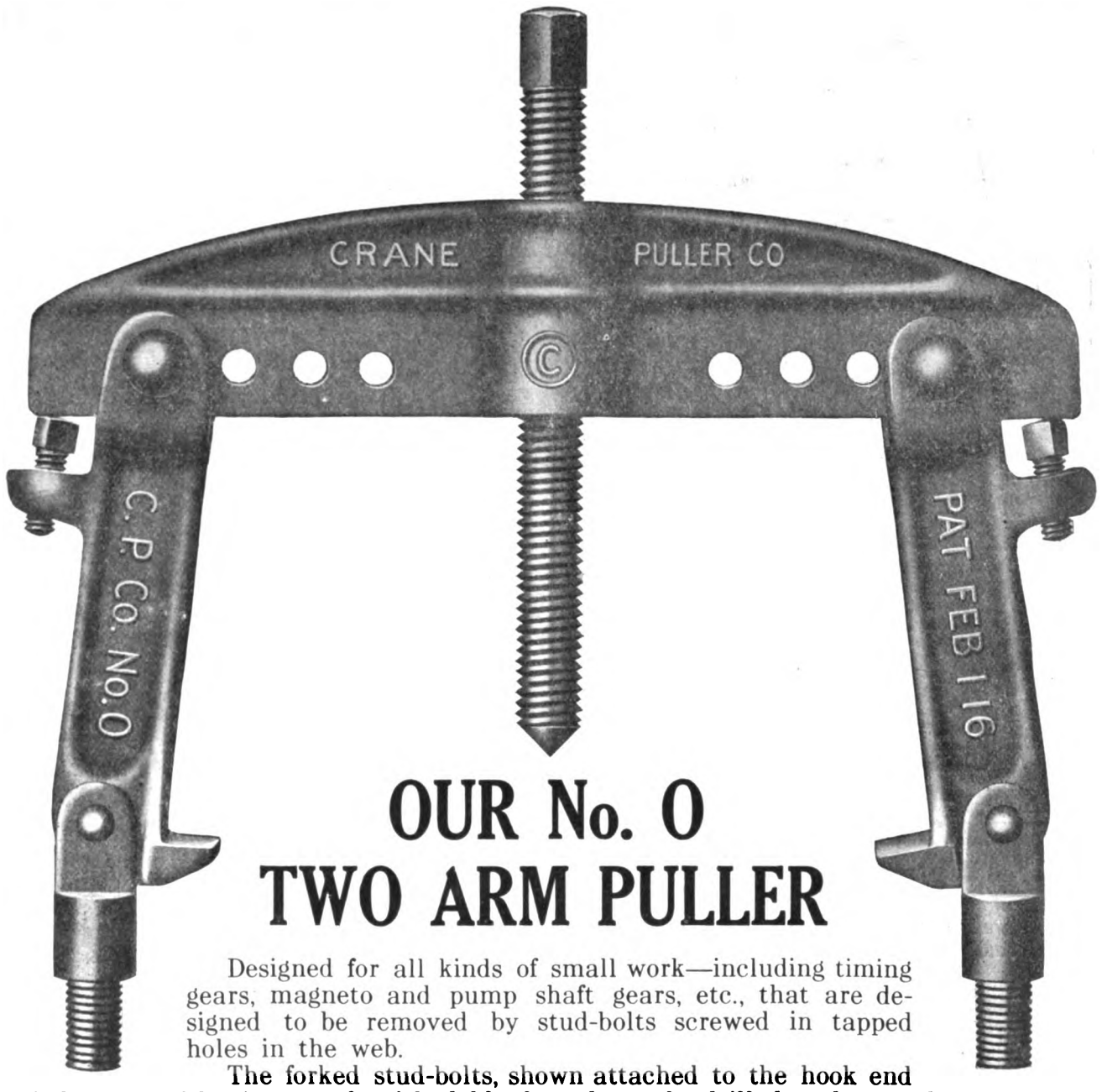
SPLITDORF ELECTRICAL CO.
NEWARK, NEW JERSEY

Splitdorf Branch Houses and Service Stations:

Atlanta,	10-12 E. Harris St.	Newark,	278 Halsey St.
Boston,	68 Brookline Av.	New York,	7 West 61st St.
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Dallas,	402 S. Ervay St.	Pittsburgh,	5943 Ellsworth Av.
Detroit,	1295 Woodward Av.	San Francisco,	1022 Geary St.
Kansas City,	1827 Grand Av.	Seattle,	1628 Broadway
Los Angeles,	1215 S. Hope St.	Toronto,	469 Yonge St.
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THE YOUNGEST MEMBER
Of the Crane Puller Family



OUR No. 0 TWO ARM PULLER

Designed for all kinds of small work—including timing gears, magneto and pump shaft gears, etc., that are designed to be removed by stud-bolts screwed in tapped holes in the web.

The forked stud-bolts, shown attached to the hook end of the arm with pins, are furnished blank and can be drilled and tapped by the purchaser for the proper thread for his work; and case-hardened headless set screws can be used for the stud.

This puller takes light work 5 inches in diameter and 3 inches from the end of shaft. It has the new patent Locking Arms, forked stud-bolts and case-hardened screw.

The List Price is $2.50 Purchase from Your Jobber

CRANE PULLER CO. Designers of Wheel and Gear Pullers for every purpose. **54 Lake St., Arlington, Mass.**

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BRAENDER TUBES AND TIRES



Of QUALITY equal to every emergency. Every test to which they have been put has emphasized the dependable service and wear-resisting qualities built into BRAENDER products.

The manufacturers know the requirments of the automobile public and have met those requirements in a manner that proves Braender superiority beyond question and makes them



"The Tyre To Tie To"

Write Us Today for Descriptive Circular and Proposition.

BRAENDER RUBBER & TIRE CO.

Factory: Rutherford, N. J., U. S. A.

BRANCHES

New York - - 250 West 54th St.
Chicago - 1350-54 So. Michigan Ave.
Philadelphia - - 683 N. Broad St.

Trade Mark

HUDSON MOTOR SPECIALTIES

HUDSON UNIVERSAL JOINTED VALVE GRINDER



The most successful grinder made

Away with all the old tools that grind valves only on one side—

Here's a sturdy, reliable Valve Grinder that hits the bull's-eye every time—grinding the **Entire** valve accurately — **Very** accurately. No guesswork about this tool—it's the straight goods.

It is fitted with a universal joint that allows the working end a certain amount of motion in any direction relative to shank—it is great for grinding the valves on the fourth cylinder of the Ford engine.

GET IT! Price $1.50

HUDSON CRANK CASE REPAIR ARM FOR FORD CARS

Just the right thing in the right place



Here's the crack-a-jack time saving idea for 1918. Crank case repairs are no joke—the engine must be taken out of the chassis, torn apart to make the repair and then have a new arm riveted on.

All that nonsense is now thrown in the discard—you can be ready for work in a tenth of the time—all you need **Now** is to loosen three bolts, slip the **Hudson Repair Arm** in place and tighten. It's a cinch!

GET IT. Price $1.50

BOSTON SHOW EXHIBIT will be at Booth of Motor Car Equipment Co.

Don't fail to send for literature that gives you all details on Hudson Motor Specialties

Write today—right now—that will be much better than to have it slip your mind

HUDSON MOTOR SPECIALTY COMPANY

1606 Real Estate Trust Building PHILADELPHIA, PA.

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POWER



RAJAH

Terminals and Adapters

Rajah Regular Clip Terminal

Adjustable to any cable. With the extra collar supplied fits any make of plug.

Rajah Thumb Nut Terminal

Adapter for Dodge, Ford, Hup, Hudson, Maxwell, Mitchell, Packard Twin Six, Pullman.



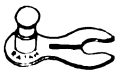
Rajah Packard Terminal

Adapter for Packard 4 and 6 Cylinder.



Rajah Ferrule Clip Terminal

With any size ferrule required. Fits any make of plug with the extra collar supplied.



Rajah Stud Terminal

Adapter for Buick, Chevrolet, Oldsmobile.

Terminals and Adapters are furnished so that Rajah Plugs can be used with any car not equipped with the Rajah Type of terminal.

THAT'S what the car owner wants most of all—power to take the hills, power to pass the road loafers, power to negotiate a stretch of heavy going.

A slow, lazy, weak spark hasn't a chance. It takes the quick, hot, brilliant spark of a Rajah to turn the trick.

Whether it is a hill climb like Pike's Peak or a gruelling struggle between racing cars, or an airplane flight, it is all the same to Rajah Plugs. No test is too severe.

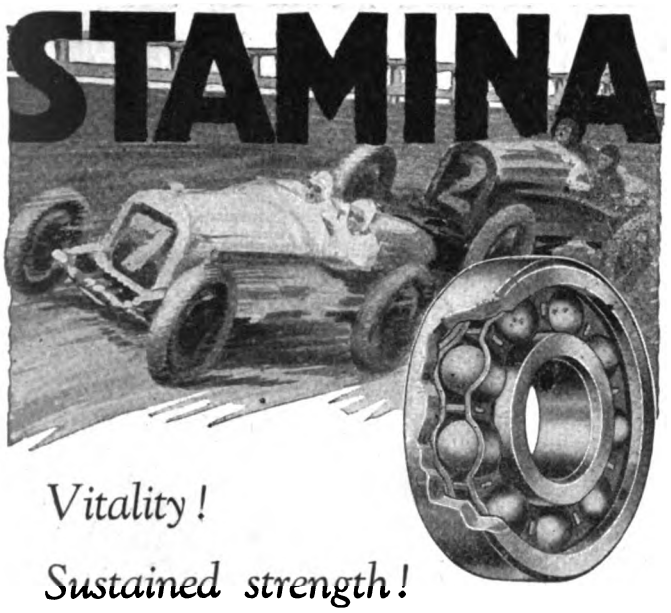
Talk power to your trade—the power that Rajah Plugs deliver—every mile—all the time.

Sell Rajahs in sets. Get car owners to completely equip and their performance will build up a trade that is permanent and lasting.

Manufactured by **Rajah Auto-Supply Co., Bloomfield, N. J.**
Sales Department **Edward A. Cassidy Co., 280 Madison Ave., New York**

RAJAH SPARK PLUGS

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Vitality!

Sustained strength!

There is enduring *Stamina* in New Departure Ball Bearings.

This is proved, time after time, by the grueling grinds in the fastest racing cars, which live ten years in as many minutes.

In a less spectacular way, they demonstrate their staying power, by their year in, year out service in all sorts of machines—saving for their owners many dollars in the form of power, lubrication, wear and replacement cost economies.

For uninterrupted service—economical operation—utmost efficiency—install New Departure Bearings.

THE NEW DEPARTURE MANUFACTURING COMPANY,
Bristol, Connecticut.

Conrad Patent Licensee.

NEW DEPARTURE BALL BEARINGS



Your Customers' Confidence

in you will be measured by their confidence in the lubricants that give 100% service.

DIXON'S GRAPHITE Automobile LUBRICANTS

will give your customers 100% service and increase their confidence in you.

Write to us for Dixon's Dealer's Deal No. 184-G.

Made in JERSEY CITY, N. J., by the

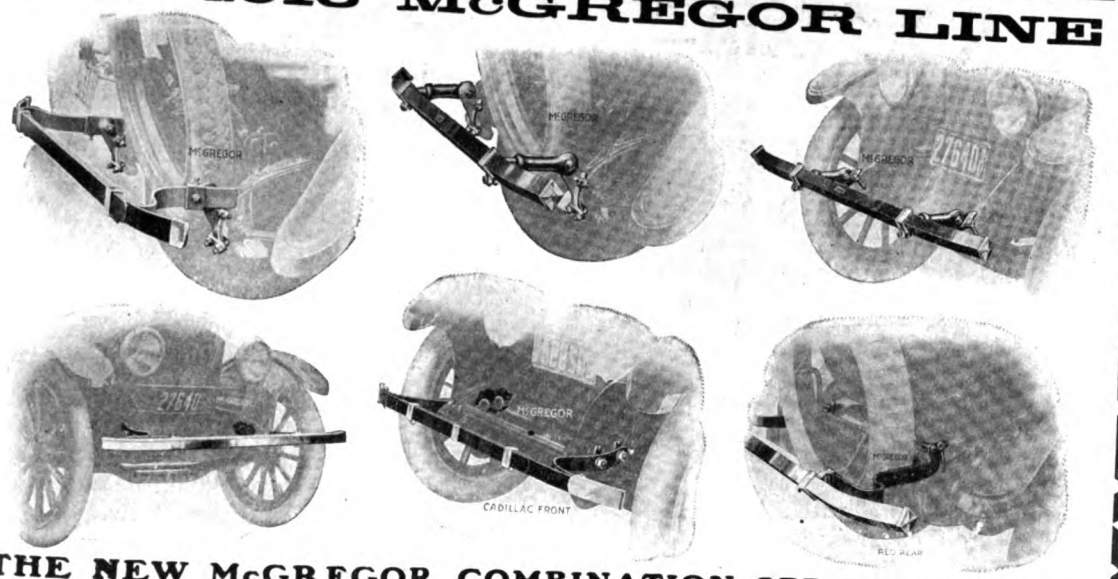
JOSEPH DIXON CRUCIBLE COMPANY

ESTABLISHED 1827



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The 1918 McGREGOR LINE



THE NEW McGREGOR COMBINATION SPRING BUMPER

Is All That Its Name Implies—The Very Latest and Best Bumper Made

Our different types of bars are made of High Carbon Steel. The Spring members, or arms, are made of High Carbon Spring Steel, and are fitted with universal adjustable brackets, applicable to any make of car, with extended frame, either front and rear.

This new bumper does away with the necessity of stocking a number of special front end bumpers, to fit Packards, Cadillacs, Dodges, and other cars with interfering mud and splash aprons. We make rear end bumpers with special designed arms, applicable to 99% of cars manufactured.

We have eliminated the Malleable Iron Arm, and now make an all Spring Steel Arm, insuring the greatest resilience and Shock-Absorbing qualities obtainable in a bumper.

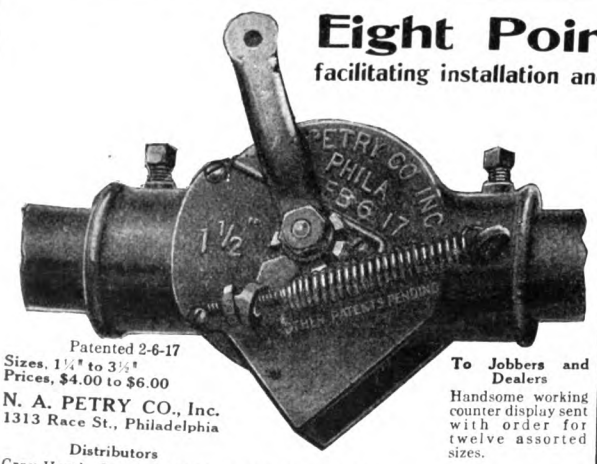
Catalogues Furnished Upon Request

Get in Touch with Your Jobber in Reference to Our Line

U. S. AUTO BUMPER COMPANY, 115 EAST 30th STREET, CHICAGO, ILL.

Eight Points of Adjustment

facilitating installation and eliminating in most cases the use of pulleys



Every motorist is quick to appreciate this exclusive, patented feature of the Petry Cut-Out.

Yet it's only one of the many constructional advantages of a cut-out scientifically correct in every detail.

The first device of its kind to give permanent satisfaction. Expels the exhaust gases through a full-size megaphone-shaped vent which greatly augments sound and facilitates tuning up of motor. Has adjustable lever, positive cut-off, non-fluttering valve, and is absolutely noise-proof when closed. Spring cannot anneal from the heat. Makes a gas-tight joint of permanent rigidity without strain on exhaust pipe. Easy to install and easy to operate. A size perfectly suited to every car.

Patented 2-6-17
Sizes, 1¼" to 3½"
Prices, $4.00 to $6.00

N. A. PETRY CO., Inc.
1313 Race St., Philadelphia

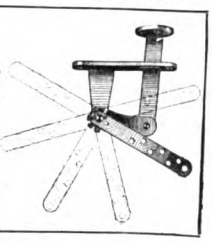
Distributors
Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.
Norman Cowan Company, 433-435 Rialto Bldg., San Francisco, Cal.

To Jobbers and Dealers

Handsome working counter display sent with order for twelve assorted sizes.

The Petry Universal Pedal

Patent Pending



Six different positions. Adjustable to pull or push; for any use for which a pedal is required. Muffler cut-outs; any style, kind or size. Accelerator. Exhaust whistle or horn. Heat valve.

The only pedal on the market that will meet all requirements.

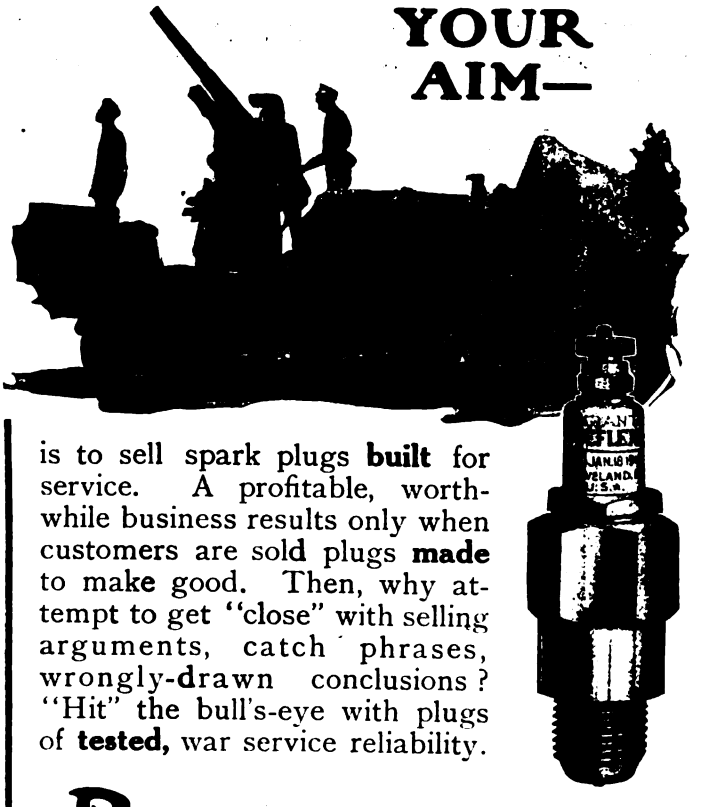
Made of high grade steel with special processed **gun-barrel finish,** not plated.

Price 75 cents each.

PETRY CUT OUT

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YOUR AIM—



is to sell spark plugs **built** for service. A profitable, worthwhile business results only when customers are sold plugs **made** to make good. Then, why attempt to get "close" with selling arguments, catch phrases, wrongly-drawn conclusions? "Hit" the bull's-eye with plugs of **tested,** war service reliability.

REFLEX SPARK PLUGS

KEEP THE CAR ON THE GO!

because every one is an exact duplicate of those specified for the thousands of White Trucks now operating in the war zones —service that is harder than that **your** trade can give them.

They are demanded because they get every iota of power from every drop of fuel—because they are made of the best materials obtainable, such as non-pit electrodes, Chromite war-service porcelain — because they give, day in and day out, the intensive spark that transforms lifeless, potential energy into brawny power.

You can sell a Reflex for every service. You can guarantee them — safely. Live, progressive dealers that want to make their time worth-while, should write for proposition today.

THE REFLEX IGNITION CO.
1711 PAYNE AVENUE, CLEVELAND, OHIO, U. S. A.

GIANT REFLEX Spark Plugs *are standard equipment on White Trucks in the war zones.*

Above shows Anti-aircraft gun mounted on a White Truck "Somewhere in France." Photo courtesy of Leslie's.

PYRAMID
STARTING AND LIGHTING BRUSHES
Make the Most Satisfactory Brush Renewals

The great number of cars, more than two million, which are equipped with starting and lighting outfits have made the brush renewal business one of big profits and quick turn-over.

Three Pyramid Brushes are standard equipment on nearly all outfits found on the modern car. You should be equipped to get your share of these profits.

Our automobile specification list gives the correct brush for every outfit. Send for it today.

National Carbon Company, Inc.
Cleveland, Ohio

SEE THAT GROOVE CONTROLLING THE OIL?



LOOK!
The groove full of oil forms a dam. Gas cannot get down, surplus oil cannot get up. That's why motor has more power, no carbon.
ISN'T THAT A REASON?

"NO-LEAK-O" RINGS GUARANTEED SATISFACTORY, OR MONEY BACK
Don't rebore cylinders.
"NO-LEAK-O" restores power when others fail.
Write for booklet A2. Ford size or under, 50c. Discount to the trade.
AUTOMOBILE ACCESSORIES CO.,
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Represented by: H. G. Paro, 1414 S. Michigan Blvd., Chicago; J. W. Van De Grift, 627 Charles Building, Denver, Colo.; J. E. Chumbley & Company, 1008 Stahlman Building, Nashville, Tenn.; A. W. Hall, 253 Lennox Building, Cleveland, Ohio; Manufacturers' Agency Co., 420 Wainwright Building, St. Louis, Mo. Carried in stock by W. E. Pruden Hdwe. Co., 864 Eighth Ave., N. Y. C. Gavin Williams Company, 1300 Fifth Street, San Diego, Cal.



THE ARMSTRONG MFG. CO.
BRIDGEPORT, CONN., U. S. A.
New York Office 248 CANAL ST.

like their products, need no introduction to the experienced steam or gas fitter.

To others, our Catalogue No. 14 will show why we are so popular.



"Makers of Genuine ARMSTRONG Stocks and Dies."

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B-W COIL TESTER



This Instrument is an absolute essential in every shop handling Ford Repairs. With it a full set of coils can be tested and accurately adjusted in less than five minutes. Render the most efficient service. Save yourself time and money. Eliminate guesswork.

ONE DAY'S USE WILL PAY FOR THIS TESTER - - - ***Price $6.00***

B-W Magneto Tester

Ascertains the exact condition of any Ford Magneto, whether the engine is on the work bench or running in the car. A minute's time is all it takes. Used by Ford Service Stations the world over.

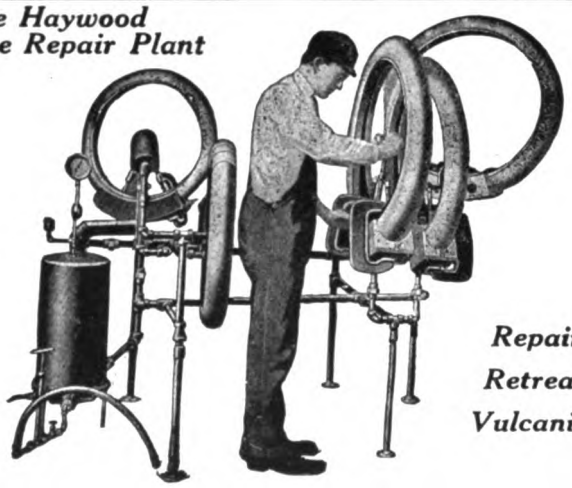


Free Trial Offer

Because we know you will appreciate the true value of this remarkable instrument after once using it, we will send one on ten days free trial to any responsible repair man. Ask us about the proposition. Address,

Ballman-Whitten Mfg. Co.,
4044 Olive St., ST. LOUIS, MO

The Haywood Tire Repair Plant



Repairs
Retreads
Vulcanizes

Give Haywood Service

HERE'S a standardized method of Tire Repairing—a method Nationally Advertised and known to motorists. Big money can be made either as side line to your present business or as a business by itself. **Equip your garage or store with a Haywood Plant.** Let it earn extra profits, or open a Haywood shop in your locality. **It's a rich opportunity.**

Write For Attractive Offer

ALL you need is one machine, a little training and you are ready to make money. A letter or post card brings all details. Interesting catalog explains **New Scientific Method** and gives particulars of our Co-operative Business Building plans. Write today.

Haywood Tire & Equipment Co.
965 N. Capitol Ave. Indianapolis, Ind.

Service

CAR owners will generally estimate the quality of your service by the quality of the product you sell.

Satisfaction to car owners—satisfaction and profit to dealers—that is the ultimate aim of Harvey Service.



PRACTICALLY UNBREAKABLE

THERE'S A HARVEY JOBBER NEAR YOU
Our new catalogue giving Complete measurements of over 900 Styles of Springs is yours on request

HARVEY SPRING & FORGING CO.
921-17th Street RACINE, WIS.

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"FIRST MONTH'S PROFITS PAID FOR THE PLANT"

THAT'S WHAT ONE MAN WRITES

No Experience Necessary—We Teach You How!

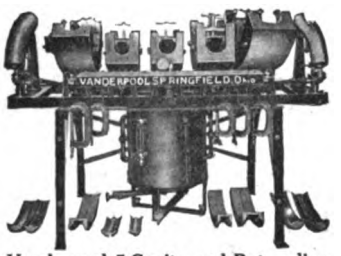
THE VANDERPOOL VULCANIZER

will get you your share of the big Winter and Spring tire repairing. Order a Vanderpool Vulcanizer today—**don't put it off—you lose money every day you delay.**

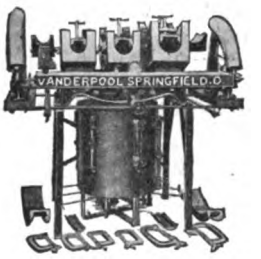
Get into this big profit-making business while work is plentiful—prices are good and everybody has more than they can do. Vanderpool Vulcanizers do the best—yes, the very best work, and that's the kind of work that satisfies customers and builds your success.

Operators of Vanderpool Vulcanizers are selling these machines for us right along—all the time. Ask for our list of users in the U. S. A., Canada, Cuba and South America. Write for price list today and send this "ad" in with your letter. (A.D.&R.)

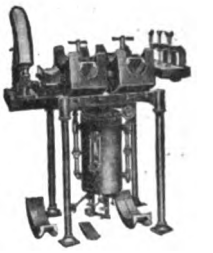
RETREADS, DOUBLE TREADS, SECTION REPAIRS, INSIDE AND OUTSIDE, CURES AND REPAIRS TUBES



Vanderpool 5-Cavity and Retreading Molds with Bead Molds



Vanderpool 3-Cavity



Vanderpool 2-Cavity

Start in Right Now—Don't Put it off a Minute Longer—Send for Catalog

VANDERPOOL COMPANY - SPRINGFIELD, OHIO

"WHITNEY" KEYS

FOR THE WOODRUFF SYSTEM

For the benefit of dealers, garages, and repair men, we are prepared to furnish our keys put up in two assortments. Every garage and repair man should keep these on hand. They may be purchased from the leading jobbers or ordered direct from the factory.

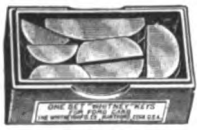


Regular Assortment

One hundred keys of the sizes most likely to be required for repair work.

Ford Assortment

One set of keys for the Ford car. These keys are of the special material and special treatment specified by the Ford Motor Company.



THE WHITNEY MFG. CO.

HARTFORD, CONN.

Chains Keys Hand Milling Machines

WITHERBEE STORAGE BATTERIES

For

STARTING — LIGHTING — IGNITION



WITHERBEE BATTERIES are of correct size, shape, voltage and capacity for every make and model of car, and for starting and lighting systems of any manufacture in general use.

MODERN—carefully constructed batteries—they possess high starting ability; the plates are specially processed to prevent buckling, and the jars are made of the finest rubber; the wood cases of acid-proofed hard wood.

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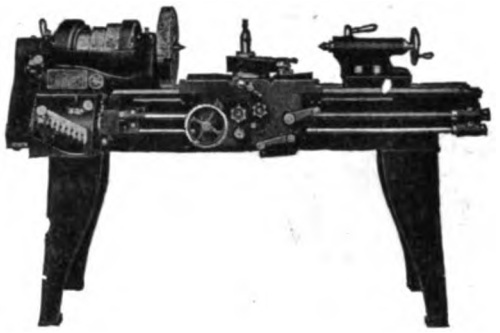
Complete information, prices and illustrated catalog mailed promptly upon request.

WITHERBEE STORAGE BATTERY CO., Inc.

1904 Broadway; Factory, 643-9 West 43rd St.

NEW YORK

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14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathe for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 11 and prices

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"IDEAL" Lawn Mower Grinder

BIG MONEY-MAKER. Many of our customers make $300 in one season. You can do as well.

PATENTED
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Grinds all kinds of Mowers perfectly in 15 minutes without removing wheels, ratchets or reel-knife, BETTER, QUICKER and EASIER than it can be done by hand. Has perfect Skate Sharpener Attachment. Run by hand or power. Nearly 10,000 in use. Sold on easy-payment terms. Also makers of the "Peerless" Horsemower Grinder.

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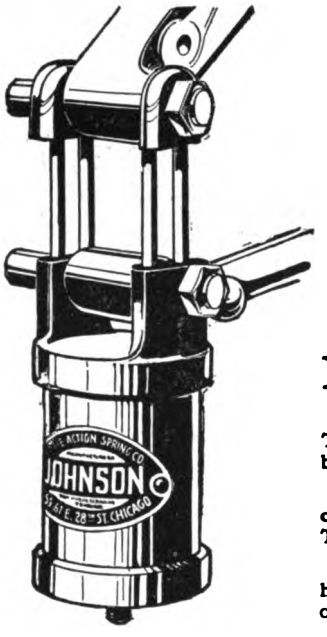
Please send me a set of **Automobile Engineering** for 7 days' examination. I will pay small shipping charge. If I decide to buy, will send $2 in 7 days and balance $2 a month until $17.80 has been paid, when books and Consulting Membership will be mine. Otherwise will notify you and hold books subject to your order. Title not to pass until fully paid.

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SPRINGS FOR ALL CARS

DO all the lame cars drive to *your* door for Temme Springs and other things?

In most good towns, Temme Springs and Temme's Triple Action Service are known to be *as good as gold.*

Hundreds of repairers, who have "banked" on Temme and never lost, are putting up Temme highway signs today.

These signs *will* bring in business. Temme has tried them, so he *knows.* And now he offers *you* what won for him.

Temme Springs *"for all cars"* means just what it says—for all cars *since 1902.* Test us by naming the spring you need. Temme Triple Action Service will have it on the way to you the same day.

"For all cars" means *designed* for all cars to factory specifications. And so good are Temme Springs—so prompt the service—so fair the prices—that dealers in *all* cars now buy from Temme *in preference* to the car maker.

You need these springs, this service, these signs. They will make you money, bring new business, help you build the good reputation you are after.

If you delay you may lose this exclusive proposition. Write or wire us now, saying: "Send Temme Spring Service Station proposition at once."

JOHNSON
Shock Absorber

This is to remind you of the new model of the famous Johnson Shock Absorber—made by us. The only cure for a hard riding car is a pair of Johnsons. Temme Spring Service Stations make good money on them. Write now for our new proposition.

TRIPLE ACTION SPRING CO., 79 East 28th Street, CHICAGO

Leave Your Tube in the Vulcanizer
AND WAIT ON YOUR CUSTOMERS
Why Not?

AMERICAN AKRON

Famous Five-Minute Cure Cement

WILL CURE IN FIVE MINUTES

Will Not Overcure, If Left in the Heat for One Hour

Put Up in Seven Size Containers
Made in Two Grades—Red and Gray
Recommended for Both Casing and Tube Repairs

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The American Rubber & Tire Co.
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Bunting Bearing Metal is overwhelmingly favored—because we have steadfastly adhered to an ideal which subordinates everything to the prime question of quality.

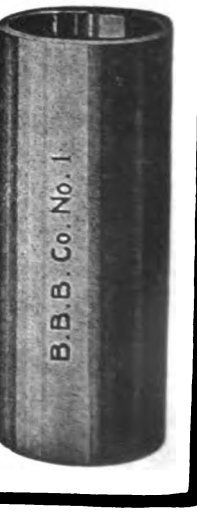
Beyond the shadow of a doubt, we can suit you to a "T"—for our Cored Bars are made of the world's best—yes—very best phosphor bronze. Over 300 of the largest manufacturers of machinery, engines and motors have adopted it for use in their products and they are more than satisfied.

If you, too, wish to use Bunting Bronze, the wise practical expedient way would be to write us a letter today—why not—it's for your own good.

Write for Pamphlet "X"

STOCK SIZES

PIECE No.	Outside Diameter	Inside Diameter	Length	Approximate Weight
A	1	½	12	2
B	1¼	½	12	3½
C	1½	¾	12	5
D	1¾	¾	12	7
E	2	1	12	8½
F	2¼	1¼	12	10
G	2½	1½	12	11½
H	2¾	1¾	12	12¾
I	3	2	12	13¾
J	3¼	2¼	12	15¼
K	3½	2½	12	17
L	4	3	12	21
M	4¼	3¼	12	20



The Bunting Brass & Bronze Co.
740 Spencer Street Toledo, Ohio

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FOUR NEW TRADE APCO MARK NEEDS FOR FORDS



SPINDLE ARM ANTI RATTLERS

The best selling repair part for Ford Cars is without a doubt the spindle arm bushing No. 2714, as this wears out quicker than any other part of the car. It is cheaply replaced, but the steering rod commences to rattle as soon as wear starts, and when you consider that one-sixteenth of an inch play in the bushing means an inch play at the wheel, the necessity of keeping the bushings in condition is doubly apparent. The slightest play in this bushing also causes a disagreeable rattle, and causes the wheels to wobble, which means excessive wear on the tires, besides making the car harder to steer.

The Apco Silencers consist of two heavy formed springs which can be put on the car in a minute with no tools but the hands. With these on the car, one set of bushings will last two years, and at no time will there be a rattle or play in the steering wheel.

Finished in black enamel, packed one pair in a box, weighing 2 ounces.

40c Pair



TIMER

The Apco Timer gives a hotter, quicker spark, an easier start, more power and speed, smoother running, longer life to the platinum points, more miles to the gallon of gasoline, fewer short circuits and freedom from all those troubles that the regular type timer develops besides being the only renewable Timer on the market. The shell is heavy pressed steel with a single piece steel advance arm riveted on. The contacts are clock spring steel, easily and cheaply replaceable, the insulation is high grade bone fibre. The roller is hardened steel, running on a hardened steel bushing held in a die-casting, which practically eliminates wear. The finish is natural steel. Each Timer is packed in a box weighing eight ounces, and one hundred in a carton weighing fifty pounds.

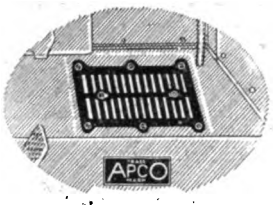
$1.00 Each



BRAKE ADJUSTER

When the Ford emergency brake shoes are half worn out they must be thrown away, as the brake shoe cams do not open the shoes wide enough to engage the drums. The Apco adjusters are driven over the cams when the shoes are worn and this extends the life of the shoes at least fifty per cent. When new shoes are installed the adjusters can be removed and used again. They are made from high grade steel and will last indefinitely, as they are subject to practically no wear.

25c Pair



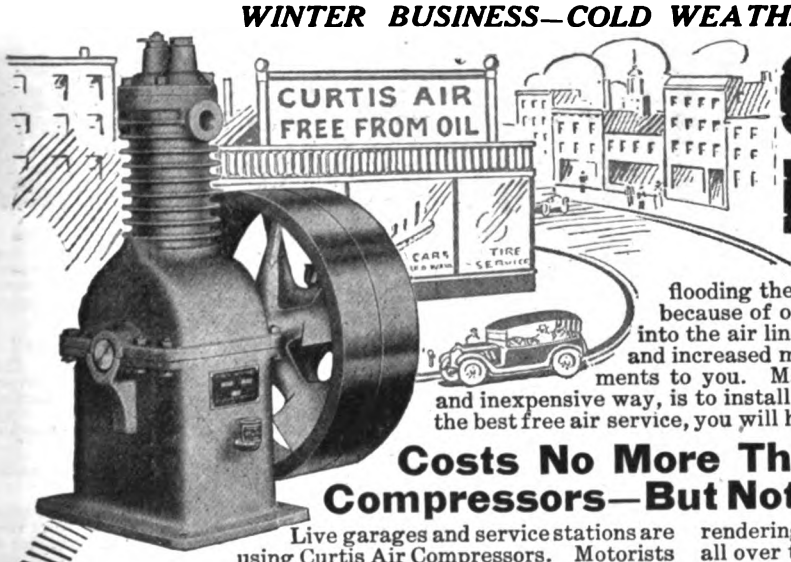
HEATER

The Ford owner has never been offered a Heater at a price in keeping with his car, and several months ago we decided that it was up to us to produce a real one and at a price that would bring it within reach of all Ford Owners. The APCO heater utilizes the heat that is blown by the fan over the exhaust manifold and this heat is produced in volume sufficient to heat the entire car in the coldest weather, and in moderate weather the heater can be closed with a slight touch of the foot, or adjusted in the same way to any desired point. The installatiion is simply a matter of cutting a hole in the floor board and fastening the Heater in place with four screws.

$1.50 Complete

APCO MANUFACTURING CO., PROVIDENCE, R. I.

WINTER BUSINESS—COLD WEATHER MADE PROFITABLE.



CURTIS AIR FREE FROM OIL

The Curtis Compressor is the only one designed to prevent flooding the cylinder with more oil than it needs for lubrication. This, because of our controlled-splash oiling system. No excess oil is forced into the air line. **Oil ruins tires**—air free from oil means fewer blowouts and increased mileage all around for your customers, with less tire adjustments to you. Make your place the most popular one in town. An easy and inexpensive way, is to install a Curtis Compressor. The customer assumes if you have the best free air service, you will have the best service in all departments.

Costs No More Than Ordinary Compressors—But Note The Difference

Live garages and service stations are using Curtis Air Compressors. Motorists expect free air service. Why not give them the best and win over new customers by supplying, not only reliable air service, but **Curtis Air—Free From Oil.** A poor air system which shoots oil into the tires, or which is unreliable, drives customers away. Thousands of Curtis Outfits are rendering daily, effective, efficient service all over the country. Your Curtis Compressor can further pay for itself by supplying air for air hoists, painting, cleaning, vulcanizing, blowing dust and drillings from tools, and many other things. Curtis Compressors are backed by manufacturers who have been specialists in this line for twenty-five years.



10 Combinations of Compressor and Tank Sizes—Any Current

Five Sizes—Tight Pulley Only, or Tight and Loose Pulley

11 Combinations of Compressor and Tank Sizes—Any Current



Makes New Customers—Holds Old Ones

Quickly pays for itself in bringing in new trade and holding the old trade, for it not only is the source of a dependable supply of air when your customers want it, but it also supplies clean, cool air—free from oil. Motorists realize that oil will quickly destroy their inner tubes, and, therefore, look for a station that supplies Curtis Air—Free From Oil.

Curtis Compressors are built to meet the requirements of your business in sizes, arrangements and prices. Send coupon at once for full information and attractive prices. It will pay you to investigate our proposition. *Write us today, or ask your jobber for prices—but insist on a Curtis.*

Curtis Pneumatic Machinery Co.
1530 Kienlen Avenue St. Louis, Mo.
530E Hudson Terminal, New York

Curtis Pneumatic Machinery Co.
1530 Kienlen Ave. St. Louis, Mo.

Gentlemen: Please send me full details regarding Curtis Garage Air Compressor—your proposition and low prices.

Name.....

Address.....

Jobber's Name.....

Address.....

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EVER
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THE mechanic these days has no time to waste with tools that will not stand up.

Screw-drivers!—handles must not work loose, nor edges turn or crumble under severe usage. They must be tools that save time, enable better and faster work—"Multiply man's power."

"YANKEE"
Plain Screw-drivers

are long-lasting, *efficiency* tools. You simply can't twist the handles loose—because the "YANKEE" is virtually a one-piece screw-driver. They'll withstand the hardest knocks of garage or repair shop work.

Well balanced, and made of the finest tool steel with the precision and care that have made "YANKEE" Tools famous the world over. Highly polished blade and ferrule; dull finish, corrugated hardwood handle, enabling a firm grip.

No. 90—Standard Style, in 15 sizes, 1¼-inch to 30-inch blades.....**20c to $2.00 each**

No. 95—Cabinet Style, in 11 sizes, 2½-inch to 15½-inch blades.....**20c to 70c each**

Your dealer can supply you

Write us for "'YANKEE' Tool Book," showing garage and repairmen's labor-saving Bench, Breast, Chain and Hand Drills, Plain and Ratchet Screw-drivers, etc. They are the tools of today!

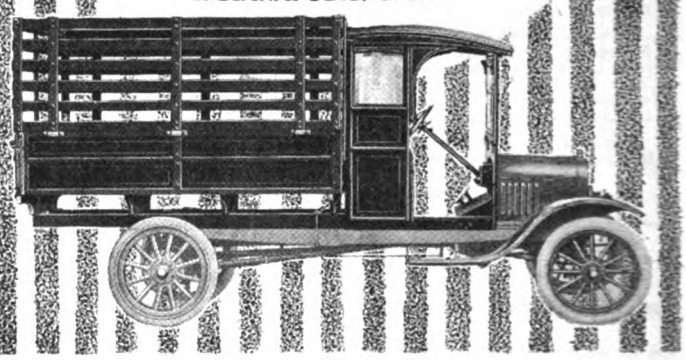


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10,000 Miles



EVERY Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser.

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Brictson Tires are puncture proof, and proof against blowouts, skidding, rut wear, rim cuts, and can't be damaged by oil or gasoline. Wonderful resiliency, easy riding and economy commend them to every car owner.

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Should the tread surface wear out after 10,000 miles of service you can get a new retread for one-fourth the original cost of the tire, instead of buying a new tire and you keep the remaining three-fourths in your pocket. With ordinary service the Brictson Tire should run enough beyond the 10,000 miles to require one or two extra retreads. The more retreads you use the cheaper your service.

FREE TRIAL OFFER

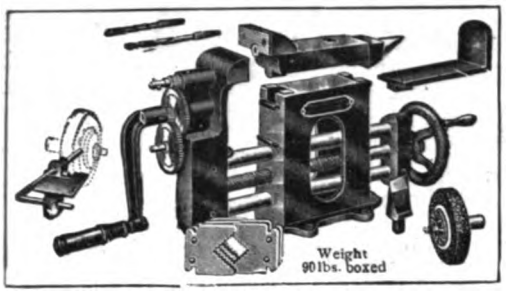
To convince you the Brictson Tire will give satisfaction TRY THEM ON YOUR CAR AT OUR EXPENSE. Write today for this Free Trial Offer, a copy of our guarantee and full information about Brictson Tires.

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A Work-shop in Itself

$14 Complete

Here's a wonderful repair outfit—a big, strong, everlasting combination of tools. Six tools in one—would cost $25 at least, if bought separately. Outfit includes strong, practical anvil; powerful vise up to 4½ inches; a sure-grip steel pipe vise, takes up to 1½ inch pipe; corundum grinding wheel 5 inches by 1 inch; a two-speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing handle grip. It operates grinding wheel, buffing wheel and many other similar tools.

SPECIAL OFFER

Send for one of the outfits, remitting $2.00 with your order, pay balance on arrival. If not entirely satisfied in every way, return it and money will be cheerfully refunded.

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Complete---Gas Burner

$150.00



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From 75c up

We teach Tire Repairing FREE OF CHARGE at factory or by mail.

Extra Ply Tires

Give More Miles at Less Cost

"COG" & "Wrapped" Treads contain 25% more Fabric and Rubber than Standard.

More Fabric Means Less Blowouts—More Miles

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BALL BEARINGS
(Patented)

The running of a car or truck—its steadiness, its power, its smoothness, its dependability—rest ultimately upon the performance of a hundred component parts. Failure in one of these may destroy that smooth unity which differentiates good performance from unending bother.

Enquire into the dependability of magnetos and lighting generators. Those of demonstrated serviceability, of proved reliability, are standardized on "NORMA" Ball Bearings—have their own inherent superiorities fortified by "NORMA" Bearing speedability.

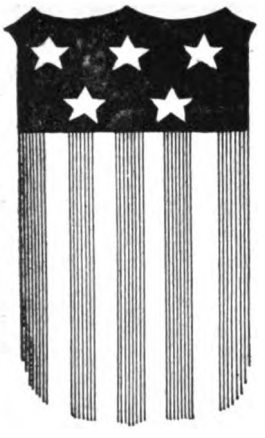
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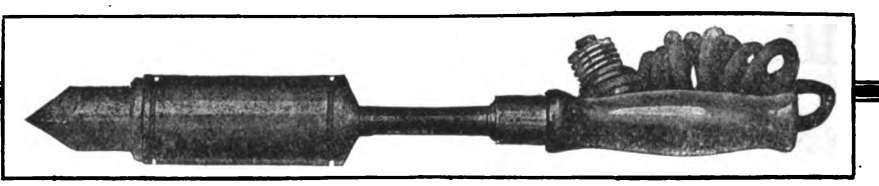
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Made of Pure Rubber, cut in small particles treated, moulded and vulcanized by our special steam process. Fits all the different size casings. No inner tube and air used, eliminating the cause of all tire trouble. Stops the expense of buying, repairing and replacing the inner tubes. Doubles the life of the casing—reducing the cost one-half. Can be transferred and re-transferred as often as is necessary. Has been sold throughout the U. S. and many of the Foreign countries for six years. Has years of actual service record back of it. It has all the easy riding qualities of the air-filled tire, with none of its faults and uncertainties. No waiting to use your car; it is always ready whenever you need it. Let us send you small sample and tell you more about it.

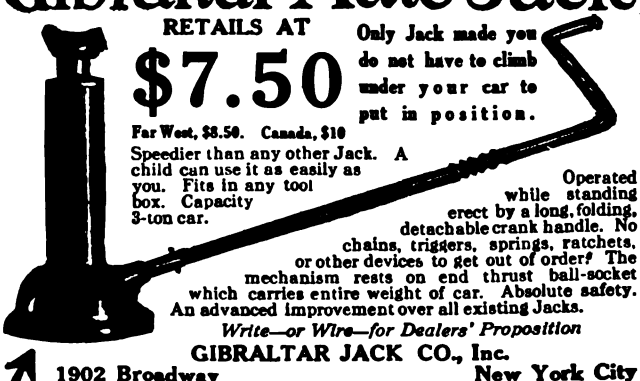


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Gibraltar Auto Jack
RETAILS AT
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Speedier than any other Jack. A child can use it as easily as you. Fits in any tool box. Capacity 3-ton car.
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1,041,975	Ford Owners, $2.00 per thousand.

All commercial lists are typewritten, show financial rating in dollars and are 1917 compilation, and guaranteed 98% correct. Ask for Price List No. 82, showing 2,500 other classifications of dependable mailing lists.

TRADE CIRCULAR ADDRESSING CO.
Phone, Franklin 1182. 166 W. Adams St., CHICAGO

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TO ALL DEALERS

AND OWNERS OF CARS NEEDING PAINTING

Right now, with the Winter months coming, there is a mighty good opportunity for you to materially increase your profits if a dealer and save money if a consumer—

SIMPLE SYSTEM——three coat work——AUTOMOBILE PAINTING

ANYBODY CAN PAINT A CAR IN 3 DAYS

and completely obliterate the marks of the Summer's usage with a hard, wearing, beautiful surface on all parts.

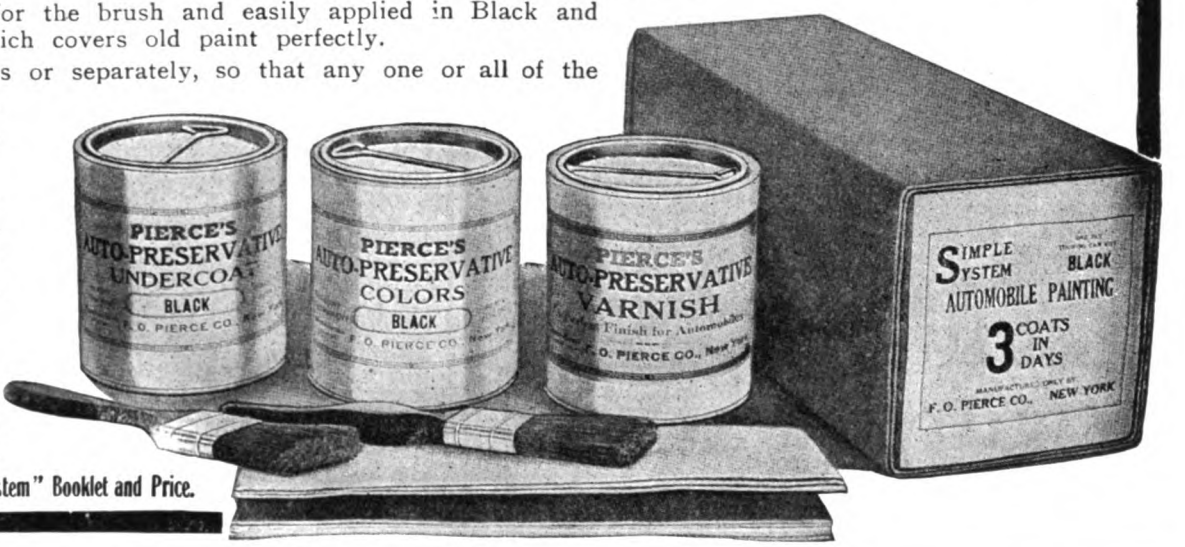
THE THREE COATS PUT UP IN SETS COMPRISING:

1 CAN AUTO PRESERVATIVE UNDERCOAT FOR FIRST COAT.
1 CAN OF AUTO PRESERVATIVE COLOR COAT FOR SECOND COAT.
1 CAN OF AUTO PRESERVATIVE VARNISH FOR THIRD COAT.
1 SHEET No. 0 SANDPAPER FOR SANDING LIGHTLY AFTER FIRST COAT IS APPLIED.
1 BRUSH FOR FIRST AND SECOND COATS.
1 VARNISH BRUSH FOR FINISHING COAT.
2 SHEETS No. 1 SANDPAPER FOR CLEANING CAR.

All ready for the brush and easily applied in Black and 12 colors, which covers old paint perfectly.

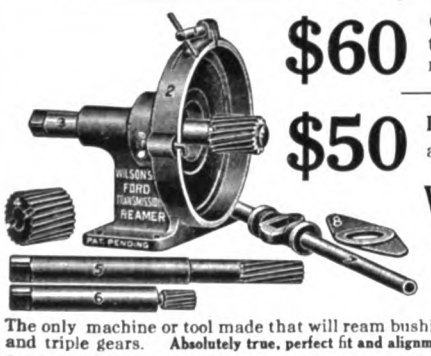
Sold in sets or separately, so that any one or all of the three coats may be had as needed.

Fifty years of experience behind every can. Quality guaranteed.



Manufactured Only By
F. O. PIERCE COMPANY,
12 WEST BROADWAY, N.Y.

Write for "Simple System" Booklet and Price.



$60 Complete with triple gear attachment (as shown).

$50 Less triple gear attachments.

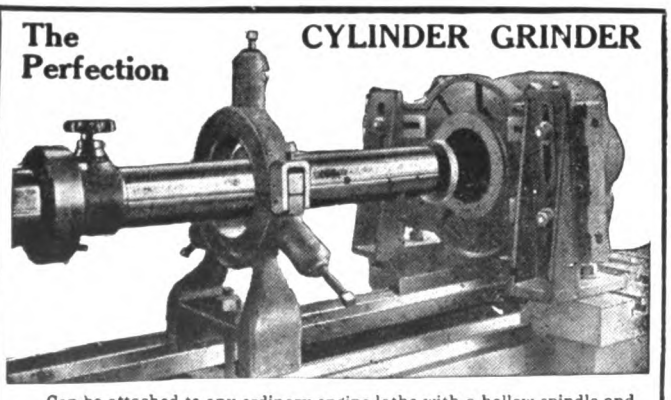
WILSON'S
Ford Transmission Bushing Reaming Machine

The only machine or tool made that will ream bushings in all three drums and triple gears. **Absolutely true, perfect fit and alignment.**

2 minutes labor required to set up and ream one bushing. 25 minutes to completely overhaul a transmission. Every job uniform. Saves 75% of labor costs. Send for special circular of other labor-saving tools.

K. R. WILSON, 1018 MAIN STREET, BUFFALO, N. Y.

The Perfection CYLINDER GRINDER



Can be attached to any ordinary engine lathe with a hollow spindle and a swing of fourteen inches or over. **Descriptive literature on request.**

WOOD & SAFFORD MACHINE WORKS, GREAT FALLS, MONTANA

ONLY PHILADELPHIA HOTEL

Having Direct Subway and Elevated Connection with All Railroad Stations, Ferries and Department Stores.

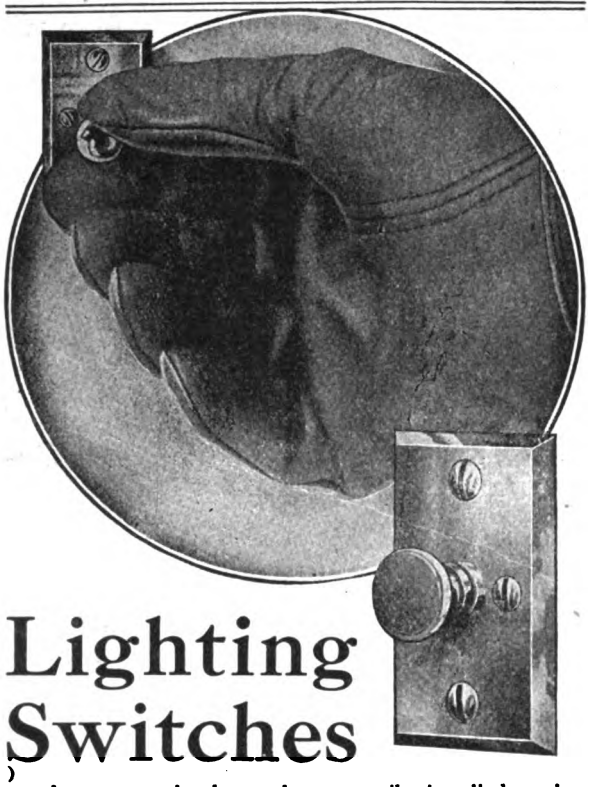
NEW BINGHAM
Cor. 11th & Market Streets
European Plan — Philadelphia, Pa.



Better Than Ever
Thoroughly Modernized
Remodeled and Equipped
NEW MANAGEMENT
ROOF GARDEN
In connection
Special Club Breakfasts and Luncheons
Rates—Without Bath, $1.50
With Bath, $2.00 and up.
FRANK KIMBLE, *Mgr.*

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CONNECTICUT



Lighting Switches

are the neatest, simplest and most easily installed equipment of their kind on the market.

Easily operated with a gauntleted hand.

Simple construction insures unending service and satisfaction.

Connecticut switches are designed to provide every arrangement of lighting control that can be desired.

One switch for all lights, individual switches for each, or any choice of functions, individual or in combination.

HEADLIGHTS

The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

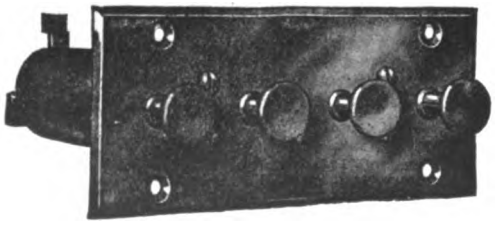
HEAD, SIDE AND TAIL LIGHTS

Head and tail lamps on and off together. Side and tail lamps on and off together.

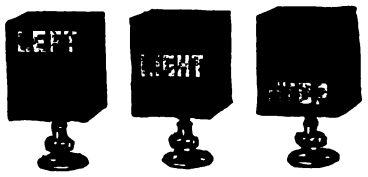
DASH LAMP

Individually or in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practical arrangement has its switch.

Trade catalog illustrating and describing full line upon request



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden, Conn.



SMITH AUTO SIGNAL

One signal box only on the left rear fender shows the words above in red, both front and rear—day and night.

The Smith Auto Signal provides the cheapest insurance known, against accidents and the fear of accidents. It signals electrically just when you want it to giving clear and definite information and warning always to both those in front and those in back —also to traffic policeman.



Front View of Car Showing Smith Auto Signal

Operates from plainly marked single handle three-way switch.
Simply constructed—nothing to get out of order. Easily installed—directions with every signal.
Already installed on 40 different makes of cars.
Measures 6" high by 5" wide by 4¼" deep.
Weighs only 3½ pounds.

Price complete $17.50

SMITH SIGNAL CORPORATION
53 West 66th Street New York



THE
BENTON
"THE CASE-HARDENED PLUG"

An unbreakable, wound mica insulator quickly cleaned by opening metal-to-metal joint and scraping or washing mica. Joint always gas tight. No deterioration from cleaning. Case-hardened wrench and thread surfaces. Service guaranteed.

Price $1.00

Write for our liberal Agency Proposition and a copy of Booklet shown.

L. F. BENTON CO.,
VERGENNES, VERMONT



KIMBALL TIRES

Are Doubling Profits for Some Dealers

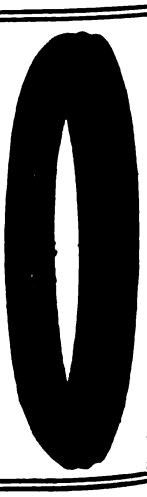
Write for Our Interesting Offer

These tires are sold without a guarantee. Write and ask how we do it. They are positively *not* seconds, but first-class fresh casings.

	Non-skid	Tubes		Non-skid	Tubes
30x3	$8.10	$1.90	32x4	$15.75	$3.05
30x3½	10.25	2.15	33x4	16.75	3.10
32x3½	12.45	2.25	34x4	17.45	3.20

Prices on Other Sizes in Proportion

Send us your order today, accompanied by cashier's draft on Chicago or New York, or money order. Large and small orders given immediate attention. *Write today for territory. Prices will positively be advanced shortly. Place your order now.*



J. C. Kimball Inc.
1469 Michigan Ave., Chicago

This "Straight Side" Type is Made Also in Clincher Type

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MOSCO SPECIALTIES

Mosco No. 200 Timer for Ford Car

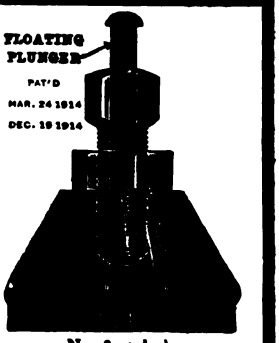


Patented Oct. 31, 1916

The case is made of extra heavy pressed steel, finished in aluminum. Gray bone fibre is used for raceway, with steel inserts dovetailed in and all lathe finished to a polished surface. The threaded terminals are insulated by fibre washers all the way through to contact points, thus removing cause of short circuiting common to this style of Timer.

Price, complete with brush, $1.50 each. Brush assembly only, $0.40 each.

Mosco Floating Plunger Wheel Puller



No. 3 and above

Starts a "Frozen" or "Stuck" wheel instantly. Strike the plunger; turn the screw, strike again and the wheel comes off without injury to hub-threads, spokes or axle.

Made for 200 models of 40 popular cars.

Mosco Socket Nut and Bolt Holder for Ford Car

A REAL TIME SAVING DEVICE. Takes the place of that other man whose help is usually required for this operation.

Simply slip MOSCO Nut and Bolt Holder over the top of each engine or Transmission nut or bolt head, the wings protruding above the hex socket engage wall of crank or transmission case and prevent nut or bolt head from turning while the man underneath the car unscrews the bolts.



POSITION ON CRANK CASE BOLTS

When replacing put head of bolt on top, slip on the MOSCO socket and proceed as in taking out.

Made of heavy pressed steel, with reinforced wings welded to body of socket. All case hardened and finished bright.

PRICE 15c EACH.

Mosco Anti-Rattling Ball Socket for Steering Rod of Ford Car

AN ENTIRELY NEW DESIGN. For taking up the wear and eliminating the rattle on worn ball sockets on both ends of steering gear connecting rod. An occasional packing of hollow hex plug with grease insures proper lubrication, smoother working and reduces wear. Tension of flat spring, which is held in position by head of bolt, prevents the hex plug in end from unscrewing. Slotted in hex end so that adjustment can be made with screw driver or wrench. Made of high grade semi-steel.

PRICE 20 CENTS EACH.



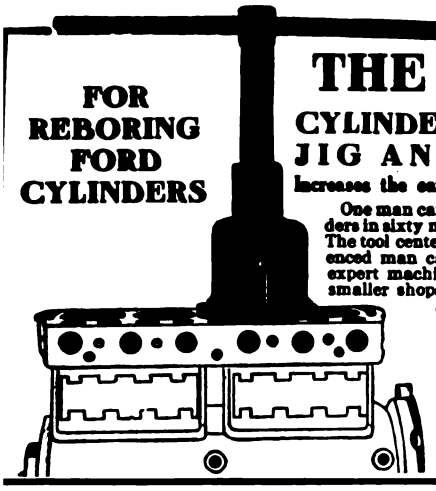
No. 2

YOUR JOBBER HAS THEM IN STOCK

MOTOR SPECIALTIES COMPANY, - WALTHAM, MASS.

THE DAVIS CYLINDER REBORING JIG AND REAMER

FOR REBORING FORD CYLINDERS



Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

Akron-Williams

TIRE REPAIR EQUIPMENT

Akron-Williams outfits include every approved time and labor-saving device for modern tire and tube repairing. No equipment is too large, no tools are too small.

Experts employed by the largest tire companies have helped design Akron-Williams equipment and over

60 LEADING TIRE COMPANIES

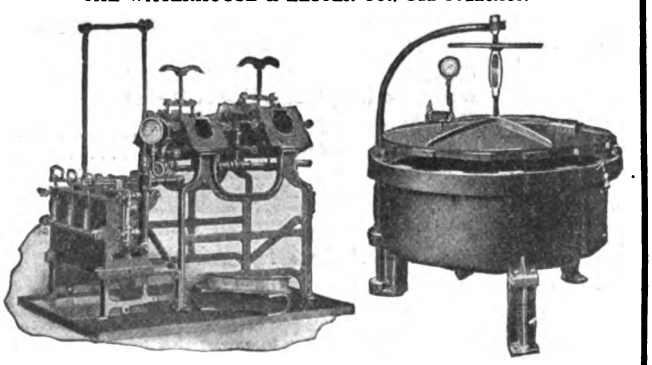
use these outfits, and recommend and sell them to their Dealers all over the world.

SEND FOR NEW CATALOG.

THE WILLIAMS FOUNDRY & MACHINE CO.

Glendale Street AKRON, OHIO

Exclusive Distributors for California:
THE WATERHOUSE & LESTER CO., San Francisco.



PERFECTION MULTIPLE PISTON RINGS

The valuable feature of our PERFECTION PISTON RING is to save expense of re-boring cylinders and fitting new pistons when the engine has failed to work properly. They will work in old cylinders where all others fail. They are easy to apply and cost less than any patented cast iron ring. Try them and prove it.

Dealers Wanted. Write for prices and discounts.

Manufactured by AMERICAN PISTON RING CO., 3-5 East German Street
BALTIMORE, MD.

N. A. PETRY CO., Inc.
1309 Race St., Philadelphia, Pa.
Eastern Representative, North and South, East of Denver.

A. H. COATES
444 Market St., San Francisco, Cal.
Western Rep., North and South, West of Denver.

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NIEHOFF SERVICE STATION OF CONTACT PARTS



DEALERS!!! This "Cash Register" of Contact Parts FREE-

Do you realize that the Contact and Brush Replacement business is comparatively a new field for repair work, and that it is proving to be a most profitable kind of business? We know it is. So we got the business down to a system where garage men and dealers can handle this line in an intelligent way. If you open up a Service Station of our Contact and Brush Parts, we will give you free the above "Cash Register," which you need, as it enables you to keep these valuable parts systematized so that you will know at a glance just what you have on hand and what you need.

Write for contract in your territory at once.

PAUL G. NIEHOFF & CO., Inc.,
Metallurgical Laboratories **232-242 E. Ohio St., CHICAGO**

20th Century's No. 6



Self-Vulcanizing Patch

Note carefully from above illustration the construction of this Patch—how the Semi-Cured Rubber is vulcanized on to the Fabric, which gives an absolute GUARANTEE against leakage, while the RED RAW Rubber Guarantees a perfect Job of Vulcanizing on to the Tube.

GUARANTEED SATISFACTION or Money REFUNDED

Made in 3 sizes { 2¼x16— 36 Square Inches .....$ .50
4 x15— 60 Square Inches .....$ .75
6½x20—130 Square Inches $1.50

If you want a Patch, call for "20th CENTURY"
We make all kinds of Patches, all Sizes and Prices.

If your JOBBER or Dealer has not got them, write to us direct.

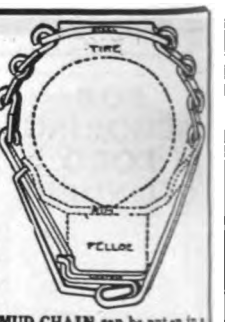
20th CENTURY TIRE PROTECTOR CO.
MIDLOTHIAN, TEXAS.

Hang on to your old tires. They will last as long as you live if covered with steel. The Kimball Steel Protector makes Blowouts, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires as flexible as ever.

Special inducements to those in new territory.





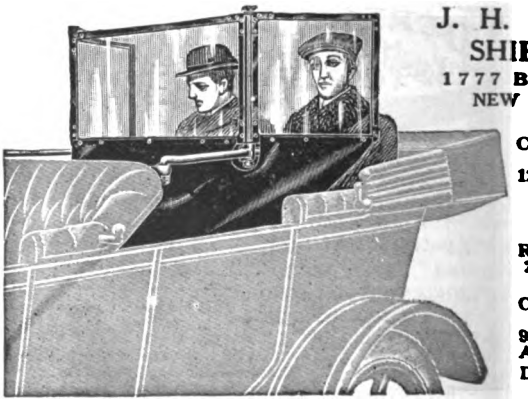


MUD CHAIN can be put on in a jiffy with one hand while standing on the run board. If you get in a mud hole you will laugh out loud. Hook the ends together and pull the little lever and they are on tight. Good for blowouts.

KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa

REAR SEAT SHIELD

Patented Feb. 27, 1912—Sept. 4, 1917. Reg. U. S. Pat. Office.



J. H. TONNEAU SHIELD CO.
1777 BROADWAY
NEW YORK CITY

Representatives

Chicago Coach & Carriage Co. 1223 Michigan Ave. Chicago, Ill.
Dafoe Eustice. Detroit, Mich.
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Columbia Tire & Top Co. 822 Commonwealth Ave., Boston, Mass.
Dunham Body Co. Newark, N. J.

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Electrical Repairs Bring the Big Profits!



If you cannot repair electric starting and lighting equipment intelligently, your customer will go elsewhere for this service. He will take the rest of his trade with him. There is more money in electrical repairs than in any other department of the garage business. The demand is enormously increasing.

Weston Model 280 **GARAGE TESTING INSTRUMENT**

is the best, the most reliable and therefore the cheapest electrical equipment for you. It enables you to determine promptly and accurately the condition of the electrical equipment of any automobile, just where the trouble is and just how to remedy it.

Write for our *Special Proposition.*

Weston Electrical Instrument Co., 2 Weston Ave., Newark, N. J.

23 Branch Offices in the Larger Cities.

"HEXALL"
RATCHET WRENCH No. 1

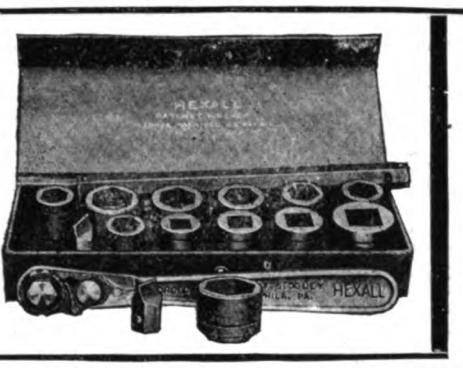
In explaining the exceptionally fair price you don't have to dodge the quality issue with "Hexall"—and as you talk, Mr. Dealer, the name "Hexall" is ever lending weight to your words—are you talking "Hexall" or just "wrench"?

Contains 7 inch, Steel Forged, Ratchet Handle; 2 Screw Driver Bits; 7 inch Extension Bar; 8 Hexagon Sockets; 4 Square Sockets. Packed in neat, strong cloth case. Weight, 35 ounces.

Send for the new catalog.

"Break any Sedgley Wrench and we repair it—no charge.

R. F. SEDGLEY, 2311-13 North 16th Street, Philadelphia, Pa., U.S.A.



Seamless Steel Tubing

Over 3,000,000 Feet on Hand.

2000 SIZES. YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING

WRITE NEAREST OFFICE

EDGAR T. WARD'S SONS CO.

304 Hudson Street	16th and Indiana Ave.	646 Washington Blvd.	44 Farnsworth Street
NEW YORK CITY	PHILADELPHIA	CHICAGO	BOSTON

THE VACUUM MUFFLER

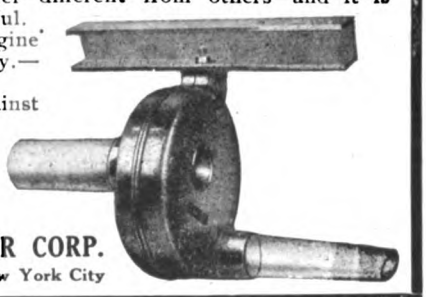
has nothing in common with the old failure type of muffler—let this one fact stick!

THE VACUUM MUFFLER is a brand new idea. It is lighter and altogether different from others—and it is marvellously successful.

It increases engine power and flexibility.—Saves gasoline.

It is guaranteed against blow-outs.

You'll learn an awful lot more by writing for particulars—today.



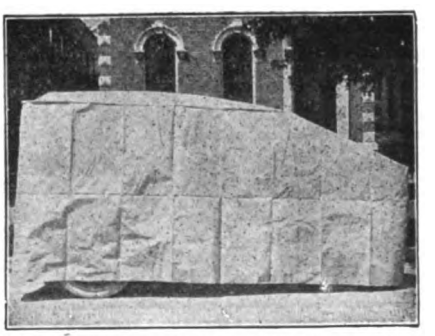
VACUUM MUFFLER CORP.
154 Nassau Street, New York City

KENNEDY AUTO STORAGE COVERS

will protect your car in storage during the winter season from dirt, dust and moisture. They are made of heavy durable paper in standard sizes and will fit any cars.

7 Passenger
5 Passenger
Ford Special
Electric

ORDER NOW



THE KENNEDY CAR LINER & BAG COMPANY, SHELBYVILLE, IND.

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THE Fisher PATENTED "RIM-GRIP" SUB-CASING

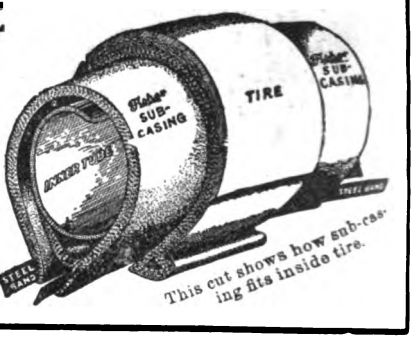
MORE MILES PER TIRE LESS TIRES TO BUY

THE BLOWS THAT YOUR TIRES RECEIVE, WHEN YOU STRIKE OBJECTS IN THE ROAD, LEAVE WEAKENED PLACES IN THE FABRIC.

A TIRE IS AS STRONG AS ITS WEAKEST PLACE

These weakened places are hard to detect now, but will result in blow-outs later.

RIM-GRIP SUB-CASINGS reinforce the fabric of the tire at all points from bead to bead. They make a partially worn tire stronger than it ever was. It can be worn out completely and the sub-casing used in another tire. As the cost of equipping a car with new tires is much greater than last year, it will pay you to investigate Rim-Grip Sub-Casings. *Write for particulars.*



This cut shows how sub-casing fits inside tire.

FISHER MANUFACTURING CO.
1706 PAYNE AVENUE, :: :: CLEVELAND, OHIO



"TRIPLEXD" GASOLINE HOSE

A gasoline hose that's proof against wear, tear, chemicals and weather. It's guaranteed.

Specify This Lasting Hose on Your Next Pump Outfit

METAL HOSE & TUBING CO. INCORPORATED
RAYMOND & TILLARY STS.
BROOKLYN, N.Y.



PISTONS FOR THE FORD

Made of a Close Grained GRAY IRON. Perfectly ROUND AND GROUND TO SIZE.

Fitted with PINS, BRONZE BUSHINGS AND STEP CUT RINGS.

WE HAVE SEVERAL HUNDRED PATTERNS OF PISTONS FOR DIFFERENT MODELS OF ENGINES.

ASK YOUR JOBBER FOR THE **DYER** Quality Piston, or Order Direct.

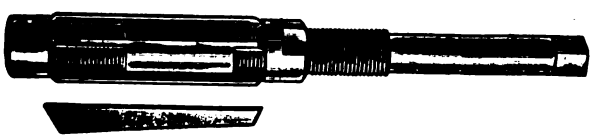
THE G. H. DYER COMPANY, Cambridge, Mass.

The best made for repair work

The Critchley Expanding Reamer

Reg. U. S. Patent Office

Try One and You Will Want More.



Reams odd size holes

Send for Circular

CHADWICK & TREFETHEN
32 BOW STREET PORTSMOUTH, N. H.

959,000 GALS. OF GASOLINE Are Wasted Daily

enough for all our war needs. Are you doing your share to overcome this waste? If you are advising your customers to

Install Pressure Proof Piston Rings

Yes. If you aren't, No. These rings produce increased power from every drop of gasoline and permanently eliminate carbon and save oil.

"New Facts About Piston Rings" will tell you why. It's free to you.

PRESSURE PROOF PISTON RING COMPANY
169 Massachusetts Ave. Boston, Mass.

COMPRESSED AIR TANKS—

SCAIFE COPPER-BRAZED TANKS are used to the exclusion of all others by the leading builders of Air Compressors.

We positively guarantee them to hold air indefinitely without loss of pressure.

Send for Catalogue

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.
New York Office: 26 CORTLANDT STREET

Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

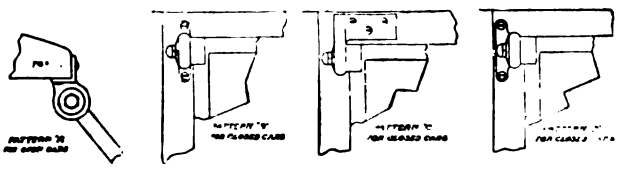
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Among the quick selling specialties we make is the

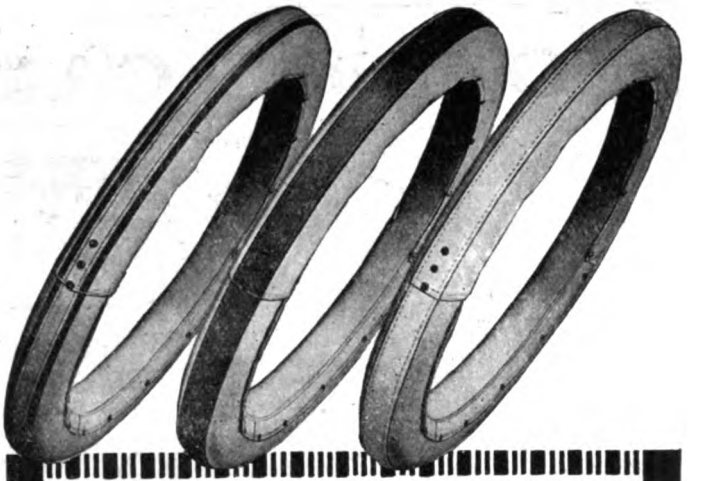
"ROAD-VIEW" SHIELD VISOR

This accessory is a great seller because it makes driving safer and more comfortable by modifying light reflections and keeping rain, snow or sleet from cutting off the view of the road. It is made of excellent plate glass with quality mountings, fastens to the front bow of the top and is adjustable to any desired angle—also made for coupes, limousines, winter tops, etc.



Price $10.00 Each ***Liberal Discounts***

JOSEPH N. SMITH & COMPANY
DETROIT, MICHIGAN



THE need for tire conservation is greater now than ever before. Spare shoes must be protected to obtain greatest mileage when finally used. The perfect protection for spare shoes is the Famous Allen Tire Case. Three styles, all colors, all sizes.

At your dealers, or write

THE ALLEN AUTO SPECIALTY COMPANY
Manufacturers
16-24 WEST 61st STREET NEW YORK
2007 Michigan Avenue, Chicago

The ALLEN TIRE CASE

Get Your FREE Sample

—OF—

GOLDEN STAR Auto Body Polish

Send before the limited Supply of Samples gives out.

We want to prove to you that it is the **"World's Best Cleaner and Polisher."**

Why pay $50.00 for refinishing your car? GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish. Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. Morris Mfg. Co. Incorporated
KANSAS CITY :: MISSOURI



F-F BATTERY BOOSTER

Full Wave A. C. Rectifier

MAGNETIC RECTIFIER

Patented April, 1916



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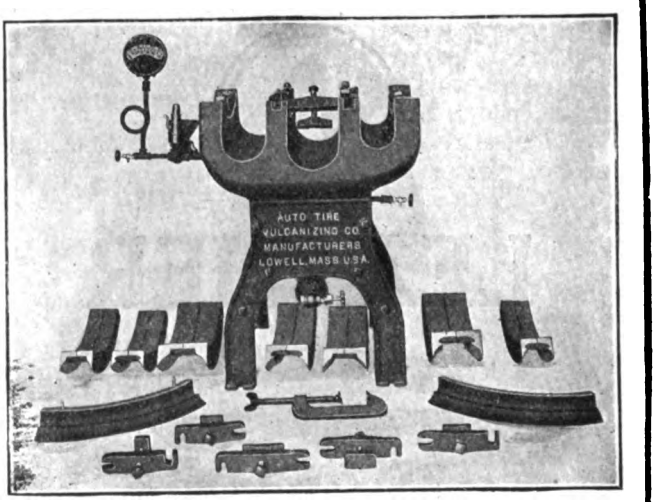
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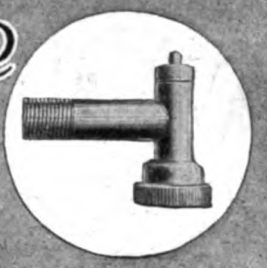
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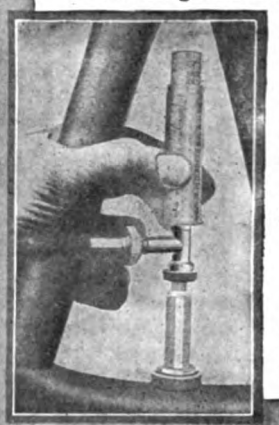
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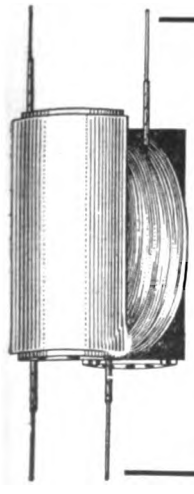
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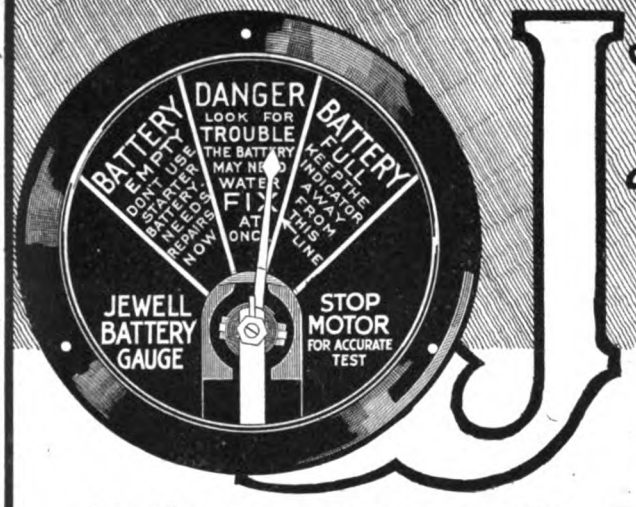
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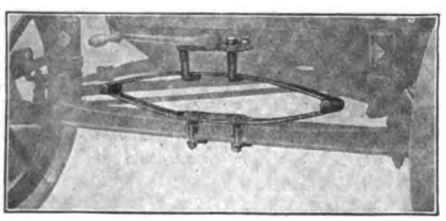
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Automobile Dealer AND Repairer

A JOURNAL OF PRACTICAL MOTORING

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VOL. XXIV. No. 6. NEW YORK, FEBRUARY, 1918. PRICE { 10c PER COPY / $1.00 PER YEAR

Good Light and Plenty of It the First Requirement of the Successful Repair Shop

Suggestions for Taking Advantage of Natural Light and So Arranging the Machinery and Equipment That Illumination Will Not Be Wasted

BY W. O. MANN, M. E.

The number of beginnings made every day in the automobile repair business is almost as amazing as the daily number of failures of those who have found that for some reason they have been unable to finish what they have started, and they drop out, or are forced out, probably poorer in purse and not much wiser. It is not rare to find that many such unsuccessful men attribute their trouble to outside causes of all kinds, when in reality the reason is an inner reason. In other words, many fail through some fault of their own rather than because there is not enough business, or because of poor location, or any of the well known explanations.

Failures and Successes.

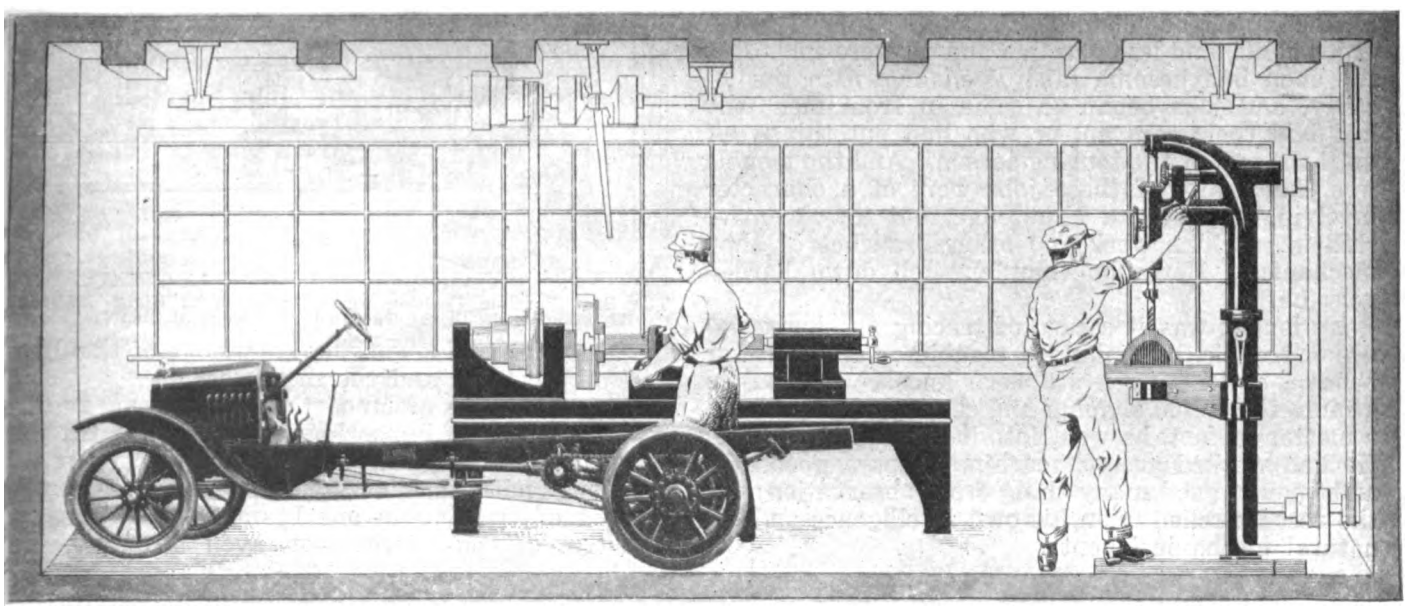
It is not proposed, however, to catalogue the reasons for small failures, nor yet to suggest remedies for all the troubles of the struggling repairman. One might just as well start out to compile an encyclopaedia. Attention is called to the fact, however, that of the many who do not make good, a large proportion fail to pull through by a very narrow margin. Often and often a man might have come through the trying early period with a whole skin if he had had just a little more of something to put on the right side of his books—capital, knowledge, experience, credit, equipment—just a little bit of something the lack of which was sufficient to push his head under water.

Mechanical Knowledge Important.

Now it may be news to some—it assuredly is not to others—that many failures are due to the fact that automobile repair shops are too often started by men with a very small amount of mechanical knowledge, though having perhaps considerable experience with automobiles. For instance, an experienced chauffeur, who knows all makes of cars thoroughly, can make his own diagnoses and adjustments and do practically anything that is required for the ordinary maintenance of a modern car, is very likely to consider himself well fitted for the business of running a repair shop. Sometimes he is. More times he is not. And a great deal of trouble has arisen from the fact that an outsider—one who knows little or nothing about automobile repair work—is tolerably certain to look upon such a chauffeur as even better than he (the chauffeur) thinks himself.

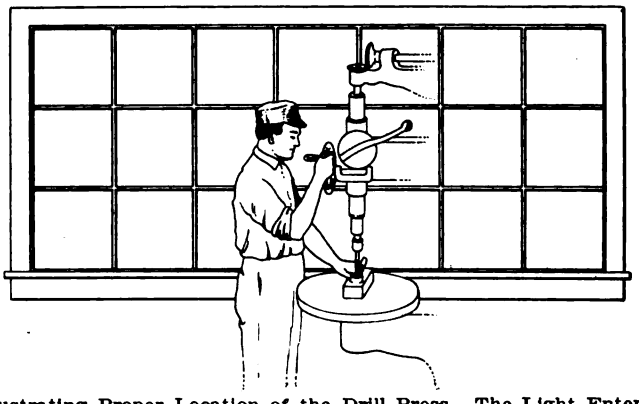
A Team That Didn't Pull.

The point is well illustrated by an actual occurrence. There was a certain rich man who maintained a large estate, and among his numerous employees there was an uncommonly capable chauffeur who



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had charge of no less than six cars and had two men under him. In course of time this rich man, through one of the flukes for which Wall Street is famous, became poor, and in shedding his estate, he shed the capable chauffeur. Having had a taste of authority, Mr. Chauffeur did not at all like the idea of hunting a job as an ordinary driver. So he



Illustrating Proper Location of the Drill-Press.—The Light Enters at Left of Operator Facing the Machine.

had a number of earnest conferences with the head gardener, who, unfortunately, had saved up considerable money.

Experience vs. Capital.

Usually it is not unfortunate to have saved money; but in this case it was. As a result of these conferences the chauffeur and the gardener decided to go into the automobile repair business, the former putting in his knowledge and experience and the latter his money; both were to work of course. Their capital did not warrant their employing help at first anyway. They were to go share and share alike in whatever profits there might be.

They bought a fairly good equipment of hand tools as a starter and considerable business came their way during the summer in which they opened. As it happened, it was all, or nearly all, of a kind that the one-time chauffeur could handle very well. In addition, they sold a lot of gasoline and oil, did a little trading in second-hand cars and, altogether, felt themselves well started on a career of prosperity.

On the Toboggan.

With the approach of cold weather, however, the character of the business changed. Tourist trade dropped off, and less gasoline and oil were sold. But the shop had become fairly well known in the locality, and jobs began to come in from men who had laid their cars up, or who had put things off until the end of the touring season. And the trouble was that many of these jobs were of a character involving not only a knowledge, but an executive skill in machine work and other branches of shop mechanics. Here the chauffeur fell down hard—very hard.

No longer was it a case of tracing an elusive ignition trouble, or making a troublesome carburetor behave, or locating a stubborn knock. He had to go into the actual shaping and cutting of metal. As a matter of fact, he went into it with all confidence. He had worked around machine shops a good deal and knew a good many thing from observation; for the rest he relied upon his own intelligence and his natural mechanical bent.

The First Difficult Job.

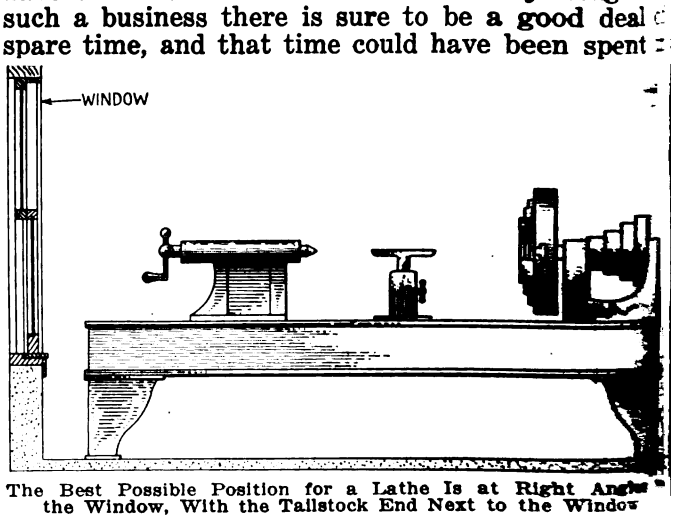
Things happened, one right after another. One of the first jobs offered was the re-bushing of a gear, which is anything but a difficult piece of work for an ordinary machinist. The gear was of steel and ran on a steel stud—an arrangement which not unnaturally resulted in rapid wear. The order was to bore the gear hub, put in a bronze bushing well fitted to a new steel stud, upon which a thread had to be cut. There is no use going into the harrowing details. The chauffeur did manage to bore the gear and put in a bushing; he did manage to scrape a spiral groove on the stud and call it a thread. But the bore was not true and neither was the bushing, and though the fit on the stud seemed snug, it was because it was a trifle tight in one place only. Elsewhere it was loose.

Lathe Proved a Factor.

When the gear was put into service it started by squealing at every revolution; but because there was no bearing to speak of on the stud, it ended by rattling all the time. The owner firmly declined to pay for such work and had the job done at the nearest large town. And this, or something much like it, was the history of job after job. In all his struggles to do work that he did not know how to do, the chauffeur never discovered that the second-hand lathe he had bought was so far out of true that he could not have done accurate work with it even if he had known how! After a winter that must have been an unusually trying one for both partners, the little firm went to the wall, the gardener minus all his capital and the chauffeur minus so much of his self-esteem that he hunted for himself a common chauffeur's job—and he is at it to this day.

What Was Lacking?

That is the story of a very narrow escape. A little appreciation of his own lack of knowledge on the part of the mechanical member would have saved the day, for he was sufficiently intelligent to have remedied that lack. In the early stages of such a business there is sure to be a good deal of spare time, and that time could have been spent



The Best Possible Position for a Lathe Is at Right Angles to the Window, With the Tailstock End Next to the Window

the acquisition of a working knowledge of the handling of the lathe and the drill-press.

It must not be assumed that a man can make a good machinist of himself by any such offhand process as this. Given, however, an intelligent man with a strong natural bent for mechanics, a certain amount of training in one branch and the strong incentive of self-interest—or, even stronger,

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The First Difficult Job.

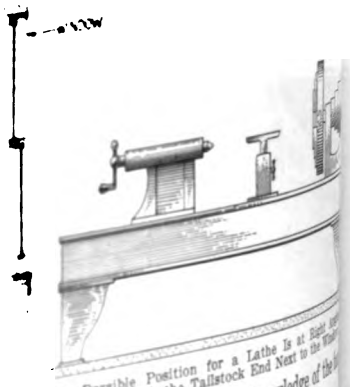
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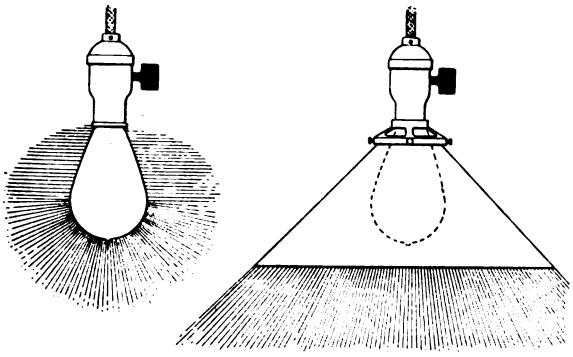


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It must not be assumed that a man can ... good machinist of himself by any such offhand ... ess as this. Given, however, an intelligent ... a strong natural bent for mechanics, ... amount of training in one branch and the ... incentive of self-interest—or, even stronger ...

preservation—and he can do surprisingly well in the way mentioned. Many old-time machinists are likely to discount this, but it is a fact that a man can fit himself to perform a large proportion of the work involved in automobile repairs in this way. At the same time he acquires something that is of equal



Naked Electric Lights With Unshaded Bulbs Are Wasteful. A Common White-Lined Tin Shade Will Throw as Much Light as Three Naked Bulbs.

importance, and that is the ability to recognize a job that is beyond his skill. What to do with such a job is a matter for the repairer himself to decide; but it is a good start if he learns what to let alone.

What It's All About.

That brings us to a high spot in this subject. If Mr. Chauffeur had had anything at all for a warning and a guide, it is likely that he would have made good. This series of articles is intended to help out those who are more or less in the chauffeur's place, and have the sense to know it.

It is utterly impossible, it may be acknowledged at once, to think of going into all the details of all the work that a repairman is likely to be called upon to do. It is possible, however, to look at matters through the eyes of the man who is starting a repair shop with a small stock of knowledge, and give a good deal of plain, straight information that will make clear many things that are not clear to the average man without mechanical training. Let it be understood very distinctly that this is no attempt to instruct the finished machinist—or even the ordinary machinist, for that matter; it is not a word to the wise, but a word to—let's say the inexperienced. So let the wise ones pass it over with a smile, if they will, for it will be mostly in words of one syllable.

Arrangement Important.

There is no use going into details of shop construction or floor plans or anything of that sort, for the man who is building his own shop will not need this primer talk. Where the small repairman begins is in the arrangement of his property in some shop that he is lucky enough to get already built. It really makes a great deal of difference how things are arranged, and if the reader will bear in mind the aforementioned fact that many failures occur by very narrow margins, he will agree that no detail is so small that it can be overlooked. And again let us repeat that this is a series of first lessons for those who need them.

Light and Plenty of Light.

The first consideration is light in the shop. There are many men who say that they are not particular about having the b... is entirely wrong. Even if a m... light it is a strain that he has ... his eyes to. Advantage must ... of natural light, and one way ... the interior as clear as possib... the passage of light, and to ha... white or whitewashed. And it ... out with everything white; it ...

Lighting the I...

In this connection there is a ... common to overlook. Say we ... so that it will have a good ligh... do is to get it as close as poss... parallel with it. Under some ... right. Under other conditions ... instance, suppose the shop is ... ceiling and low windows. And ... ing done on the lathe. The ... the job on which the tool is ... rectly in the shadow, which t... the rather concentrated light f... shining straight into his eyes.

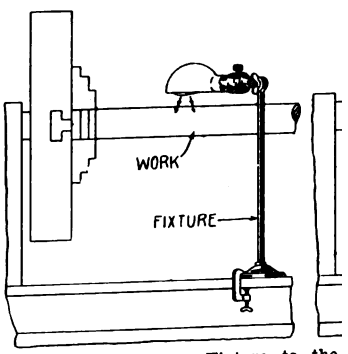
Directly on the ...

If the shop is comparatively ... dows and with other windows ... front of the lathe, it will not ... will be plenty of diffused ligh... position for a lathe is at right ... —that is, with the tailstock ... dow. The light then shines ... and the tool.

This position has its disad... become necessary to put somet... will extend beyond the end of ... might be found to be in the ... position is not quite so econo... parallel position. But these a... that must be decided according ... individual. As for the drill-p... so that the light will shine ... operator as he stands facing t...

Don't Waste Illum...

A machine shop is not easy ... erly; there is so much materia... or neutral tinted that light is ...



Clamping a Lighting Fixture to the Mirror Will Concentrate the ...

the reason why the usual impre... lighted machine shop is a darl... That is not the point, howev...

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there should be as much light as possible where it is needed—on the work.

Naked electric lights with unshaded bulbs are exceedingly wasteful affairs. They shed light in all directions when it should be shed in one direction. Of what use would an automobile headlight be without a reflector: It would throw a feeble gleam in all directions, but no strong light anywhere. It is the same with the naked lamp. It wants a reflector, and there are on the market plenty of metal shades with polished or white enameled linings, which concentrate the light. It is worth knowing that one lamp with a common white-lined tin shade will throw as much light on the work as three naked bulbs at the same distance.

While figuring on lighting requirements, bear in mind that in machine work it often is necessary to cast the light on some part of the work where it will not ordinarily fall. For instance, in doing a boring job on the lathe the light from a pendant lamp is likely to simply throw a shadow on the tool. A fixture that will clamp to the lathe and hold the light in any position is cheap—so cheap that any man who refuses to provide one ought to blush for his parsimony.

A Little Kink.

This may be a good place to mention a little scheme that often is worked and is exceedingly useful. It is merely to use a small mirror to throw a concentrated light on some particular spot where close and careful watching is required. Usually the machinist is content to have the mirror handy and hold it in his hand while using it; but occasionally mirrors have been rigged up on adjustable stands, so that once set, they would throw a steady light. This works equally well with artificial or natural light.

Other Lighting Requirements.

But the machine tools are not the only consideration in figuring on the lighting problem. There must be a bench, or benches, and there must be light on cars brought into the shop for work. Benches are best placed directly facing the windows; indeed, there seems no better way unless there are overhead windows or skylights. The presence of these would of course considerably modify all lighting plans. The car brought into the small shop must necessarily be the last thing considered in the matter of illumination. It is not what might be called a fixed quantity, but is a variable that must take its chances. If the general lighting is as good as possible, and there are good extension lamps, little more can be asked for.

It may be well to add that in an automobile repair shop anything but electric light is practically out of the question. And if there is no electric current available—which is unusual—it is by no means impracticable to rig up a small lighting plant with a little stationary gasoline or kerosene, or even a steam engine, and a second-hand generator, which often can be picked up for a low price. The matter of handling such an electric lighting system will be dealt with at some future time.

Ed. Note.—This is the first of a series of articles dealing with the equipment, operation and maintenance of the repair shop. Each article will be a complete story.

Theft Insurance Not Increased.

The proposed increase in rates for automobile insurance in Detroit, Mich., has been abandoned for the present owing to the obnoxious features incorporated. So many cars have been stolen that the rates for indemnity were advanced partially in Detroit and Wayne County on November 1.

The proposed new rates would increase the insurance on low priced cars 12 per cent., and also carries a 50 per cent. co-insurance clause under which the owner would be obliged to stand half of any loss. Some companies are said to favor the issuance of a policy excluding extra tires, etc., not supplied at the time the car was purchased. The following are the old and new rates:

	Old	New
Cars $790 and under	$3.75	$5.35
Cars $800 to $1,399	3.00	3.85
Cars $1,400 to $2,499	2.00	3.85
Cars $2,500 to $3,499	1.75	2.10
Cars $3,500 and over	1.50	1.85

Show Proceeds for Red Cross.

The American Red Cross Association should be several thousand dollars richer at the closing of the Duluth, Minn., automobile show. The Duluth Automobile Dealers' Association has unanimously voted to donate the entire proceeds of its fourth annual event, which is to be held the week of February 23, to the Red Cross.

COMING EVENTS.

Albany, N. Y., February 16-23.—Show, Albany Automobile Dealers' Association.
Des Moines, Ia., February 16-23.—Show, Des Moines Automobile Dealers' Association.
Hartford, Conn., February 16-23.—Show, Hartford Automobile Dealers' Association.
Newark, N. J., February 16-23.—Show, N. J. Auto Exhibition Co.
San Francisco, Cal., February 16-24.—Second annual Pacific automobile show, Motor Car Dealers' Association of San Francisco.
Nashville, Tenn., February 18-23.—Show, Nashville Auto Trades Association.
St. Louis, Mo., February 18-23.—Show, St. Louis Automobile Manufacturers' and Dealers' Association.
Duluth, Minn., February 18-23.—Show, Duluth Automobile Trade Association.
Waterbury, Conn., February 18-23.—Show, United Shows Co.
Springfield, Ohio, February 18-23.—Show, Springfield Auto Trade Association.
Syracuse, N. Y.—February 18-23.—Show, Syracuse Automobile Dealers' Association.
Pittsfield, Mass., February 18-23.—Show, State Guard.
Grand Rapids, Mich., February 18-23.—Show, Automobile Business Association.
Des Moines, Iowa, February 18-23.—Show, Des Moines Automobile Dealers' Association.
Brooklyn, N. Y., February 22-March 9.—Show, Brooklyn Motor Vehicle Dealers' Association.
Omaha, Neb., February 23-March 2.—Show, Omaha Auto Trades Association.
Indianapolis, Ind., February 25-March 2.—Show, Indianapolis Automobile Trade Association.
Muskegon, Mich., February 25-March 2.—Second annual show.
Columbus, O., February 27-28.—Show, Columbus Auto Show Co.
Boston, Mass., March 2-9.—Automobile Show, Boston Automobile Dealers' Association.
St. Joseph, Mo., March 6-9.—Show, St. Joseph Automobile Dealers' Association.
Great Falls, Mont., March 16-20.—Second annual show, Montana Automobile Distributors' Association.
San Francisco, Cal., March 19-24.—Show, Motor Truck Dealers of San Francisco.
Trenton, N. J., March 20-23.—Show, Trenton Auto Trade
Bridgeport, Conn., March 25-30.—Show, Fourth Regiment Conn.
Association.
Red Bank, N. J., April 6-13.—Show, Monmouth County Automobile Dealers' Association.
Stockton, Cal., April 9-13.—Show, San Joaquin Auto Trade Association.
Calumet, Mich., April 17-20.—Show, Copper County Automobile Dealers' & Garage Owners' Association.

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EFFECTS BIG SAVING.

Passenger Car Saves Over $500 in Travelling Costs in One Year.

Figures showing the possibilities of the motor vehicle as a time and money saver have been supplied by the maker of a passenger type of machine. An Indiana business man purchased a car in 1915 for the use of himself and his salesman. During the first year the vehicles saved $511 in operation and maintenance charges over the cost of the previous horse operation, covered 2,000 more miles, brought salesman in contact with 35 per cent. more customers, and increased sales 40 per cent.

During the previous year the party paid $645 in horse and buggy hire, and drove about 5,000 miles. The motor vehicle bought in 1915 was operated 7,000 miles at a cost of $94.70 for oil and fuel, $45 for insurance, and $150 for garaging and a commercial car body, a total of $289. It earned $175 as a truck.

In 1916 the machine was operated 7,300 miles at a cost of $124 for fuel and oil, $120.96 for garaging and $45 for insurance. It earned $225 in that it saved that amount by transporting material that would otherwise have cost money. The car made a better showing the second year. The salesman utilizing it increased his sales 200 per cent., but the owner does not credit the car with all of this gain, stating that about 75 per cent. represents a fair credit to the vehicle.

Use Cars for Business.

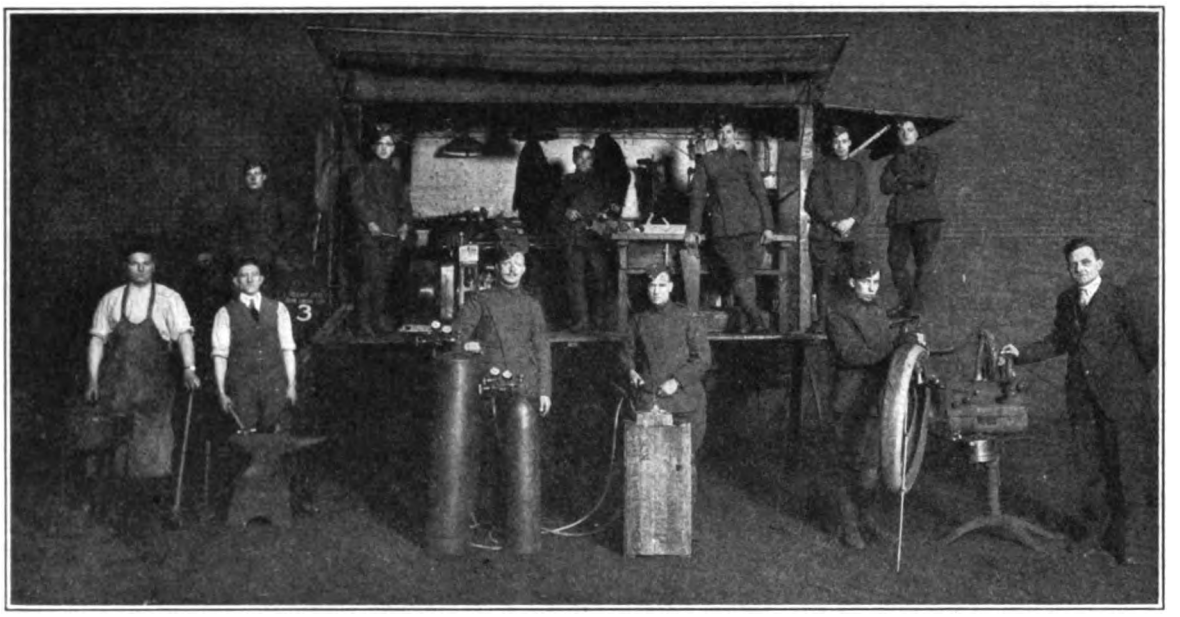
A census of passenger cars taken in Livingston County, Ill., among owners of two makes of machines, one selling from $650 to $850, and the other selling at $1,650, revealed that the vehicles were largely used for business purposes.

Of 88 farmer-owners, 63, or 73 per cent., bought their cars as necessary farm equipment; 21, or 25 per cent.. bought them for business and pleasure, while only two said they bought them primarily for pleasure. Asked what percentage of the use of their cars was for business, 22 said 95 per cent.; 20, 90 per cent., and 10 70 per cent. The average of all replies was 82 per cent. The average distance the 88 farmers drove their cars was 2,934 miles a year. Average value of the farms in Livingston County is more than $30,000. Results of the investigation may be considered typical of the way farmers throughout the country use their cars.

EXAMINING MECHANICS.

Recruits Must Pass a Thorough Examination for Aviation Corps.

Thousands of mechanics are required behind the lines to maintain the airplanes in serviceable condition and mechanics applying or enlisting in the Canadian aviation corps must pass a thorough examination before being accepted. The recruits are given an opportunity to demonstrate their efficiency with the various apparatus, as shown by the accompanying illustration. A motor truck is utilized in the work and is completely equipped with a lathe, drill press, etc., also forge, anvil, oxy-acetylene welding equipment, vulcanizer, etc. The examinations are conducted at the Toronto armories.



Mechanics Enlisting With the Canadian Aviation Corps Are Required to Pass an Examination as to Ability, etc. A Motor Truck Carrying a Complete Machine Shop, etc., is Used.

Freight Congestion Delays Tags.

The receipt of motor vehicle license tags at Panama for 1918 has been delayed because of freight congestion in the United States. Pending their arrival, 1917 tags will be recognized as valid by the Canal Zone police.

This is not to be interpreted as authorizing a delay in the payment of license fees for 1918. Receipts are being sent by the Division of Civil Affairs to owners of motor vehicles who have paid for their 1918 licenses, with the information that their 1917 tags may be continued in use upon condition that the operator of the machine carry his 1918 receipt for exhibition to the police if it is asked for. Owners will be allowed until January 15, 1918, to renew their licenses.

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Fitting the Insurance Policy to the Garage and Repair Shop

Analyzing the Various Clauses of Different Policies and Factors Invalidating the Policy—Why One Should Read Every Word in Policy

BY FRANK A. FARRINGTON

You know as much as I do about the advisability of carrying fire insurance. You appreciate the importance of having enough fire insurance to protect you and your family against bankruptcy in case of a disastrous conflagration, but do you know all about your insurance? Do you know to a certainty that you will receive from the insurance companies, when your fire comes, the insurance money you are expecting you will get at such a time?

When to Read the Policy.

You can tell off-hand the amount of insurance you are carrying on your buildings and on your stock, but can you tell whether you will get the face value of your policies? In the cold, gray dawn of the morning after, will you be able to look over the premises where you were doing business the day before and say to yourself, "Well, it might have been a good deal worse. I've got enough insurance coming to rebuild?" Or will you then be worrying about certain clauses in your policies that you never noticed until you sat down after the fire to read those very important documents?

It is not that you have reason to doubt the soundness or the ability of your insurance companies to pay their losses, or their honesty and fairness as compared with other companies. Most companies are sound enough and honest enough. It is not that your policies are not perfectly good policies, because, no doubt, they are standard policies recognized and approved by the laws and by the insurance department of your State. The question at the all-important times will be whether you have realized just what your part in the contract was, and whether you have lived up to it.

Must Be in Writing.

The mere fact that your insurance policies are the standard form does not cause your duty to end with paying the premium. You have to do more than pay the agent what he charges you. An insurance policy is a contract, and, like all contracts, it has two parties to it, each of whom must do certain specified things. If you think your policy is going to mean anything more favorable to you than the expressed terms in it indicate, you will be disappointed. You may be able to hold the company on a verbal application to their agent for insurance, but verbal agreements about matters not mentioned in the policy will not count. It must be down in black and white.

Read the Policy.

There is just one proper time for making sure what your policy contains and that is when you accept it, or if you did not do it then, right now. After the fire starts it will be too late to obtain any special permits or to change your warranties. The loss will be adjusted on the existing form of the policy, not on what you thought or hoped it contained, or supposed it said. You would not think of entering into any other form of contract involving thousands of dollars without even reading the contract, fine print and all, but have you read your fire insurance policies?

The Responsibilities.

Find out at once just what your policy promises and just what you promise when you accept it. If you have hitherto neglected this, don't go to bed tonight without making sure of these things, even if you have to get the insurance agent out of bed to make certain of where you stand. Every provision of the policy that puts any responsibility upon you must be kept or the company will refuse to pay, on the ground that you, the assured, have not complied with the provisions of the contract.

See that your policies at all times fit your business and your plant. If you have for a long time been doing business in the same garage with substantially the same building, you may have been simply getting your original forms of policies renewed every year. The first, original policy may have fitted well enough at the time and yet changes in your methods and in your equipment may have rendered that old form of policy absolutely valueless to you. Look this up and if new warranties or permits are needed to make the policy fit, get them inserted before you are a day older. You have to pay a high rate for your insurance, so it is important to see that it actually insures you.

Insure to Cover Losses.

If your policy is only almost right, it is no good at all. An almost good policy is in the same class with an almost good egg. It is poor economy to skimp on the price you pay for insurance. If you cannot afford to pay for the kind of insurance you need, the kind that will cover your losses, you certainly cannot afford to take anything less than that in value.

You may have enough resources outside of your business so that you prefer to insure yourself, saving the premiums and taking the risk of loss. You may regard your building as fireproof and your stock may be scattered in two or three buildings, so you are not afraid of a total loss by one fire. This is, of course, up to you, and no one can know as well as you do how much insurance you ought to carry. But if your capital is all invested in your business it is certainly a wise plan to insure to the limit.

The 80 Per Cent. Clause.

Sometimes a man is tempted to take the reduced rates offered with an 80 per cent. co-insurance clause in a policy. Do you understand what this co-insurance clause does to your policy? If you have a plant worth $10,000 and you take out insurance with the 80 per cent. co-insurance clause for $8,000 and have a fire with a loss of $5,000, you get the $5,000. But

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suppose, under that same clause, you take out insurance for less than 80 per cent. of the value of the property, say $7,000. Then, with a $5,000 loss you would receive only seven-eighths of the loss. The insurance paid you would be in proportion to the loss as the insurance carried was in proportion to 80 per cent. of the value of the property insured.

Records, Etc., Must Be Kept.

With this co-insurance clause you must be able to prove that your property was insured up to at least 80 per cent. of its full value. This makes it essential for you to keep, where the fire will not destroy them, inventories and invoices and sales records so you can prove the value of the stock and the amount of the loss. This is very important, however, in the case of any form of insurance. Insurance is to provide indemnity for loss, not to give you a profit, so you must show the loss.

The "old line companies," so called, are properly regarded as the standards of insurance safety, but it does not follow that a small mutual company may not also be safe. Companies which scatter their risks widely, perhaps insuring one garage in a town, or one in a section of the city, will not be likely to meet with large losses in that class of risks. The secret of soundness in an insurance company, after honesty in management, lies in such a distribution of risks that no great fire can wipe out its surplus.

How Rates Are Based.

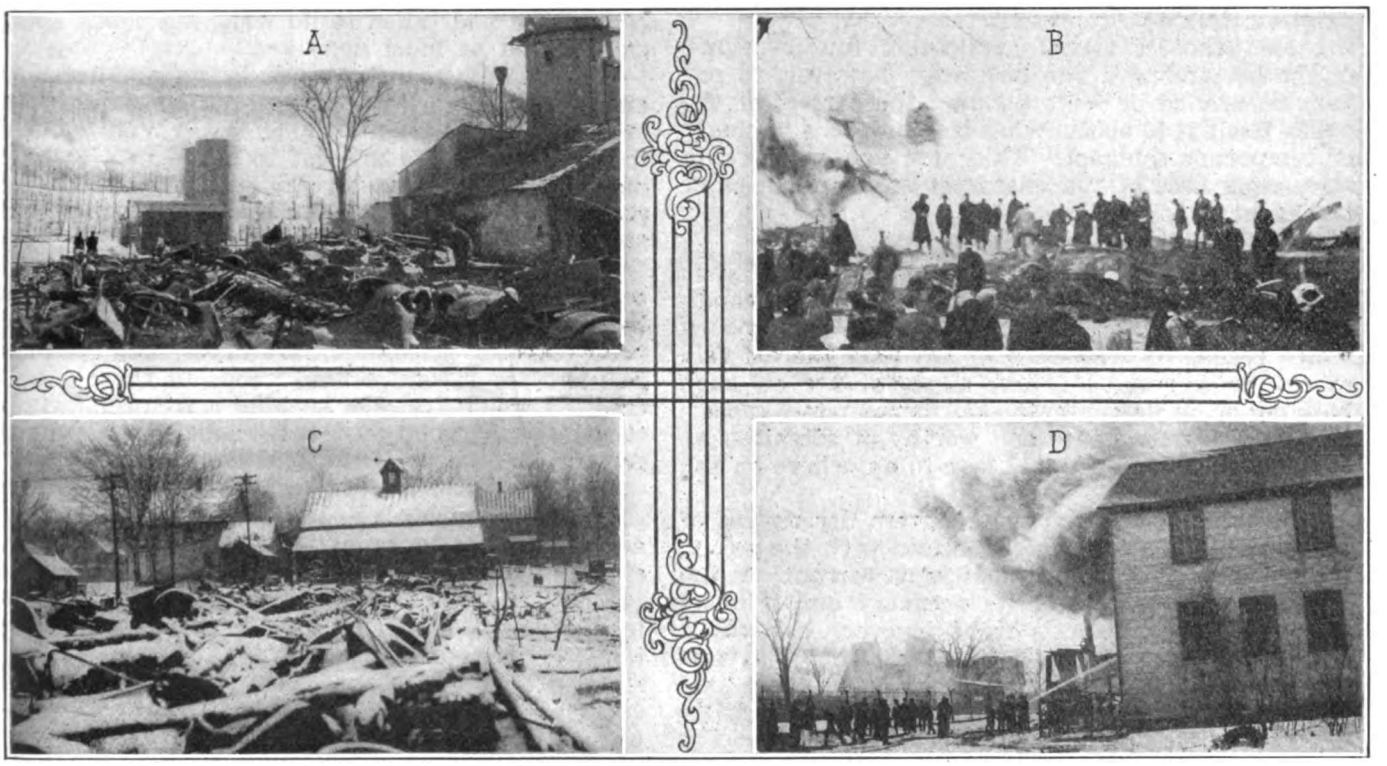
The rate you pay for standard insurance is based on what the statistics have shown to be the "probabilities" of a fire in your case. Since all companies accept practically the same statistics, it is obvious that the rate charged for your chance of fire will be practically the same in all cases except in those purely mutual companies which reduce the risks by a very wide separation of risks, and perhaps even go so far as to make all their charges by means of assessments as needed.

To the rate charged for the probability of a fire must be added further charges for expenses of operating the company and for the profits to the stockholders. These charges comprise what is known as "loading the policy." Obviously, with the same table of probabilities as a basis, differences in rates must depend upon differences in the "loading" charges.

Avoid Falsification.

Any garage man would know the danger of giving the insurance, along with his application, false data that might influence the rate of premium, or enable him to secure a more favorable policy than he could get on a true representation of the situation. But not every man realizes that the omission, intentional or otherwise, of important information may prove fatal. Omission of part of the facts may be taken as evidence of intent to defraud, thus invalidating the policy. It is necessary to tell all the truth as well as to avoid falsification.

See that everything incorporated in the policy as a part of the warranty you give the company is accurately complied with. For example, there is the "standard chimney warranty" in some states. Are the chimneys in your building so constructed as to comply with the terms of this warranty? If not, have you arranged for permits to cover any exception? Have you put in a short tile chimney somewhere when you wanted a stove temporarily, or have you built a chimney from the "attic" up? Is there a chimney built on a bracket that would not pass inspection? The insurance companies are inclined to be very fussy about chimneys and, for that matter, they have a right to be so. Consult your agent regarding every chimney change.



Concrete Examples of Losses Which Could Have Been Avoided.—A, This Garage Was Partially Covered by Insurance; B, Total Loss Due to Defective Chimney That Failed to Pass Inspection; C, Remains of a Garage the Owner of Which Did Not Believe in Insurance; D, Will You Feel Comfortable When You See the Smoke Coming Out of Your Building Like This?

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Don't keep more gasoline or other explosive inside of your building than your policy specifically allows. See that you have a lightning clause in the policy. Take out no concurrent insurance in other companies without permission from the companies already insuring you, unless the policy already taken out contains a clause permitting such other insurance.

Is your electric wiring all in shape to pass inspection? The "Standard Electricity Permit" will make interesting reading if you have never read it before. It might possibly make expensive reading if you wait to read it after the fire.

There is a clause in your policy which says that "No one not authorized in writing shall be considered an agent of the company," so it is important for you to do business with a reliable and a properly accredited representative. Don't transact such business with a man of questionable methods, unless you know he is authorized to do business for the company he claims to represent.

I said that a verbal application for insurance might be binding. The best way, however, to put your insurance in force pending the arrival of the policy itself is to obtain what is known as a "binder" or temporary contract. This puts you on the safe side, regardless of the character or carelessness of the agent.

Adjoining Sheds, Etc.

Is there an annex or a shed that is a part of your insured property and that is in tumbledown condition? There is probably a clause in your policy which reads, "If a building or any part thereof fall, except as a result of fire, all insurance on such building or on its contents shall immediately cease." This is a drastic clause and worthy of attention by the man with a shaky, old lean-to anywhere on the premises.

If any kind of a chart or diagram descriptive of your premises is used in connection with the policy, bear in mind that as a part of your warranty to the company, you guarantee its accuracy and it is up to you to see that it is right in every particular. Your policy will be no better than that diagram, just as a chain is no stronger than its weakest link.

Don't assign your insurance policy to anyone without first getting permission from the company. The policy is very explicit about this and a form for permission as well as for assignment appears on the back of most policies.

Be careful to take up with your agent as they come up, such matters as the introduction of an illuminating gas plant into any building, the placing of a chattel mortgage upon any property insured, the reduction in any way of your own interest in any of the property to anything less than full ownership, the increase in your fire risk by any means within your knowledge.

If you want to make sure that your policy covers certain things ordinarily excepted, have them specifically incorporated. Among these are property in storage or there for repairs; accounts, securities and currency; awnings; office furniture and fixtures; signs. Don't "guess" that these or other uncertain items are covered. Guesswork in insurance is expensive.

Place Losses in Writing.

When you do have a fire there are certain things you need to do. When the fire is put out, make it your business to protect the remaining property from further loss. Make out an inventory of the property. Get the damaged premises into the best possible condition. Notify the insurance company in writing of the loss.

The insurance policy provides that a sworn proof of loss must be sent to the company within 60 days of the date of the fire. The agent will supply you with the proper blank form and help you to fill it out if you wish. In this "Proof of Loss" blank there is a clause like this: "It is expressly understood that the furnishing of this proof of loss blank to the assured, or assistance in making up the proofs by an adjuster or person otherwise an agent of the company, is an act of courtesy and is not a waiver of the rights of the said company."

When Insured Lost Out.

One business man neglected these proofs, thinking something less than a sworn proof was sufficient. He sued five companies and lost every case because he had failed to do what his policy specifically stated he must do.

We have all heard more or less about fire insurance companies trying to get out of paying their losses, escaping on a technicality. Well, we have to admit that they are apt to settle in a technical manner, but that is all the more reason for the policyholder seeing that he understands the situation and lives up to his part of it.

There are thousands of garage men who have only their fire insurance standing between them and bankruptcy in case of a total fire loss, and a large percentage of these men have never even read their policies. If I were selling goods to these men on credit, I would feel like sending a representative to them at once to go over their policies with them—for my own safety if not for theirs.

Read Every Word in Policy.

Read your policy. Read it from beginning to end and take time to read it intelligently and understandingly. If there is anything about it that you fail to understand, get the agent of the company to make it clear. Don't remain in doubt and don't take anything for granted that is not explicitly stated in the policy. Remember that your policy expires on the stroke of the hour. A fire five minutes after the policy expires will no more be covered by that policy than a fire a year after its expiration.

Of course, you know your fire insurance policy does not cover loss by war, insurrection, riot or usurpation of power by military authorities. If you want protection under such conditions, you will have to secure it in some other way than through the ordinary insurance channels.

Garagemen and Tractor.

The Federal and State employment service men at the interstate and federal conference held recently at Kansas City, Mo., expressed the hope that garagemen would as early as possible get in touch with the farmers, learn their equipment and arrange for handling all work, particularly emergency repairs. The Commissioners pointed out that only through the fullest co-operation from garagemen could the labor employed in connection with tractor operation on farms be used to the most economical advantage. The commissioners do not believe it will be essential for any repairman to leave his work to render aid to a farmer in the field.

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Preventing Leaks in Government's Post Office Garage at St. Louis

BY JAMES F. HOBART, M. E.

The United States post office at St. Louis, Mo., operates a garage in which 60 cars are stored. The garage, an imposing one-story structure, was built three years ago by the Government.

About two or three years ago the automobile question was "dumped" upon the post office department without warning. Since that time the department has been slowly digging itself out from in under the "snow-slide." Contracts were made at that time for the use of and maintenance of cars, but as they expire they are not renewed. The department now takes over both the automobiles and their upkeep.

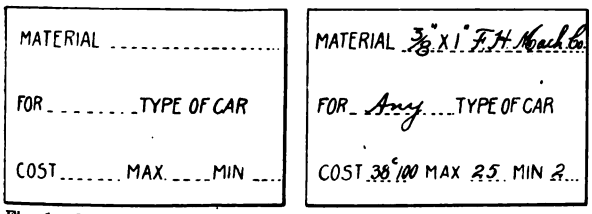


Fig. 1. Material Slip Used for Keeping Track of Stock Including Parts, etc., Issued by Stock Room.

Types of Cars Used.

Of the 60 cars cared for in this garage, 20 are the product of the General Motors Co. Of these 14 are of ¾-ton capacity and six 1½-ton capacity. There are four ½-ton Studebaker trucks and 36 Fords. The cars enter the garage at A and leave at U, as shown at Fig. 2. There is never any confusion during the entrance and exit of vehicles.

Plan of Garage.

Each car is stopped just inside the door and is not allowed to proceed until its fuel supply is renewed and to capacity. This avoids the possibility of a car leaving, no matter how hurriedly it may go, without its full complement of gasoline. Should a car be run out and around the block its fuel supply must be renewed as it enters as though the car had been out all day.

A very strict account is kept of each car and its driver, and every drop of gasoline and oil used, as well as every bolt, nut, cotter pin, etc., is charged up to be accounted for.

After entering, the car is parked in its particular place whenever it is possible. Otherwise the car parks where convenient. All the solid tire cars must park on the space CC, which is reserved for that class of vehicles. The other cars, those with pneumatic tires, park where they can find room, their own places preferred, and at all times the spaces DD are kept as clear as possible in order that room may be had for inflating tires, making minor repairs, etc., before the cars proceed to their places.

The inflation of tires is done in spaces DD, the air pipes being brought down the two posts as indicated at EE from the air compressor which is located in the shop at M. It will be noted that there are very few posts in this garage, the roof being supported upon the four posts shown at EE, GG. The beams between the posts are carried upon rod trusses about 50 feet long.

The section of roof between the two lines of trusses is covered by a "lantern" or monitor which gives plenty of light to the central portion of the garage. This, together with that from the very large windows in the front and rear walls, lights the garage evenly and fully.

The Paint Shop.

A wooden partition, HL, separates the paint shop from the machine shop. A canvas curtain, I, dropped from the roof to the floor, cuts off the garage from the paint shop, which can be very readily entered by vehicles by simply lifting that part of the curtain which is opposite the place where the car desires to enter. Thus dust is kept out of the paint shop and cars can enter almost anywhere without the trouble of opening doors.

The shop, which is separated from the garage by the short partition I, has an air compressor at M, and a fine radial drill stands at N. A bench stands against the cross partition at O, and the screw-cutting lathe P is by the window where the light is good. The emery grinder is located at Q, the forge at R, the anvil at S, and the remainder of the shop space K is used for repairing and overhauling.

The doors TT opening on the alley are never used and are kept locked. Door V is kept locked under the present arrangements. All entrances and exits are made through A and U, respectively, save through the office shown at the extreme left of X.

Depreciation and Accounting.

In addition to a very exacting system of accounting there is also a very fine depreciation system which is followed as closely as possible, 25 per cent. per year being charged off each year.

Repairs and Painting.

The repair policy followed is an exceedingly simple one. Each and every repair or renewal is made just as soon as its need is discovered. If drivers do not report needed repairs immediately they are apt to have a bad quarter of an hour explaining matters to the garage superintendent.

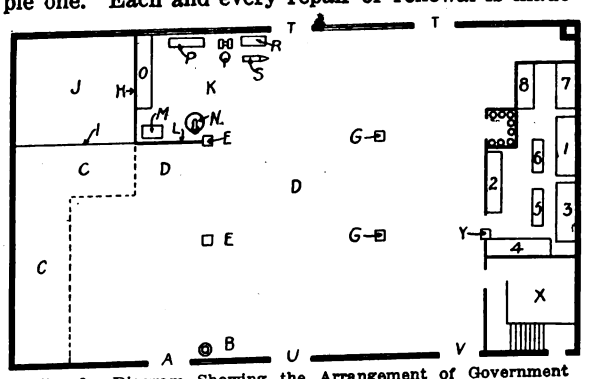


Fig. 2. Diagram Showing the Arrangement of Government Garage at St. Louis, Figures and Letters Indicating Spaces, Equipment, Stock Room, etc.

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When an engine needs overhauling the entire car is sent through the repair shop and painted. All of the old paint is removed. Thus the cars cared for are always spick and span. They give the best of service under very exacting requirements.

Duplicate Rear Ends.

Duplicate parts are kept in stock so that no time is lost in making repairs and renewals. Six Ford rear ends are kept in stock all the time, and the mechanics use these as "knitting work" which can be picked up and carried on while other work is not pressing. Thus there is one extra rear end on hand for each of the six Fords. When anything is found to be the matter with a rear axle, gears or any other part of it, the old rear end is removed, another put in its place and the car put back into service again in about an hour's time. Without the extra rear ends a car might be out of service a considerable time while repairs or adjustments were being made to the rear portion.

Method of Using Tires.

Each car using pneumatics is fitted and charged with six tires. One extra tire is carried and the others stored in a rack in the tire repair department. The rack which carries all the extra tires is indicated at 7 and the vulcanizing bench is shown at 8. When a tire goes bad the driver replaces it with the extra member. Upon returning to the garage, the extra tire is taken from the rack 7 and carried while the damaged tire is being repaired. After the old tire has been repaired it is placed upon its wheel again and the tire taken from the wheel is carried as a spare. The other extra tire is returned to the store room rack. With this method a set of tires is worn out and replaced with new ones.

The Stock Room.

As shown by Fig. 2, one end of the garage is given over for stock room and office purposes. The office space X is equipped with all that a superintendent needs in the way of fixtures, filing cabinets, etc. The stock room occupies the balance of the end of the building save a small space at W, where the heating apparatus for the building is located. The boiler supplying the steam radiators throughout the building is connected to a built-in-the-wall chimney in the extreme corner of the outer walls.

Tools and parts are given out through the door and window Y, and all oil is stored in the room Z. Every drop is charged to the cars with the exception of the small quantity used in the machine shop.

Racks or units of bins are provided for spare parts. The racks and space shown by the figure 4 are exceptions. Space 1 is made with large compartments and contains the large parts for all makes of cars, while 4 contains the parts used in common by all of the cars.

Each of the other storage cases, which by the way were converted from disused carrier stands, is used for the parts of a single make of car. The Ford small parts are kept in case 5 convenient to the window Y. The G. M. C. parts are stored at 3, the Studebaker at 5, while tools and other necessary material are placed in racks 2 and 6.

Accounting Methods.

A very thorough and comprehensive system is in use for keeping track of the cost of repairs, operating expenses, etc., of each car. Each compartment of the stock racks has a label or tag showing the contents, cost, etc.

For example: On the front of each compartment in rack 4, which contains the parts used on all the cars, will be found a label similar to that shown by Fig. 1. Each label is filled out in accordance with the article contained in that particular compartment. The one devoted to 3/8 x 1-inch flat head machine screws will be found filled out as shown. The last line on the label gives information which the stock clerk is interested in. The cost is entered against each and every car to which one of these screws is delivered, also the maximum and minimum number which shall be carried in the compartment. In this case the maximum number is 25 and the minimum number 2. When the stock clerk finds but two pieces remain another lot is at once placed in the compartment.

It was considered allowable, when the scheme was outlined to allow a maximum quantity of 30 of these machine screws, but the system is to be changed so as to allow a maximum number equal to that in which the specified article may be purchased. For example: Screws come in lots of 100 each. Therefore, the label will be changed to read 100 instead of 30.

In issuing parts the stock man uses an ordinary cash sales machine in which two slips of paper are fed continuously with carbon paper interposed between the slips. Frequently the carbon transfer material is coated upon the back of the top slip of paper. The date, car number (each car owned by the Government is given a distinct number), time, labor, material, oil, driver; in fact, all expense is entered.

On the double slip is entered the name of the material issued, the number thereof and its cost. The stock man allows the slip to remain in the machine, after a piece has been drawn, in expectation that other parts will be drawn in a short time. This usually enables the stock man to list all the parts upon a single pair of slips.

Should some article be drawn for some other car the stock man tears off the slips already marked and starts a new pair of slips. If more parts are wanted for the first car new slips are made out for the car.

One slip of each pair is sent across the street to the postmaster. The other or duplicate slip is kept on file in the superintendent's office for the purpose of checking stock when necessary. A statistician in the post office building compiles the quantities from each slip and charges them against the cars for which they were issued. The garage superintendent is thus relieved of all this routine business.

Stock is taken once each month in the stock room. The statistician checks against each stock report the previous report, purchases and articles supplied each car. Should there be any discrepancy a search is instituted among the stock racks and the charge slips. The stock man is held responsible for the missing material and pays for the same. Very few parts are ever lost or stolen from this stock room.

Stars Added to Goodrich Flag.

Enlistments have followed rapidly at the plant of The B. F. Goodrich Rubber Co., Akron, O. To date 1,624 men have gone from various departments. Almost every day brings an increase. Recently the company hoisted a service flag containing 1,414 stars and has had to lower it twice to affix new stars.

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Prevents Short Circuiting of Ford Magneto Contact Assembly

A trouble sometimes encountered by Ford owners is the short circuiting of the low-tension magneto current, owing to foreign matter becoming lodged between the current pick-up point and spring, carried by the magneto fibre plug on the top of the transmission cover, and the metal of the upper part of the crank case.

It should be explained that the current of the Ford magneto is collected from all the stationary spools by a stud attached to the spool unit, and that upon the top of this stud—as shown in the sketch at A on the left of the accompanying illustration—rests a steel spike, the shaft of which is surrounded by a helical spring that passes up into the interior of the fibre plug held by three screws to the transmission cover.

Construction of Unit.

The spool unit is insulated from the metal of the engine, and the current has to pass through the stud to the spike and spring, and thence, by way of a terminal on the top of the fibre plug, through the wire leading from the plug to the coil box. Any leakage of current between the plug and the engine frame, or between the spike and spring above the plug and the frame, results at the best in reduced efficiency of the ignition and at the worst in a sudden and entire cessation of the current at the sparking plug points, says a writer in the Autocar.

Why Deposits Gather.

On the Ford car there is no special protection for the current pick-up stud or for the spike resting upon it, and there is always the chance of foreign matter, such as small fragments of the material with which the transmission brake bands are lined, being swept up in the oil and deposited in the comparatively narrow space between the metal of the crank chamber and the stud and spike above it. When this occurs current leakage often takes place across the bridge so formed.

Some considerable degree of protection at this point is provided by the Rejax (an English device) shielded magneto contact, shown at B. This device forms an attachment to the standard fibre plug, illustrated in the left-hand sketch, on the transmission cover. In order to fit the shielded contact, the fibre plug is removed and the spring and spike are taken out. The spring is then cut short, and one end is hooked round a recess prepared for its reception in the upper extremity of the Rejax fitting. The short spring with the fitting attached is then reinserted in the center of the fibre plug, and the plug itself is replaced in the transmission cover.

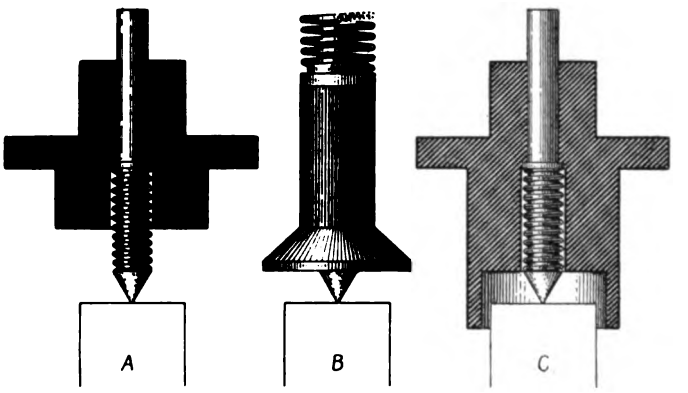
Is Shielded by Sleeve.

It will be seen that the lower end of the Rejax contact, which is made of vulcanite, comes down and rests upon the top of the current pick-up stud, so that the point of the contact itself is completely shielded by the vulcanite sleeve. The result is that no short circuiting can take place between the metal of the engine and the contact point, which is spring-supported from within the sleeve. To this extent, then, the Rejax fitting shows a marked improvement over the standard Ford arrangement, but the protection afforded is only to the contact point, and not to the current pick-up stud below it.

Shields Parts.

Another writer suggests that all risk of short-circuiting between the stud and the engine frame could be eliminated by the construction of a fibre plug to take the place of the standard Ford fitting and shaped in the manner shown in the sketch at C.

It will be observed that the portion of the plug below the flange through which pass the screws attaching it to the transmission cover is continued downward, so that it entirely shields the spring and the contact spike that rests upon the current pick-up stud. A further extension of the lower part of the fibre plug acts as a skirt, which surrounds the stud itself and passes down to the bottom of the last-named, thus effectually checking the design of any foreign matter that may endeavor to lodge itself between the stud and the engine frame.



Ford Magneto Terminal Contacts: A, Standard Type; B, Rejax Shielded Contact; C, Suggested Design.

Has Possibilities.

The idea is practical, and, in view of the fact that the expense of manufacturing a plug of this pattern should be very slight, there should be a good market for it among owners of Ford cars.

Those Ford owners who have not made a study of the Ford ignition system are sometimes held up on the road through short circuiting at the point referred to, and much waste of time is caused because the driver has not realized that the contact point and stud, which are normally out of sight within the transmission case, represent a possible source of ignition failure.

An Engine Record.

What is believed to be a record for constructing an engine is that made by the Northway Motor & Mfg. Co. Drawings were given the company for the engine, a Class "AA" truck engine, and on November 27, at 6 p. m., the order and layout were given to Northway engineer. The complete engine was weighed and photographed at 9.30 p. m. December 9. Two hours later it was running on its dynamometer test. The actual time, 11 days and one hour. This is said to better the record made in the construction of engines for the other Liberty trucks.

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How Randy Smith, Garageman, Made Use of the Letter Salesman

Randy Smith's garage business had been marking time for several months and Randy had decided it must be gingered. "You stay here and look after things," he said one morning to a 20 year old assistant. "I'll go out and drum up trade."

The first fellow Randy dropped in on was a jeweler who had two cars and who used to stop at Randy's now and then for gasoline. When Randy entered the jewelry store the proprietor was showing a La-Valliere to a well-dressed young lady. A clerk came forward but Randy waved him back, indicating he wanted to talk to the boss. It was 25 minutes, however, before the lady customer passed out. She didn't buy a thing. So when Randy sidled up to the show case the proprietor wasn't in any too happy frame of mind.

Randy wasn't recognized at first. He was taken for a customer. So he had to introduce himself. This made him feel awkward. But he handed out the best line of talk he had. In five minutes he got the jeweler to talking about tires, and Randy was smiling inwardly. Then the telephone rang.

First Call a Failure.

The telephone talk took five minutes by Randy's watch. Worst of all, there was some kind of bad news involved. It sounded to Randy as though some fellow had bought an expensive watch for a girl for Christmas, that the watch wouldn't run and that the girl had called his attention to the fact, causing an embarrassing situation.

The jeweler was "riled" when he hung up the receiver and before he would talk to Randy again he sent a "hot" telegram to the watch jobbers. When he came back to the show case, his mind was clearly off tires and repairs and Randy saw further talk was in vain. He bid good morning and walked out. Fifty-five minutes wasted here.

Second Call a Loss of Time.

Randy drove four blocks down the street and then two blocks to the right. He was on the trail of Jones and Pixley, attorneys. There was a time, not so long ago, either, when Jones was a good customer. When Randy stepped into the office there was an air of bustle and business. A girl stopped clicking her typewriter to answer Randy's questions. Yes, Mr. Jones was in, but it would be fully 20 minutes before he could see him. It usually took Jones that long to answer his morning mail. There were two people waiting to see Mr. Jones besides. If it were an urgent personal call, the girl would gladly call Mr. Jones, but otherwise Mr. Smith would have to leave a message with her, or make an appointment, take his turn or talk to one of the younger members of the firm.

Randy couldn't wait and he couldn't very well leave a message, so he departed dejectedly.

Third Prospect Was Ill.

Now there was a Mrs. Lynch who has owned two gasoline cars and an electric. She had stopped once at the shop one day to talk cord tires, but Randy was not in at the time. Randy thought this was a good time to see her again. So he drove two miles to the fashionable residential district. A prim servant answered his ring at the Lynch home. Sorry, but Mrs. Lynch was not up yet—bad headache! If the gentleman wanted to see her personally he had better make an appointment for the next day as Mrs. Lynch's headaches generally lasted several hours. Randy didn't make an appointment.

And in the Meantime.

It was noon before Randy breezed back to the shop. He saw at once that something had gone wrong. Yes, Frank Wise, one of his best customers, had had a bad collision—car pretty badly smashed up, etc., needed overhauling and a complete set of new tires. Mr. Wise had even talked of buying a new car.

"I was afraid to make a price, the machine was so banged up," apologized the boy. "I tried my best to locate you by phone, but couldn't. Mr. Wise said he was leaving town for 10 days and wanted the car when he returned. I'm afraid he went elsewhere."

To make things worse, young Dickson, of the Country Club, had paused to get a price on some new tires and left when he found Randy was out.

Salesman to the Rescue.

Randy could contain himself no longer. He exploded, and in loud fashion, too. In the midst of his declamation George Lane, an accessory salesman, arrived on the scene. He listened sympathetically to Randy's lamentations.

"Randy," he said, "you're foolish to make trips like that. Why do you do it? Your place is right here. Why don't you send a representative?"

"Whom do you mean—this kid here?" replied Randy scornfully.

"No, a letter salesman," said Lane.

"Most people don't realize the value of a letter," continued Lane. "Why, Randy, you can say the very same thing in a letter that you can say personally. And, better still, a letter gets into a man's private office—right onto his desk. And it usually has a chance to talk to him when his mind is fresh and clear. Most people open their mail first thing in the morning.

"Then, again, your letter doesn't peeve a man by taking up his time. And it doesn't take your time, either. It travels while you sleep and works while you go on with your business.

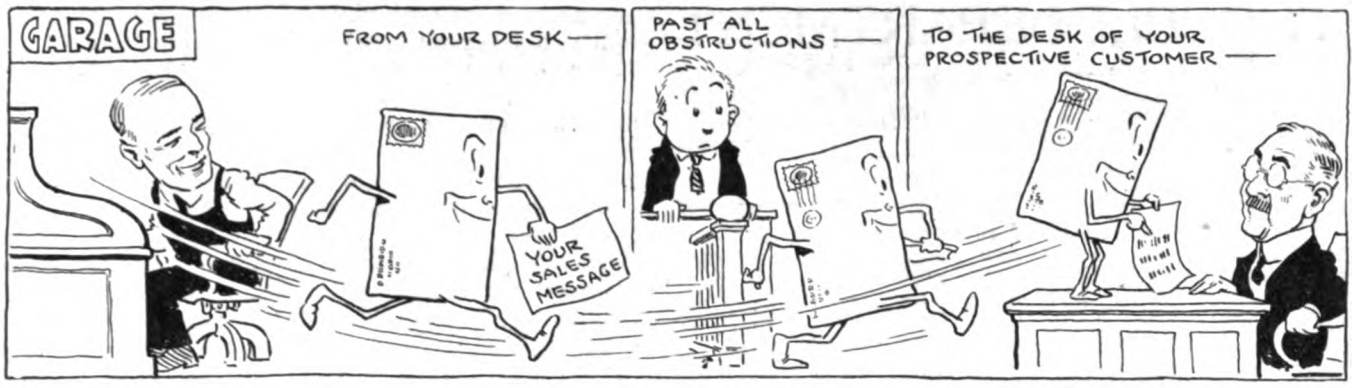
"It is a mighty cheap proposition, too," he concluded. "You figure you lost $40 this morning by not being on the job. For that $40 you could have sent nearly 1,700 letters. Think of that! Or you could have sent 500 letters and used the rest in advertising. And every one of your letters would have talked to its man or woman in private office or boudoir first thing in the morning."

That sounded convincing.

Letters Lacked the Punch.

When Lane left, Randy tried his hand at writing some letters. But he was out of practice in writing and the letters didn't say what he wanted them to say. Besides, he didn't have a typewriter and

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he realized that copying would be expensive. Then he remembered a salesman of the B. F. Goodrich Rubber Company who told him about the help given by the company in letter writing. Randy consulted the corporation. He was told that Goodrich would not only write or help him write his letters, but would multigraph them, put them in envelopes all ready for mailing. All Randy would have to do would be to pay the postage.

How the Scheme Worked.

Randy's first mailing list was 100 people. Letters went out to this list. Five days later another batch of letters, differently worded, went out to the same people. And after another five days another batch went out, all bright, snappy letter salesmen. They carried the conclusive message—a clear, straight-out-and-out invitation to visit Randy's garage and be assured of prompt service, full money values and attention.

This was the beginning of Randy's first direct-by-mail and newspaper campaign.

Lane, the salesman, happened around a few months afterwards. He found five machines outside the shop. He found Randy's staff doubled—a stenographer annexed.

Randy was directing a repair job, but he broke away when he saw Lane.

"Your hunch on those letters was a peach," he exulted, slapping Lane on the back. "Why I found a bunch of car owners who didn't know I was on the face of the earth.

"I tell you, George, I'm going to follow your tips hereafter. I'm going to let my letter salesmen continue my soliciting. I'm going in more and more for advertising. I find that you can get a lot of help from manufacturers if you'll only go after it. I'm planning now to dress up my windows, have my walls painted, put in signs and cards—touring bureau cards; I find most autoists come in for them—and play the game in a big way."

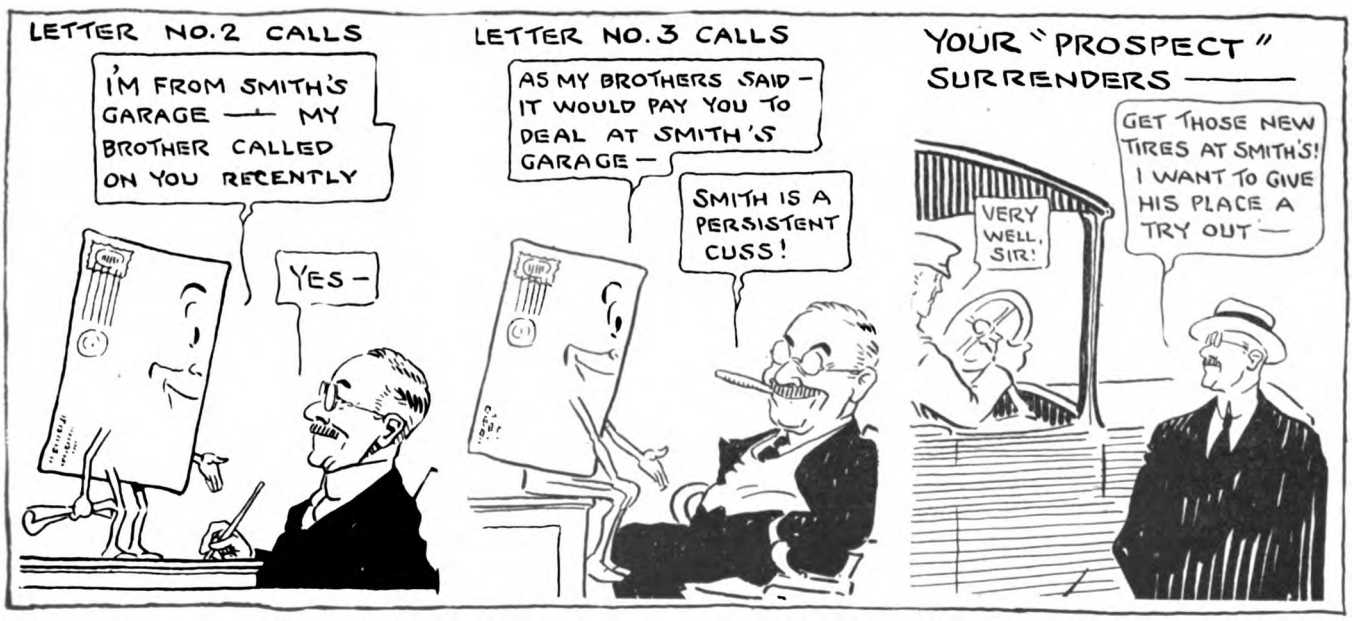
Every dealer can do the same.

Exempts Garages from Fuel Order.

Fuel Administrator Garfield has ruled that garages are public utilities, and as such are exempt from the provisions of the Monday closing order. Garages may remain open, at least to the extent necessary to allow owners to secure their cars. The ruling is the result of energetic protests made by professional men, such as doctors, who could not obtain their machines when same were stored on the floors requiring the service of elevators. These conditions obtained in the large cities, principally New York, Chicago and Boston.

Has 17 Per Cent. in Service.

The Locomobile Company of America, Bridgeport, Conn., maker of the Locomobile cars, has 336 men in the country's service. This is about 17 per cent. of the entire organization, and includes 19 commissioned officers in the army and three in the navy.



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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

2339 Will Reduce Efficiency.

From E. Huntley, Ohio.—I have a small electric motor rated at two horsepower, 1,200 r.p.m., 250 volts, bi-polar, which I belted to a gas engine, using same for lighting and small power purposes. I used a double throw switch on the board so I could use current from the town plant or from my own generator. I used a home-made resistance in series with the field coils to regulate the voltage. The machine is shunt wound. The town current has now been changed to 110 volts and I am writing to ask how I can alter the machine to develop 110 volts instead of 250. Can I do this without greatly reducing the capacity of the generator?

Reply.—You can use the machine, but the efficiency will be greatly reduced, about one-half, as the speed, horsepower, torque, etc., will be affected to the extent above stated. The better way would be to utilize a machine adapted to the new voltage.

2340 Testing Ford Coils and Magnets.

From W. L. Crum, Illinois.—Some time ago I read some place complete instructions for testing out the Ford magneto, but have since been unable to locate it, but think possibly it was in your magazine. If so, will you please advise me what issue it was in and if not could you furnish the desired information? I would like to know how I can tell whether the trouble is in the magnets or the windings or both. I have the article on recharging Ford magnets in the January issue at hand, but this does not tell how to tell if the magnets are weak or strong or how to test out the coils.

I also notice that D. C. Bays, Colorado, says that he overcame fouling of plugs by grinding the upper edge of the rings off. I know some mechanics who advocate the grinding off of the lower edge instead of the upper. Which is correct or would not both have the result of leaving a sort of vacuum and have the same result? I should think that grinding the upper edge would tend to let the compression escape more than the lower edge.

Reply.—We regret that we have not the issue in question as the number is exhausted. The magnets can be tested by noting if they will support a block of iron, equal to their weight. If not, it will probably be necessary to install new ones.

The coils can be tested for grounds by pulling off the ground connection of the magneto coil assembly and using testing wires with current taken from a 110-volt circuit. The current should be led through a 32-candlepower carbon lamp to prevent an excessive flow of electricity. Sometimes several of the bulbs are used in parallel so as to permit of a greater flow of current, the idea being that a small ground can be burned away. An air blast is sometimes used to blow out any dirt or metallic particles causing the ground and which may collect between the coils and the steel corners. A special insulating varnish should be used to protect any exposed metal discovered and the cause of the ground. A complete story dealing with the work will be published in the near future.

Relative to the grinding of the edges of the rings, the accepted practice is to bevel the lower section of edge. The method described and illustrated in answer to No. 2289 in the December issue is held to be superior to either.

2341 Bosch Dynamo Circuit.

From Frank Cais, Colorado.—Please help me explain the circuit diagram on Bosch starting system which I enclose. Either I must be wrong or the diagram is wrong. A book I have on starting and lighting systems has the diagram which shows the method of current regulation by a ballast of bucking coil which imposes resistance to weaken the magnetic field and keeps the output of the generator reasonably constant. Now I start by positive — brush on generator, go through shunt fields to terminal 2 on generator to 2 on control box, thence through field fuse, potential winding on cutout to — B to 3 to 3 on generator. And then to — brush, this completing the circuit. Am I right?

Now when the voltage is high enough the cutout points are closed and current flows from positive + brush to positive + 1 on generator to 1 on control box, through series winding, through the closed points to + B on control B to + on battery, through battery to ammeter to — B on control B to 3, then to 3 on generator and to — brush. Am I right?

Now at the same time current is flowing from 3 on control box through the resistance to 4 on control box to 4 on generator, through bucking field to — brush. I cannot see regulation in this. What is the use of having the bucking coil and resistance in series? I think they should be parallel and when the resistance coil is hot the current should go through the bucking coil. I will appreciate any explanation. Thank you for your answer on piston travel, etc.

Reply.—The current flow of the dynamo is shown in the accompanying illustration at A and the complete circuit diagram at D. B and C shows the bucking coil method of regulation referred to. The dynamo has two field windings, a shunt and a regulating winding. The last named is so placed in relation to the shunt field winding that when a current is allowed to flow through, it tends to lessen or dampen the magnetism created at the field pieces by the shunt field winding.

The flow of the current through the regulating winding is controlled by a resistance inserted in parallel with that winding, and so placed that when the current output of the dynamo tends to increase beyond a certain point, the resistance increases to a

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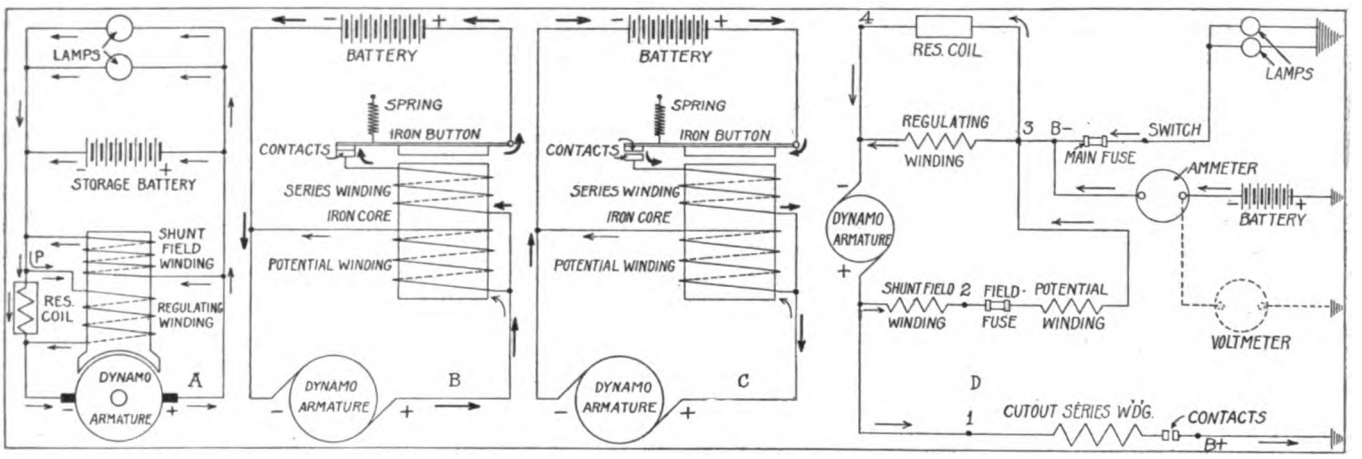
point where a current is allowed to flow through the regulating winding, reducing the magnetic strength at the field poles. As the output of the dynamo depends upon this, as well as its speed or rotation, any reduction of the magnetic strength results in a corresponding reduction in the output of the dynamo. This reduction permits of the controlling resistance condition to return to normal, but should the output tend to increase, the series of changes described is repeated, resulting in holding the output practically constant irrespective of the speed.

This method of regulation is illustrated by the circuit diagram at A. The current leaves the armature at the positive + lead, and flows along this wire to the battery. One end of the shunt field is connected to this wire. The current flows through the battery, out of the negative — terminal, and, beginning at the point P, has two paths it can take. One is through the resistance coil, and the other through the regulating winding. The current then returns to the dynamo by means of the negative — lead. The negative — end of the shunt field winding is connected to the lead that connects the negative — terminal of the battery to the point marked P.

The method of providing two paths for the current is termed paralleling the circuit. The proportion of the resistance in the resistance coil to that in the regulating winding is such that at low dynamo speeds practically all of the current generated passes through the resistance coil, but the current under such conditions is not great enough to cause the resistance coil to become heated. At higher dynamo speeds, the tendency of the dynamo to increase its output is counteracted by the action of the resistance coil. The increased dynamo current flows through the resistance coil, and when this occurs the material in the coil becomes heated, increasing the resistance very rapidly, and allowing a greater portion of the shunted or parallel circuit to flow through the regulating winding.

The principle of operation of the cut-out is shown at B and C, and as may be noted the potential winding always remains electrically connected with the dynamo, and the current passing through this winding flows always in one direction, as indicated by the light arrows. When the contacts are closed, current flows from the dynamo through the cut-out series winding to the battery, as indicated by the heavy arrows at B. When the output of the dynamo is below that necessary to charge the battery, the current, instead of flowing from the dynamo to the battery, flows from the battery to the dynamo, as shown at C.

Under such conditions, the direction of the current through the potential winding remains the same as in the case where the voltage of the dynamo exceeds that of the battery, the change being in the direction of the current through the series winding of the cut-out, as shown by the heavy arrows. This reversal of current through the series winding results in the contact points separating, preventing the battery from discharging through the dynamo.



Bosch Dynamo Circuit.—A, Diagram Showing Current Flow and Principle of Operation; B, C, Principle of Cut-Out; D, Circuit Diagram.

2342 **Another Ring Question.**

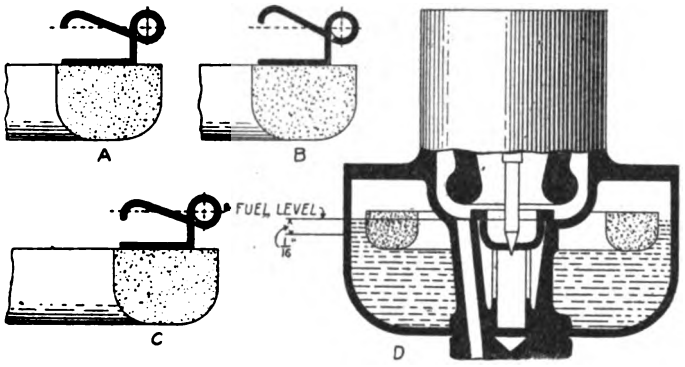
From M. Jessup, Michigan.—Would like some information concerning a 1913 Buick model 31 equipped with Schebler carburetor and model RL Remy magneto and LE switch and coil. The two middle cylinders leak oil, the No. 2 quite badly. I only get about 15 miles without cleaning the spark plug. The carburetor and magneto have been to the factory. Have installed Inland piston rings in the top groove of piston and a plain ring in the middle groove. The lower groove has an old ring. The car has been run about 8,500 miles. It has never been hot or dry. There isn't a scratch or a mark on the cylinders and the old rings are perfectly smooth and shiny all around. The carbon has been cleaned out and valves ground. Sometimes the engine has lots of power and other times it is dead. Have run it about 700 miles since rings were installed. The engine will miss for quite a way and all at once will take hold and work fine for a way. What do you think of filing the upper edge of the piston rings and making them round as D. C. Bays did? What are the symptoms of a bad coil?

Reply.—The symptoms are those of mixture conditions upset by the spraying nozzle or needle valve being clogged or the fuel line partially clogged. The height of the fuel in the float chamber has an effect upon the mixture, and when the level is too low the mixture is starved. Too high a level results in too rich a mixture. The better way to alter rings is as suggested in the answer to No. 2289 in the December issue. A defective coil causes erratic operation of the engine.

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2343 Many Questions.

From John Vossler, Indiana.—1—The strength of the Ford magneto in volts is from 9 to 30. What is it after it passes through coils going to the spark plugs or what is the primary and secondary ratio? 2—If I connect my lamps in parallel instead of in series, what voltage and amperage lamps should I



Showing the Float Assembly of Holley Carburetor and How Level Should Be Set.

purchase to avoid drawing too much current from the magneto? 3—When connected in parallel does it double the voltage or the amperage? 4—If my car is running 20 miles an hour, what is the piston speed per feet per minute or what is the engine and rear wheel ratio? 5—When the high speed clutch cannot be tightened any more can a new disc be put in or must I put in a new set of discs? 6—I want to put in a new float in a 1914-1915 Holley carburetor. Can you give me the proper float adjustment? 7—What kind of advice is that given by James Hobart on page 47 of the November issue? He says the carburetor adjustment should not be touched. If I didn't open my Holley carburetor a half turn when the engine is cold, I would be all day trying to get started. I know many others who do the same thing. The Ford Company says open the needle valve a half turn when the engine is cold or in cold weather, as it makes starting easier.

Reply.—1—Anywhere between 30,000 and 40,000 volts, it depending upon the number of turns or length of the primary and secondary windings. 2—Twelve to 16 volt, one ampere, 15 candlepower bulbs should be used on old cars and 18 volt with the new type of magneto. 3—Wiring in series increases the pressure or voltage; in parallel or multiple the amperage or capacity is increased. 4—At 1,000 r. p. m. and on high speed the car travels 24.59 miles per hour. 5—An examination of the large and small dics and large or thrust plate would be necessary before answering this question. 6—The float assembly and level is shown in an accompanying drawing. 7—Mr. Hobart evidently intended to convey the impression that much of the trouble experienced with carburetors is due to tampering with the adjustment. You are correct as to the Ford and the same will apply to a number of other makes.

2344 A Motor Sled Problem.

From L. De Laney, Michigan. — Last winter I built an air sled having a single cylinder buckboard engine. The bore is 3¼ and stroke 4½. The propeller is four inches diameter with a three-inch pitch, two blades, true pitch. The blades are of parabolic section and are 2½ inches wide. The engine is geared back ¾ to 1. The outfit weighs 275 pounds. Under ideal conditions I failed to get thrust enough to start the sled. Neither would it keep itself in motion after being started by hand. The propeller does not seem to be much more than half a load for the engine, as the engine fairly runs away with it. Do you think it possible to drive a sled of this kind with a propeller? I intended trying a propeller of heavier pitch and with wider blades, as I do not like to increase the diameter on account of making the rig higher and wider. It seems to me that a four-foot propeller should be able to absorb all the power that an engine of this size can develop. Do you think that using a higher gear ratio with the same propeller would help any?

Ed. Note.—Perhaps some of our readers who have had experience in constructing motor-driven sleds can give Mr. De Laney the information he desires.

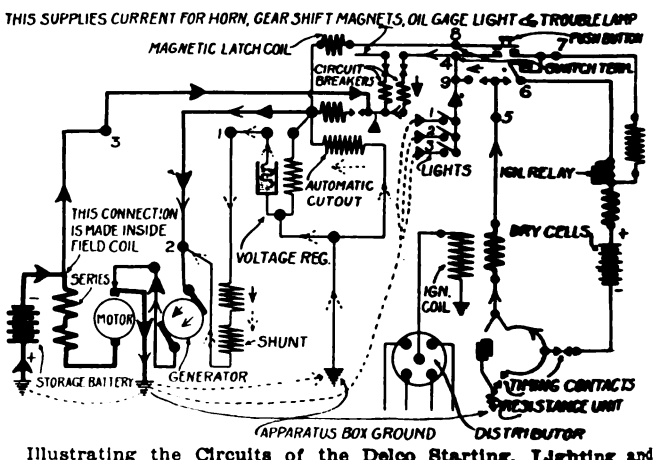
2345 Engine Overheated.

From N. S. Wright, New York.—Would appreciate your opinion as to the damage done to my Paige car. On a day when the temperature was at zero I filled the radiator and drove about 20 miles. The engine got so hot that it would not run. The next day we filled the radiator with hot water but the engine would not start. We found the battery quite low. Have put the car up for the winter.

Reply.—It is difficult to state how much or little damage has resulted without examining the engine. The fact that the engine got very hot does not indicate that it is damaged, particularly if there was plenty of oil in the lubricating system. Would suggest a careful examination, testing compression, examining bearings, etc.

2346 Circuit Diagram of Delco System.

From J. Schneider, New York.—Would it be possible for you to publish a wiring diagram of the Cunningham or a Cadillac car with the Delco system of lighting, starting and ignition and show by arrows the path of the current?



Illustrating the Circuits of the Delco Starting, Lighting and Ignition System of a 1914 Cadillac Car. The Arrows Indicate the Path of the Current.

Reply.—The path of the current was explained in detail in the November issue, page 51. The accompanying illustration shows the diagram with arrows indicating the path of the current.

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2347 Is Storing Car for Winter.

From L. Savard, New York.—My car is a 1916 Reo Six. Have had the carbon removed, etc. Have put car in storage until April on account of the snow. Would you advise me to put kerosene or cylinder oil in the engine to prevent rust or is there something better. There is a knock in my engine which I think is a piston slap and in the No. 4 cylinder. The knock has been there ever since the car was new and I have driven it over 10,000 miles and the knock is no worse. My reason for believing it is a piston slap is as follows: I placed a small quantity of kerosene in the cylinders. In a few hours the No. 4 cylinder was dry. The others held the oil. The service man from the factory said my trouble was a wristpin knock. What is your opinion? Where can I get made those gauze cones referred to in the October number? Which had I better use, the No. 60 or 80, and how many on my engine?

Reply.—Use cylinder oil and with the engine warm pour a small quantity in each cylinder. With plugs removed or petcocks open turn the engine over by hand and several times to work the oil around the rings, etc. An examination will reveal the cause of the knock. It looks as if it might be a piston slap as you state kerosene works past the rings of the cylinder in question. You can make the cones described or have them made at any tinsmith. Use a cone for each branch of the intake manifold as described and illustrated in the article. Try the No. 60 gauze.

2348 Charging With House Current.

From John Kelby, New Jersey.—I want to charge my storage battery with the house current. It is a Willard 6-80. The charging rate is—starting 12 and finishing four amperes. How many 25-watt lamps should I use and how many 40-watt? Could I charge it with 40-watt lamps as I only use battery on Saturdays and Sundays? If I want to charge a separate cell would it be necessary to disconnect the terminals? On page 38 of the September issue there was an article on spark gaps by Morris R. Machol. Could you tell me where I could obtain the gaps he mentions? I had glass enclosed devices, but they ran down a new set of dry cells in 50 miles and short-circuited the device. I have the Atwater-Kent system. Would they work all right with a magneto?

Reply.—Complete instructions were given in the answer to No. 2220 published on page 50 of the October issue. The spark gaps mentioned are not manufactured or marketed insofar as we know. The gap is a theoretical one. You will have to disconnect terminals.

2349 Engine Fails on Magneto.

From W. J. Hill, Indiana.—I have a Studebaker 25 equipped with a Splitdorf magneto and a transformer coil. Up to last summer I was able to start on the magneto with a quarter of a turn, but for some cause which I am unable to locate, I am unable to start on the magneto at present. When I start on the batteries and switch over to the magneto the engine runs all right. The wiring, coil and magneto seem all right. Will be pleased to have you tell me why I am unable to start on the magneto.

Reply.—The failure to start on the magneto is doubtless due to the fact that the magnets are not as strong as when the engine started as you describe. The permanent type of magnet will lose its strength if subjected to shock or blows and is affected by extreme heat. You probably could start on the magneto if you could rotate the crankshaft of the engine fast enough and advanced the spark more fully. Try decreasing the gap of the spark plugs; also see that the break of the contact points be not too large.

2350 Oil Works Past Rings.

From Bruce C. Junk, Ohio.—I have had the cylinders of my Ford rebored .031 inch oversize. All of the cylinders have good compression. The two front cylinders foul with oil if I carry oil up to the top of the petcock. I have run the car 2,000 miles since having the cylinders rebored. Have installed Ford special taper rings on all pistons. Am thinking of slanting the lower edge of ring grooves and drilling holes to let the oil drain back into the crankcase. Would like to know what size holes to drill, also how many in each piston. Would you advise drilling all of the pistons or just the front ones?

Reply.—Use a No. 30 drill and drill about six holes equidistant. Would drill those giving trouble. If all four pistons are out of cylinders would suggest all be treated.

2351 Carbon in Crankcase.

From Joseph Montag, New York.—I would like to know what causes the accumulation of granules of carbon in the crankcase of an engine.

Reply.—Very fine particles of carbon may be present in the lubricating oil, but if large ones be found their presence can only be explained by carelessness when overhauling the power plant.

2352 Variable Vs. Fixed Spark Magneto.

From J. H. Erkmann, Missouri.—I have a NU4 Bosch fixed spark magneto and wish to change it into a variable type. A magneto expert informs me that all that is needed is to cut a slot in the breaker box and attach a lever.

Reply.—The breaker box can be converted from a fixed to a variable or moveable type as suggested but we would not advise so doing as it is essential that the work be carefully performed. In other words, a slight variation in the time of setting would affect the spark obtained. It would be better to purchase a box made for the magneto by the maker, the Bosch Magneto Co. Such a box can be obtained from any of the service stations of the company or direct.

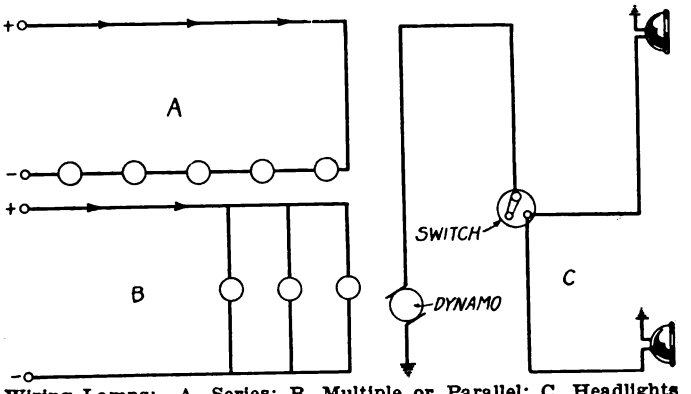
2353 Wiring Lamps in Parallel.

From August Schaack, Jr., Illinois.—Please advise me how I may wire my 1917 Ford to better the lighting conditions. Can the car be wired so that if one light burns out the other will continue to burn? What size globes should I use?

Reply.—We do not believe you will improve the factory wiring of the car; that is, the series wiring. The disadvantage of the series wiring of lamps is that should a lamp burn out the others will be extinguished. This is avoided by wiring in parallel or multiple. Both methods are shown in the accompanying illustration, the drawing at A illustrating

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series wiring and that at B the parallel. At A the lamps are shown in series with each other; that is, the same current is passing through one lamp after the other. Assuming that two amperes pass through each lamp, and as each has two ohms re-



Wiring Lamps: A, Series; B, Multiple or Parallel; C, Headlights Wired in Multiple.

sistance, the drop between the ends of the lamps would be $2 \times 2 = 4$ volts.

In parallel or multiple circuits the current divides up; each part of the circuit taking current according to its resistance. The drawing at B shows three lamps in a multiple circuit and three amperes are drawn. In the sketch the three amperes are divided up into three separate currents of one ampere each. The current divides as shown because the resistance of each branch will not permit any more to pass through.

The drawing at C shows multiple wiring of the headlights and 18 volt bulbs should be used with engines equipped with the new magneto. A disadvantage of wiring in multiple is that care must be exercised in running the engine to avoid burning out the bulbs.

2354 Gasoline in Crankcase.

From C. A. Van Wert, New York.—Upon draining the crankcase of three of our cars recently, I found from a gallon to five quarts of gasoline in each crankcase. While this is not new to me I cannot understand why it should be present in such large quantities. All of the engines have good compression in each cylinder, but they have been run several thousand miles. I understand that the crankcases of the cars were drained in August, but have been run several thousand miles since. Two of these cars are six-cylinder Premiers and the other is a six-cylinder Lexington. Could this have been caused by running with one or more cylinders missing?

Reply.—Fuel escaping past the rings and into the crankcase would mix with the oil, thinning the latter. Are you sure the fluid is not water?

2355 Grounding the Battery.

From F. Jeffrey, Nebraska.—What is the best practice in packing the cylinder heads of gas engines aside from the regular copper asbestos gasket? Is there anything better than asbestos paper and white lead? Is there any rule for connecting storage batteries as to which pole to ground with single wire systems, also double?

Reply.—There are several good heat and waterproof packings marketed and which can be procured at any automobile supply house. In the single wire or grounded system the positive + is connected to the parts receiving the current. The other side or terminal of each part is connected by wire to the metal frame. The negative — is connected to the frame or ground. In the two-wire system neither wire is grounded. Both are insulated from the frame.

2356 Setting Ford Timer.

From Wm. Ryan, Illinois.—Would like to know how to set the timer or time a model T 1916 Ford.

Reply.—To replace or reset the timer make sure that the exhaust valve of the No. 1 cylinder (that nearest the radiator) is closed. The brush is replaced on the camshaft so that it points upward. This may be ascertained by noting the operation of the No. 1 valve.

2357 Has Trouble With Brush.

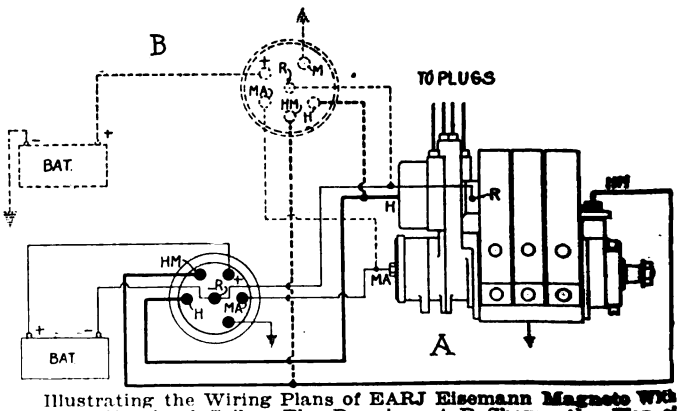
From Thomas Seary, Texas.—We have a model E Brush and the gearset or transmission is giving trouble. When we start in the low the wheels seem to lock. When trying to go in high there is a terrible racket and the car will not move. We cannot get the car to reverse. There is no one in this country that knows anything about this car. It is said to have the same gear-set as the Ford except a hand lever is used.

Reply.—The gearset or transmission used on this car is a form of planetary and the lever referred to is used to lock the high or direct drive. Your trouble is evidently due to the gearset being so badly worn that it will not function. Disassemble it and locate the trouble. It will only go together one way and that is the right way. If parts are badly worn you can obtain new ones from the Standard Motor Parts Co., Newcastle, Ind., or the Puritan Machine Co., Detroit.

2358 Wiring EARJ Eisemann Magneto.

From John Smith, Vermont.—Please send me a diagram or wiring plan for the model EARJ Eisemann magneto. It has a coil.

Reply.—The EARJ Eisemann magneto (dual) use both vibrating and non-vibrating coils. The D2U and DCR are non-vibrating and the DT is vibrating.



Illustrating the Wiring Plans of EARJ Eisemann Magneto With Different Types of Coils. The Drawing at B Shows the Plan of the D2U and DRC Coils.

The first named have mechanical vibrators actuated by means of ratchets to facilitate starting on compression. The DT has an electrical vibrator which is set in motion when the switch lever is thrown to the "Battery" position, providing the battery

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breaker contact points are closed. These types of coils embody the necessary switches for both the magneto and the coil.

The wiring plan of the DT coil is shown at A and with the high-tension wires indicated by heavy lines. The light lines show the primary wires. The sketch at B shows the wiring of the D2U and DCR coils. The DCR connections are exactly the same, but the terminals on the bottom of the coil, according to symbols, occupy different positions on the plate. Wire according to the symbols. The wiring plan at B is shown by dotted lines and as may be noted the connections from the coil terminals to those on the magneto are shown by splices. Both wiring plans are given as the type of coil was not mentioned.

2359 **Kerosene as a Fuel.**

From Lloyd Reeve, New Jersey.—Inasmuch as kerosene as a fuel for motor car engines is becoming, in all probability, a necessity, I should like to have your candid opinion concerning same.

One man, a draftsman who had been connected with the manufacture of gas and gasoline engines for a number of years, says a gasoline engine will not successfully operate on kerosene even after a special carburetor and intake manifold are provided. He says that all the kerosene will not burn, thus leaving a deposit on piston head, cylinder head and walls, etc., that it will have a worse effect on the engine than carbon. He also adds that the kerosene will leak past the piston rings, enter the lubricating system, thin the oil, and so ruin the engine.

My opinion on the matter is this: Gasoline to be had now-a-days is of a very poor grade. As every one knows, carburetion of same is far from perfect. Also, gasoline is of a lesser density than kerosene, so I think that it would more readily pass the piston rings than kerosene. Unless there may be some chemical reaction between kerosene "gas" and the iron of the engine, I can see no reason why it should not be used.

Now I have one more question to ask. Assuming that kerosene is a satisfactory fuel, what is the approximate mileage that can be secured from same with good carburetion?

The above is more of a manuscript than a question or so, but I hope you will print enough of same to make the idea clear. Believe me, your opinion on the matter will be very much appreciated.

Reply.—The successful use of kerosene as a fuel in the internal combustion engine depends upon a number of factors, the discussion of which would require considerable space. If the carburetor, vaporizer or other device will break up and convert the fuel in question into the right kind of a vapor, and if this vapor is properly mixed with air, and there is no tendency for it to revert back into a liquid, etc., kerosene can be used. As you say, the time is coming when kerosene or a fuel similar to it will be used in the variable load, variable speed engine, the automobile engine. As to the mileage, it is claimed that more heat units are obtained with kerosene than with gasoline, and the automobile engine is a heat engine.

2360 **Gear Ratios, Speed, Etc.**

From George R. Blain, Illinois.—What is the bore and stroke of the little Buick 4, the Dodge and the Ford, all 1918 make? What is the gear ratio of each; that is, the gear ratio at their different gearset speeds? What horsepower will they develop at a car speed of about 20 miles an hour? Explain and give an example of how the horsepower is figured using the Dodge engine, for example. Also explain how the length of the stroke affects the power. Does the position of the valves in the Buick give the engine more power than if they were placed as in the Dodge?

Reply.—The bore and stroke of the Buick is $3\frac{7}{8}$x$4\frac{3}{4}$. That of the Dodge is $3\frac{7}{8}$x$4\frac{1}{2}$. The Ford is $3\frac{3}{4}$x4. The gear ratio of the Dodge on the low and reverse gears is 19.434 to 1; intermediate or second, 7.978 to 1; direct drive or high, 4.166 to 1. The horsepower developed at 20 miles an hour car speed is $10\frac{1}{2}$ on the direct drive or high.

The gear ratio of the Ford on the low speed is 10 to 1. On the high or direct it is 3 7/11 to 1. The reverse is 14.5 to 1. At 1,000 r. p. m. the car speed is 24.59 miles per hour on the direct drive, 11.178 on the low and 7.794 on the reverse. The horsepower developed at 20 miles per hour is not given. We have no data on the Buick engine.

To figure the horsepower of an engine and according to the S. A. E. formula which takes into consideration the bore only, square the bore, multiply by the number of cylinders and divide by 2.5. For example, the bore and stroke of the Dodge car is $3\frac{7}{8}$x$4\frac{1}{2}$. Using the decimal equivalent for $\frac{7}{8}$, we have .875. Multiplying 3.875x3.875 (squaring the bore) obtains 15.015625. This multiplied by the number of cylinders 4 obtains 60.0625. Dividing the result by 2.5 gives 24.22 the horsepower.

The advocates of the valve in the head type of engine claim greater power than the conventional design. If you mean difference between the long and short stroke motor, would explain that the short stroke engine is a high speed design while the long stroke is generally confined to slow speed engines. Short stroke engines also have a longer period of valve opening.

2361 **Kerosene Anti-Freeze Solution.**

From P. H. Harner, Virginia.—I noted in a past issue where some one was using kerosene in the radiator instead of water to prevent freezing. I want your opinion as to my plan of taking several gallons of cheap machine oil and thinning it with kerosene. I have never tried this. What do you think of it? Seems to me I have read where some one used just the machine oil.

Reply.—We do not approve of the use of oil or even a mixture of oil and kerosene in the cooling system of a car. The reasons have been given in practically every issue for the past three months.

2362 **Engine Starts Hard.**

From E. Coplin, Ohio.—I have trouble in starting my 1916 Saxon Six in cold weather. It is almost impossible to start without filling the radiator with hot water. The engine has priming cups, but after priming it will run a few seconds then stop. When engine is warm it runs fine and pulls well. The carburetor is a Rayfield.

Reply.—Either the mixture is too thin, too little fuel in proportion to the air, or the fuel does not flow freely through the jet. Try choking the air

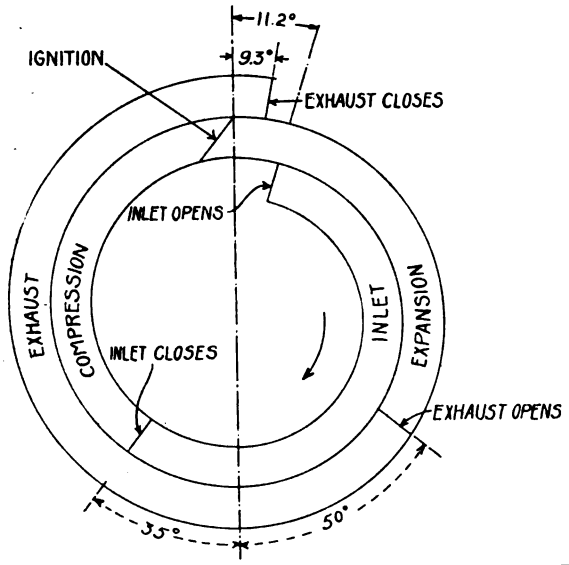
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supply and slightly flood the carburetor until the engine warms up. Your trouble is not an uncommon one in cold weather.

2363 Average Valve Timing.

From F. D. Hume, Massachusetts.—Will you tell me how to time a four-cylinder engine? This engine has no markings and the camshaft gear is smashed. It is an orphan and we have tried in vain to get the timing plan. What is the average timing?

Reply.—The accompanying diagram gives the average valve timing of four-cylinder engines. It is the average of American-made engines. Your best plan would be to try a setting and note how the engine runs. If the engine be small and run at high speed try having the inlet open from 12 to 15 degrees after top dead center and close 25 to 30 after lower dead center. Have the exhaust close from 10 to 12 degrees after top dead center. If a large engine and runs slow, try an inlet opening of 5 to



Illustrating the Valve Timing of the Average American Four-Cylinder Engine.

10 degrees after top dead center and a closing of 15 to 20 degrees after lower dead center. Have exhaust open 30 to 40 degrees before lower dead center and close 0 to 5 degrees after top dead center. For medium speed engines use timing between the two.

2364 A Number of Questions.

From L. J. Macdonald, Connecticut.—I have been reading your magazine for the past year and have secured a great deal of useful information from it, and although I subscribe to similar magazines, there are none that I like as well as yours. I would like to ask you a few questions. 1—What kind of piston rings do you advise for use in a Ford car? Is there any choice between the McQuay Norris, Inland, No-Leak-O or Munger or High-Comp? 2—Can you give me a diagram showing how to build or make some kind of an attachment to inject warm air into the manifold on a Ford car in place of the cold air opening that I am now using; that is, pet cock with a 1/8-inch opening? 3—How can I test the coils in order that they will all work alike and in buying new points what kind do you advise? 4—In a recent issue you gave instructions for making a wire cone for a Ford manifold. I cannot locate the issue. 5—Is there any way that I can test the compression of a Ford engine except by cranking? If there is an instrument on the market, please tell me where it is made and by whom. 6—What do you consider the most satisfactory lens for a Ford machine? 7—Do you know of any spark plug that will give better results on a Ford than a Champion X and what is your opinion of the new AC? 8—What is the difference, if any, between a ball and a brush timer, and has one any preference, if so, which? Also what make do you advise? 9—Do you advise changing the gear ratio on a touring type of Ford and what benefit would I derive by so doing?

Reply.—1—We never recommend any make of a ring in preference to another. 2—Use a stove over the exhaust or place the opening of the air device in close proximity to the exhaust. This will permit of the use of heated air instead of cold. 3—The proper method of testing coils to see if they draw a similar amount of current is to insert a low reading ammeter in the primary coil circuit. One terminal of the ammeter is connected directly to the coil terminal and the other ammeter terminal is connected to the battery, the usual connection being removed for the time being. Another method is adjusting by ear, noting the sound of the cylinder in question as well as the action of the vibrator. Buy the same points or same make as used in the coil. 4—The instructions were published on page 59 of the October issue. 5—Compression is tested by inserting or threading a gauge in the spark plug opening in the cylinder. These gauges can be secured at any supply house. 6, 7—We cannot answer these questions for the reason given in the reply to the first question. 8—With the ball time of timer the contacting member strikes or contacts with a steel ball and the impact is broken or cushioned by a spring in back of the ball. The brush operates on the principle of a brush wiping or touching a part to complete the circuit. 9—Changing the gear ratio is not advisable unless one desires to indulge in racing.

2365 Silent Chain Is Noisy.

From Arthur Pugh, Canada.—I have an English Knight engine. The sleeves are operated by chain and the chain has stretched and is noisy. Owing to war conditions it would be difficult to procure another chain. Is there any way of silencing the chain? It is not slack enough to permit of removing a link. I thought of taking the front cover off the engine, drilling and tapping the case to take a 1/2-inch bolt or one as big as practical, caseharden it and mount on it and rotate a phosphor bronze bushing with an interlining of fibre. I propose to place it between the large and small sprocket and against the chain to act as an idler. I believe it would eliminate the noise. What is your opinion? Am fitting new rings. The bore is 4 7/8 inches. How many thousandths should I leave between the ends of the rings?

Reply.—The installation of an idler would tend to control the slack but will not cure the noise. The better way would be to buy an American-made type of silent chain, also sprockets for same. Any manufacturer of the silent type of chain will supply you

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with data sheets upon application. Allow between .008 and .015-inch between ends of rings for expansion caused by heat.

2366 **Wants Horsepower Rating.**

From J. Harry Kelly, South Dakota.—1—What is the horsepower of a four-cylinder engine having a bore of 3¼ inches and a stroke of 5 inches, and how is it figured? 2—What is meant by the term two-cycle and how do you determine the number of cycles of an engine? 3—What is the number of cycles used in the Delco farm lighting equipment?

Reply.—The horsepower, S. A. E. rating, is 16.92. It takes into consideration the bore only. The formula and an example are given in the answer to George R. Blain. The two-cycle engine derives its name from the fact that the mixture enters the cylinder and the burned gases pass out through openings or port holes in the cylinder walls as the holes are uncovered by the piston. During two movements or strokes of the piston the four operations of intake, compression, firing and exhaust occur. The original term of the engine described was two-stroke, which is more nearly correct than two-cycle. The cycle, as referred to, is determined by the number of strokes and occurring during a revolution of the crankshaft. With the four-cycle engine the crankshaft makes two complete revolutions during the four strokes. We have no data on the farm engine mentioned.

2367 **Fitting Aluminum Pistons.**

From Fletcher & Metterl, Ohio.—How close should aluminum pistons be fitted in a Ford?

Reply.—This question has been answered several times of late in this department. The clearance varies according to the design and type of piston and engine speed. For average speeds .007 to .008-inch at skirt, and .014 to .016-inch at top. For racing, .014 to .015-inch at skirt and .024 to .027 at top.

2368 **as Short in Secondary Circuit.**

From M. O. Nelson, South Dakota.—I am having trouble with my Ford. The ignition is at fault. There appears to be a short circuit which will at times stop the engine. After cranking a while the engine will restart. The points of the coils seem to spark and more than one at the same time. I have tested out the primary wires from timer to the coils, also looked the timer over, but cannot locate the fault.

Reply.—The intermittent missing or short circuiting is doubtless caused by a short or ground in the secondary circuit. If the trouble occurs when driving over rough roads look for movement of the coil units in the coil box as the units may come in contact with the metal of the cover. Dampness in the box will cause misfiring. Go over all secondary wires for possible grounds and examine insulation carefully. Clean and true contact points of vibrators.

2369 **Wants Electric Lighting.**

From V. D. Barbot, Georgia.—I desire to equip my 1911 Hudson with electric lights, although the car is seven years old, it is in good shape and affords splendid service. I have to use a Prest-O-Lite tank, but do not like it. While I know it is not your policy to recommend one product over another, and I am not asking you to break your rule, is there a practical generator that can be used on old cars or is there a concern rebuilding and selling second hand generators?

Reply.—There are several concerns, manufacturers, who supply lighting and starting equipment for used cars, particularly lighting dynamos. Some of these concerns have in stock the brackets required for mounting the dynamo, as its practical use involves only a proper drive and mounting. Would suggest that you purchase new equipment, also make inquiry at the service station of the manufacturer whose equipment you may be interested in.

2370 **Battery Is at Fault.**

From S. Nelson, Montana.—The starter connection of the battery is loose; that is, the post itself. When I attempt to start the engine with the starter the post or terminal will smoke and the engine will not start. I find nothing wrong or missing. There is a leak at the connection and the acid has destroyed a corner of the battery where the wires rest, and the covering of the wire is eaten off, but the inside is all right. Is the trouble in the battery or the starter?

Reply.—The battery is at fault. The smoking or burning action is due to a resistance in the circuit and the trouble as well as the leak should be remedied. Send the battery to the nearest service station or to some expert for repairs.

2371 **A Question of Condition.**

From Daisy, Washington.—I have the parts of a 1917 Dodge car which was in a fire. I have taken it all apart and the engine seems good as new. I have put in new bearings as the old ones had started to melt, also installed new valve springs. The aluminum transmission case is partly melted. The axles, differential and gears look good and sound like bells. There was about three pints of oil in the crankcase after the engine cooled. Of course all of the electrical parts were ruined. The carburetor and Timken bearings seem to be good. Is it advisable to use these parts, especially the engine?

Reply.—This is a difficult question to answer without an opportunity of inspecting the parts. If the bearings in the engine melted as did the gearset housing, it is evident that the parts were subjected to considerable heat.

2372 **Another Horsepower Question.**

From J. R. Benson, Illinois.—I would like to know the horsepower of a four-cylinder, four-cycle engine having a bore and stroke of four inches.

Reply.—The horsepower, S. A. E. rating, is 25.60. The formula for ascertaining the horsepower of engines is given in the answer to George R. Blain.

2373 **A Vulcanizing Question.**

From J. L. Vaughan, New York.—I have a vulcanizer that works by a steam pressure and a clock just like a steam boiler. I get repair gums with instructions to vulcanize at so many degrees of heat, Fahrenheit, and I am at loss to know just how many pounds of steam I should carry. If you could give me a table it would be a great help, as I am par-

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ticular and like to cure just right, according to the instructions of the gum makers.

Reply.—The following table gives the degrees in temperature and pressure of steam, pounds:

Temperature	Pressure	Temperature	Pressure
227.2	5	280.6	35
239.4	10	286.7	40
249.8	15	292.4	45
258.8	20	297.7	50
266.8	25	302.6	55
274.0	30	307.2	60

2374 **Carburetor Information.**

From George Geiken, Nebraska.—Please insert a drawing of new Stromberg carburetor for the Ford car and show the different parts. Also explain how it operates, how it makes the mixture and fully explain the different adjustments.

Reply.—To give the information you desire would require at least two pages, and as the space is limited, we would suggest that you write the makers of the carburetor. They will supply you with a booklet giving the information desired.

2375 **Fuses Burn Out.**

From Frank Hageman, Washington.—What is the matter with the lighting system of my 1914 Detroiter? It is equipped with a Remy system. When I pull the button to light the headlights the fuse burns out every time, especially when the engine is running. The bulb has burnt out when the engine was idle. I have hunted the wiring over for a short circuit, but cannot find any. The tailight fuse does not burn out. The current passing through the fuse is very strong, as I have watched the flash in the glass when I pull out the button.

Reply.—You have a short circuit or are using the wrong type of bulb in the lamps. Are you sure that you have replaced the original fuse with one of similar capacity? See that fuse is of the proper amperage and is that supplied by Remy Company. They are special fuses. If you cannot locate short, take matter up with service station expert. The Remy Electric Co. have a service station at 606 East Pike Street, Seattle, Wash.

Ether for Priming.

From George C. Murphy, Maryland.—Noting that Roy Kenney, of Kentucky, asks about the use of ether for starting, will give my experience. I had to remain out all day and night with a White truck in a snow storm. The next day the engine was so stiff that I could not spin it with the compression released. I got some ether and used it in the raw state. Every time I budged the crank the engine would knock and start for a second. After a while I got the engine running and warmed up.

I noticed a miss and found the trouble to be a bursted spark plug. I fixed that and used the truck during the balance of the day, but noticed on a hard pull the engine would miss a little. In looking for the trouble that night I found an exhaust valve warped. I faced the valve off, reground it and had no more trouble for a few days. The next time the car was out in the cold I used a teaspoonful of ether to a half pint of gasoline.

After warming up the engine, I noticed a general missing and found that all of the nuts holding the porcelain in the plugs were loose. Took out the porcelains, but they were not cracked, so put them back and the engine ran fine.

Now I have had one and year-half years' experience as a repairman and with a fleet of trucks and never before have I noticed that ether had any bad effect on engines, so I went to work trying to get some way to make starting easy. I took the manifold, which is very thin and made of bronze, and bored a hole at the curved section where it goes to the cylinders. I soldered a priming cock in the opening. The next time the engine was cold and stiff I got a fellow to crank with the compression released while I let ether mixed with gasoline drip in through the petcock opening.

The engine started at once. Of course, you must give the engine compression again or she will stop. By this method all of the ether is ignited before it causes any damage and passes out in the exhaust. Of course, you must be careful not to get a back kick. I have taken the engine down and find no bad effects. I believe this is the only way to use ether.

Cure for Noisy Tappets.

From Harold Cleveland, Kansas.—I have been a reader of your journal for about a year, and having profited by many articles, would like to say, for the benefit of No. 2298, experiencing noisy tappets, that if he will take his pushrods and have them rounded off by a competent blacksmith on a slow emery wheel, it will cure the trouble. I had the same trouble for about a year and overcame it by this method.

A Pointer for Mr. Snedaker.

From L. P. Conklin, New Jersey.—Perhaps I can help Mr. Snedaker, No. 2307. I have owned a car, or cars, the last 14 years. Have done all my own repairing and have never yet had to get anyone to assist me, when in trouble, outside of the trouble department in The Automobile and Repairer. A few weeks ago I thought I was surely stuck. I had a new Ford with one of the smoothest running motors I ever rode behind. After about 1,000 miles it began to act just like Mr. Snedaker's Maxwell. I took out all the spark plugs and found them clean and points all right. Then I went over the wires, coil, magneto terminal, etc., found everything apparently all right, then sat down and said to myself, "you are stuck, for the first time in your life." The next day I started in again and while monkeying with the spark plugs I discovered that the porcelain was a little loose in the shell of one of them and leaked air. I put a new plug in its place. That settled my trouble. Look for a leaky spark plug. Have taken The Automobile Dealer and Repairer since its first issue, that is why I have been able to do all my own automobile repairing without calling in a garage man to help me.

A New Excuse.

Here's a brand a new excuse for being intoxicated. one of the many which just now is interesting "dry" Washington:

Thomas Brooks, a chauffeur, arrested on a charge of driving an automobile while under the influence of liquor, told the Court that he had become intoxicated from the fumes of alcohol placed in the radiator to keep the water from freezing.

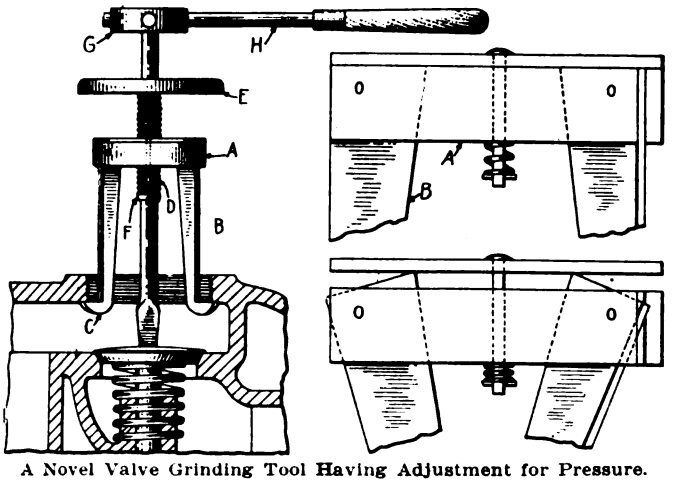
"I thought I'd heard all the excuses," said the Judge, "but this one will cost you $25."

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NEW VALVE GRINDING TOOL.

Has Adjustment Whereby Pressure on the Valve May Be Varied.

A novel and interesting type of valve grinding tool has been invented by an English motorist and is described in the Autocar, an English motoring print.



A Novel Valve Grinding Tool Having Adjustment for Pressure.

The accompanying sketch is almost self-explanatory insofar as the operation of the tool is concerned.

The invention consists of a metal disc A, around the circumference of which are pivoted three legs B, with the toes C turned outwards at right angles. Through the center of the disc passes a threaded sleeve or bolt D, carrying at its upper extremity a turn-button or wheel E, by means of which the bolt can be screwed either upward or downward through the disc carrying the three legs.

Passing upward through the center of the threaded sleeve is the shaft of a screwdriver, which carries on it, about halfway down, a shoulder F against which the lower end of the threaded sleeve bears. The upper extremity of the screwdriver shaft is provided with a solid metal cap G, through which are drilled at right angles to one another two holes to take a tommy-bar H.

Raises Valve From Seat.

When valve grinding has to be undertaken, the valve spring with its cotter and retaining washer are removed, the valve itself is withdrawn, and then replaced with a light helical spring interposed between the underside of the valve head and the cylinder casting close to the top of the valve stem guide. This helical spring is shown in place in the sketch, and its object is, when the downward pressure on the screwdriver is released, slightly to raise the valve from the seating, so as to give a better chance to the grinding compound to remain upon or return to the faces to be treated.

Regulates Pressure.

After the threaded sleeve carrying the grinding screwdriver has been adjusted to approximately the desired position, the operator grasps the three legs of the tool, and compreses them inward, so that the toes can be pushed down through the valve cap orifice. When the inward pressure on the legs is released, the legs themselves tend to spread again, so that they come into contact with the walls of the orifice, the toes catching on the level surface of the underside of the casting, as shown in the main sketch. The threaded sleeve is then screwed down until the end of the screwdriver blade is pressed firmly into the slot in the valve head and the latter is in grinding contact with the valve seating; finally, the tommy handle is inserted, so that the necessary reciprocating grinding action can easily be produced. The desired pressure and the occasional release are obtained by operating the threaded sleeve.

How Expansion Is Obtained.

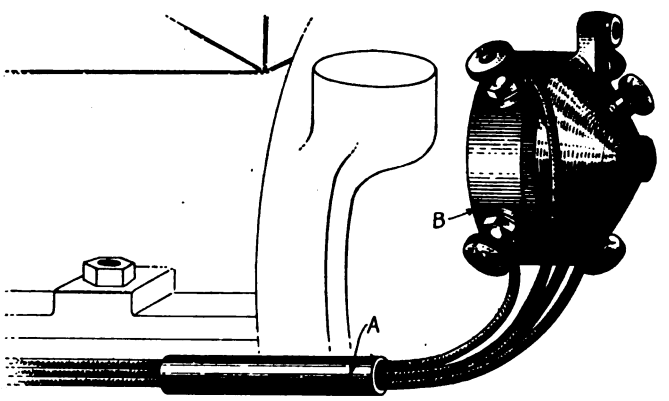
The smaller sketches to the right of the main illustration show the simple method whereby the pivoted legs carried by the central disc are kept normally expanded. As will be seen, there are, equally spaced round the disc near its outer circumference, three small vertical pins, terminating at their lower ends in spring washers and cotters. These pins pass not only through the disc, but through a thin circular cover plate, of which the lower surface is in contact with the inner point of the top of each pivoted leg. Inward compression of the legs results in their inner toe points pushing up against the underside of the cover plate, the last-named being raised within the limits permitted by the spring washers at the bottom of the pins.

When the inward pressure on the legs is removed, the spring washers expand again, pulling down the cover plate of the disc, and so forcing outward the lower extremities of the pivoted legs. The sole object of the spring top of the disc carrying the legs is to ensure the toes catching firmly beneath the casting into which the valve cap screws.

Protecting Primary Wires.

Although the primary wires, those leading from the commutator or timer on the Ford car are colored to facilitate replacing correctly, they quickly become soiled. Under these conditions the colors cannot be used as a guide when replacing a wire unless the wire is traced from the coil or a section not discolored.

An exchange suggests a method the principle of which is enclosing the wires in a fibre tube to avoid the possibility of oil and dirt discoloring the insulation.: The scheme consists of using a tube about 3 inches long and ⅜-inch diameter inside. The leads are run through the tube, as shown in the accompanying sketch at A. Whenever one desires to replace a wire removed from the timer terminal the tube is slipped back or forward disclosing a clean section of the wire and its color. The tube should be a snug fit else it will slide.



Illustrating Use of Fibre Tube to Keep Primary Wires Clean and Making Easy Identification of Colors.

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Automobile Dealer and Repairer

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M. T. RICHARDSON, Editor
C. P. SHATTUCK, Managing Editor

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, FEBRUARY, 1918.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THE IMPORTANCE OF CAR INSURANCE.

There are not many car owners, probably, who have ever appreciated fully the necessity of covering the many risks in connection with a motor car with proper insurance. Not many, perhaps, know how many kinds of insurance there are.

First, there is the liability insurance, which covers all cases of individual injury. Then come collision insurance, which covers any damage which may result to the car from collisions. Third, there is property damage insurance, which means any damage which your car may cause to the property of others. Fourth and last, there is fire and theft insurance.

The two most important policies to take out are the liability and fire and theft. But if the car owner wishes to be fully protected, all four classes of insurance should be taken.

We advise our readers who are not insured in any one of the classes mentioned to consult a competent insurance broker and arrange for such insurance as they may feel disposed to contract for. And before accepting any policy read every clause in it. Ascertain what it promises and what you promise before you accept it. As you have to pay a high rate, it is important to see that it actually insures you and your car.

A PERMANENT FUEL ADMINISTRATOR.

The frightful condition the entire country, almost, is in today, owing to a lack of coal, suggests the importance of a law providing for a permanent Fuel Administrator. The distribution of coal in the past has been made in what might be called an accidental way. Sections which clamored the loudest got the most coal.

Heretofore, this haphazard method of distributing coal has not resulted in anything serious; but this year, owing to the congestion on the railroads, in consequence of war conditions, intense cold, etc., there is a shortage of coal everywhere, and great suffering as a result, especially in the cities. In country places, wood is generally available when the coal runs out; but in cities it is different. In New York and vicinity wood suitable for burning either in stoves or in fireplaces costs $22.50 a cord or more and is, of course, beyond the means of the ordinary family.

It would be the duty of a Fuel Administrator to plot the whole country, so to speak, ascertaining the wants of each locality, and seeing to it that these wants were provided for. He should get reports, of course, from the railways, as to the shipment of coal every week or every month, and it could be very easily determined where there is a short supply, and where less coal is needed.

Early in the fall it should be the business of the Fuel Administrator to find out which localities, if any, were short of coal, and to see that they got it. If for any reason a short supply of coal was being mined, it would be the duty of the Fuel Administrator to take measures for speeding up the output. Such an office as this, if conducted efficiently, would be worth much more than its cost to the entire country.

SAVINGS BANK DEPOSITS.

Why is it that the people of Massachusetts make use of savings banks to a greater extent than the people of any other State in the Union?

The savings bank depositors in Massachusetts number one-sixth of the entire savings bank depositors of the whole country.

In point of money these depositors total one-fifth of the entire savings bank deposits of the country.

This is almost a marvelous exhibit of thrift. Just why the working people of Massachusetts save their money and put it in savings banks in a larger proportion than the workingmen of any other portion of the country is one of the mysteries that have never been explained.

It would seem as though an advertising campaign on the part of savings banks in various parts of the country, pointing out the advantages of depositing regularly even a small amount per week or month, would result in increasing savings bank deposits very materially.

AN URGENT REMINDER.

Our learned legislators in Washington (some of them) insist that advertising in periodicals has no educational value and should be taxed out of existence.

All advertisements contain business information of more or less value from an educational point of view and are of far greater importance in promoting the trade of the country than the reading matter of the various publications.

We must once more remind our readers of the importance of writing immediately to their Representatives in Congress and to the two Senators of their States protesting against the unfair and ob-

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noxious second-class postage law which passed the last session of Congress and will go into effect, if not repealed, the first of July. This will increase postage from 300 to 800 per cent.

It is in every sense a tax on intelligence. It practically imposes a penalty upon every man or woman who subscribes for a periodical of any kind, whether weekly or monthly. It should be resisted not only by subscribers to every kind of a journal, but also by all publishers. It is one of the most outrageous measures ever placed upon the statute books.

If you haven't already done so, please write to your Representative at once as suggested. If you don't know his name you can no doubt get it from your Postmaster. Then write to him at the House of Representatives, Washington, D. C., and ask him to use his influence to have the bill repealed. Also write to the two Senators from your State, addressing them Senate Chamber, Washington, D. C., in the same manner.

FAMILIARITY BREEDS CONTEMPT.

Familiarity with motor vehicles has made people more or less careless. They take chances in crossing streets. They let their wits go wool-gathering when they should be thinking of their safety. To navigate successfully the streets of New York, or any other big city, requires alertness. One must have his eyes and ears open all the time—especially his eyes. Some motor car drivers are careless and reckless. They often assume, when they see somebody in their path ahead, that that person is going to get out of the way as soon as he hears the signal sounded. And on this assumption they rush their cars right along without reducing speed, and are frequently successful in avoiding any trouble.

It is up to the car driver as well as the pedestrian to be careful. People have a right to cross the streets. When a driver sees a pedestrian ahead of him crossing the street he should slow down, if necessary, to allow the person to cross in safety.

WASTED WATER POWER.

For several years a few fanatics have been agitating, in the public press, and before Congress, the question of "conserving," as they call it, the water power of the nation. Their form of conservation, however, is to let the water run to waste, for fear that somebody might profit by building dams and erecting factories for the manufacture of goods, or supplying electricity for manufacturing purposes.

These water cranks have insisted upon such restrictions on the part of the Government as no capitalist would be willing to submit to. Meantime, the country is burning up coal, millions of tons of which could be saved if Congress would permit the utilization of various water powers under its control.

No man or corporation can build a dam and utilize the water power without conferring a great benefit on the surrounding country, at the same time that he or the corporation may be realizing a profit. Permit capital to use the water power on reasonable terms, and the country at large will be greatly benefited.

THE TRUTH IN ADVERTISING.

On another page we print an important legal opinion with respect to advertisements calculated to mislead the public by reason of statements which the goods do not bear out. A positive statement with respect to goods of any kind is held to be in the nature of a guarantee as to the quality of these goods. But read the article.

Advocate Building Good Roads.

At a recent meeting of the American Association of State Highway Officials at Richmond, Va., resolutions were adopted advocating the proper construction and maintenance of the highways of the country. The resolutions, which were presented to the Government through the director general of railroads, are as follows:

WHEREAS, the proper construction and maintenance of the highways of the country is necessary to the successful conduct of the war; and,

WHEREAS, the plans of all highway authorities in the country, all users of highways, and all citizens interested in any way in highway construction and maintenance, are at the present time upset and tied up; and,

WHEREAS, there is need for a definite policy so that plans can be formulated for the coming year; and,

WHEREAS, a properly outlined policy directing the construction and maintenance of such roads and streets as are of general economic and military value will conserve the resources of the country and will greatly facilitate the transportation of freight over highways and streets,

THEREFORE BE IT RESOLVED that the American Association of State Highway Officials request the United States Government to formulate and promulgate, as soon as possible, a definite policy for road and street construction and maintenance, and

That it is requested that said policy contain a statement that freight cars shall be furnished next spring for the transportation of the necessary materials for the construction and maintenance of streets and roads of economic or military value.

Trucks Co-operate With Roads.

A demonstration of the possibility of co-operation between motor trucks and boat lines for the improvement of transportation facilities has been given in the territory adjacent to Long Island Sound, according to reports that have been received by the Office of the Chief of Engineers of the War Department, and communicated to the Department of Commerce.

At New Haven, Conn., products are being received from interior points in that state by auto trucks which deliver goods at the dock of the Starin New Haven Line. Transportation is by water from that city to New York, and the following day the goods are loaded on a through car for their destination on the Lackawanna Fast Freight Lines.

This new war-dispatch route eliminates the transfer car, and the use of car, engine, and floor space in freight house, and tends to consolidation and increased tonnage on the through car from New York to the destination. Among the places in Connecticut that are being put into direct communication with the sound transportation facilities are Derby, Shelton, Ansonia, Seymour, Waterbury, New Britain, Meriden, Hartford, Middletown and Wallingford.

Restrict Use of Fuel.

A series of restrictions concerning the use of gasoline, particularly for private automobiles, are in force in France. The decree provides that after January 1, 1918, no card entitling the holder to purchase and consume gasoline shall be delivered except under certain prescribed conditions, the object of which is to confine the consumption of gasoline to domestic consumption, to vehicles used for transportation by common carriers, to vehicles used for the public service, and to such uses as grow out of the necessities of commercial, industrial, farming and transportation enterprises.

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S. F. Beach, Chicago, New Head of N. A. A. A. J.

The new president of the National Association of Automobile Accessory Jobbers is S. F. Beach, of the Motor Car Supply Co., Chicago, Ill. He succeeded Charles E. Faeth, of Kansas City, at a recent meeting of the N. A. A. A. J. held in New York City. Mr. Beach is one of the founders of the organization and has been prominent in its activities since it began. P. H. Lyon, of Chanselor & Lyon Co., San Francisco, Cal., was elected vice president; R. R. Englehart, of the Siego Co., Davenport, Ia., was chosen chairman of the board of directors; William Sparks of the Sparks-Withington Co., Jackson, Mich., is vice-chairman.

S. F. Beach, Charles E. Faeth and William Sparks were appointed a committee on Federal Relations. Practically all of the other general committees remain as before. The directors for one year were chosen as follows:

W. W. Low, Electric Appliance Co., Chicago; G. N. Schafer, Pruden Hardware Co., New York; F. B. Caswell, Champion Spark Plug Co., Toledo; C. E. Jackson, Jackson Motor Supply Co., Pittsburgh; G. M. McWilliams, Hyslop Bros., Toronto; E. C. Graham, National Electric Supply Co., Washington.

Directors for two years: W. D. Alexander, Alexander-Feewaldo Co., Atlanta, Ga.; C. F. Wright, Ballou & Wright, Portland, Ore.; P. H. Lyon, Chanselor & Lyon Co., San Francisco; Wm. K. Norris, McQuay-Norris Mfg. Co., St. Louis; S. F. Beach, R. R. Englehart.

New directors: S. F. Proctor, Minneapolis Iron Store Co., Minneapolis; S. T. McCullom, Auto Equipment Co., Denver; Frank T. Chase, Frank Mossberg Co., Attleboro, Mass.; W. T. Walker, Walker Mfg. Co., Racine, Wis.; L. P. Halladay, L. P. Halladay Co, Streator, Ill.; F. A. Ferris, Ferris-Dunlap Auto Supply Co., Dallas.

Reports of various members representing different sections showed progress during the past year. In reporting for California, Robert Weinstock said that the California Automobile Trade Association had 2,300 members comprising 30 local associations. Each of these is divided into what is termed crafts, which include dealers, garagemen, painters, repairmen, etc. Price cutting had been largely eliminated through educational methods. Shop practices have been standardized, modern accounting methods introduced, etc., with the result that business was not only increased, but made more profitable. Various other states were reported on and along the same lines.

The association has decided not to continue the distribution of its jobbers' list. George H. Fritz, field secretary of the association, spoke on the subject of dealer betterments, which was a vital topic at the meeting. He said in part:

"When you all go back home do not permit your good intentions to be moss-ridden but strain all efforts to put into effect State dealers' associations and immediately start a personal campaign to educate and keep in line the dealers so that they may be able to do a profitable accessory business.

"For this purpose I would suggest the employment of a practical man who will call upon the dealer periodically and who will demonstrate to the dealers the best way to do efficient work. Being that this man represents the dealers' association, he is neutral and, therefore, the element of selfish motive is eliminated. In that way you will instill into the dealer the initiative, which is sorely lacking with many of them, and you will be able to keep the accessory business where it rightfully belongs.

"Sending of literature and bulletins is mighty helpful but I have my doubts that it would have the effect so necessary. Gentlemen, this is a serious problem; indeed, too serious to be overlooked for a moment. I know, because I have made a close study of this question during the past year in my travels and the time for action is now."

The next meeting of the organization wil be held at Hot Springs, Va., June 5-12.

Motor Cars Replace Engines.

To enable division superintendents to get about easily without the use of locomotives needed in regular service, the Chicago, Burlington & Quincy Railroad has converted a number of automobiles of a moderate price make into vehicles capable of traveling on the rails, says the Railway Age Gazette. These automobiles were adapted by replacing the rubber tired wheels with pressed steel flanged wheels, attached to a rigid axle, adjusted to standard gauge. The steering wheel is made inoperative, the steering posts serving to support the throttle and spark levers. Since the steel wheels are somewhat smaller than those with which the car is regularly equipped, it was necessary to apply racing gears instead of the standard gears furnished with the car. This makes possible a speed of 40 miles an hour. A frame is placed under the center of the car, on which it is raised when it is necessary to turn it around or remove it from the track. The cars are run under train orders, the driver acting as engineer and the superintendent as conductor.

To Tax Cars for Roads.

At its recent session the Ecuadorian Congress enacted a law providing for a public highway leading from the city of Guayaquil toward the interior, which will be the first ever constructed in the lowlands of the republic. The road will extend from Guayaquil northward for about 20 miles to the town of Pascuales on the Daule river.

The funds provided include a monthly tax of 2 sucres ($0.97 at normal exchange) on each public taxicab and 4 sucres ($1.95) on each private automobile; 3 per cent. ad valorem on each automobile imported into and to be used in Guayaquil; 2 per cent. ad valorem for each carriage imported for Guayaquil; 50 sucres ($24.34) assessment on each lineal kilometer (0.62) mile of property through which the road passes; and such sums of money as the municipality of Guayaquil may appropriate from its own funds.

After the construction of the road shall have been completed, for its upkeep an annual tax of 5 sucres ($2.43) for each kilometer of road will be imposed on the adjoining property; a monthly tax of 1 sucre and 2 sucres ($0.48 and $0.97) on the taxicabs and private automobiles, respectively, used in Guayaquil; and the import duties on automobiles and carriages mentioned above, which are to be collected by the municipality of Guayaquil, which is also authorized to make the necessary expropriations of land, to be paid for by the funds collected.

The municipality of Guayaquil is placed in charge of the construction of the highway, which may be done administratively or by contract. Doubtless this is the beginning of a plan to construct public highways in the Ecuadorian lowlands, where they are greatly needed, the credit for which is due to the advent of the automobile.

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SAFETY CRANKER.

A Mechanical Device for Preventing Back Kicks of Crank.

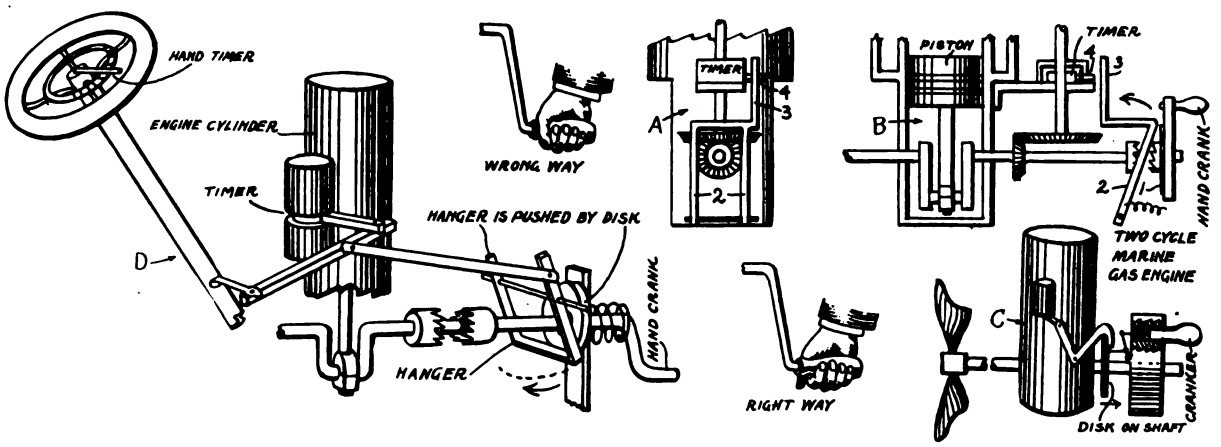
BY A. A. WEST, M. E.

A back kick or reverse movement of the starting crank of a gasoline engine is possible when the spark occurs and the mixture ignites before the piston attains top dead center or completes the compression stroke. When the mixture is thus ignited the piston is driven downward by the expansion of the gases, reversing the direction of rotation of the crankshaft. Consequently the starting crank will rotate to the left or anti-clockwise, when normally it runs or rotates the crankshaft of the engine clockwise or in a right hand direction.

If the driver cranks the engine with the thumb on the handle and opposite to the fingers, as shown, a backfire is very likely to result in injury. One is less likely to receive an injury if the engine be cranked with the thumb on the same side of the handle as the fingers, as generally the handle is jerked out of the hand, although it is possible for the flying handle to revolve and strike the hand or wrist.

Back kicks are generally due to the driver forgetting to fully retard the spark lever before starting the engine. The device shown in the accompanying will, if properly attached, prevent a back kick. It consists of a disc attached to the starting handle, a pivotally mounted hanger and suitable linkage. The operation of the device is as follows:

When the starting handle is pushed in the disc imparts a reverse movement to the hanger which, in turn, actuates the linkage between the hanger and the timer or commutator. This results in turning the timer to a fully retarded position. Three views are shown of the device which can be constructed by any repairman or mechanic and at little expense. The application of the device to a two-cycle engine is also shown in the drawing.



Illustrating Construction and Operation of Device for Automatically Retarding the Spark and Preventing a Back Kick of Starting Crank.

INCREASES 29 PER CENT.

utput of Crude Oil in 1917 Shows a Gain Over 1916.

The official figures given out by the Bureau of ines shows that the supply of crude oil for the calidar year of 1917 increased 29 per cent. over that 1916. This represents a daily increase of crude oil 196,905 barrels. In 1916 the daily average was 4,849 barrels. In the first six months of 1917 it was 796,106 barrels and the last three months it was 871,774 barrels.

These figures are reassuring despite the fact that there is a scarcity of new wells, labor for sinking same and material for piping, etc. There has been an increase in the storage supply of gasoline. Between June 30 and September 30, a three months' period, the stored supply of gasoline was drawn on to the extent of 77,217,782 gallons. The outputs of the different refineries for the first six months of 1917 show a daily average of gasoline of 6,763,457 gallons. The total output of gasoline during the period was 1,224,182,157 gallons.

Magistrate Warns Pedestrians.

A New York magistrate is issuing a series of Safety First bulletins. The thirteenth deals with pedestrians of the "You-dare-not-run-over-me" type. The bulletin is as follows:

"A pedestrian should always remember that an automobile or other vehicle has as much right on a street or highway as he has.

"Do not put all the burden of care and prudence upon the operator or driver. You are required to use the same care and caution.

"In crossing a street or highway never assume the 'You-dare-not-run-over-me' attitude. If you do you may create a situation beyond the control of the operator or driver.

"Remember an operator or driver has rights which you must respect."

NEW BOOKS RECEIVED.

Acknowledgment is made of the following books and house publications:

Bearing Engineering for Tractor Designers. By C. M. Eason, manager tractor bearings sales division Hyatt Roller Bearing Co., Detroit, Mich. Contains diagrams, data sheets, etc., for engineers and designers.

Bakelite Micarta-D Gears and Pinions. Westinghouse Electric & Mfg. Co., East Pittsburg, Pa. Technical information regarding gears and pinions and including tables of pitch, teeth, etc. Will be sent to engineers and designers.

Eye Hazards in Industrial Occupations. National Committee for the Prevention of Blindness, New York City. Contains statistics of interest to manufacturer as well as the layman and deals with protective devices, etc., and their installation. Price 50 cents.

Du Pont Magazine. House Organ published by E. I. Du Pont De Nemours & Co., Wilmington, Del. Price 50 cents the year.

Safe Practices. Publication issued by National Safety Council, Chicago, Ill. Deals with accidents, hazards and best practices for their elimination. Ten cents the copy.

Westinghouse Automotive Equipment. A special publication describing generators and ignition units for automobiles, trucks, tractors, motor boats, etc. Published by Westinghouse Electric & Mfg. Co., East Pittsburg, Pa. Copies will be supplied at any of the Westinghouse offices.

Empire Tire Dealer. House organ published by the Empire Rubber & Tire Co., Trenton, N. J., in the interests of Empire tire dealers and salesmen.

Standard Parts Messenger. House organ published by the Standard Parts Co., Cleveland, O.

Endurance News. House publication published by the Endurance Tire & Rubber Co., New Brunswick, N. J.

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OFFERS USE OF TRUCKS.

M. C. Schweinert Suggests Practical Plan for Relieving Coal Famine.

M. Charles Schweinert, treasurer and manager of A. Schrader's Son, Inc., Brooklyn, N. Y., makes a practical suggestion for relieving the coal situation in New York City. He suggests that the owners and operators of motor trucks place their cars in a special service of transporting coal from the New Jersey side of the Hudson River to Manhattan. To operate the machines, and handle the coal, Mr. Schweinert suggests that labor released because of the shutdown of industry be utilized in the work. He wired the proposal to President Wilson, Fuel Administrator Garfield and New York State Fuel Administrator Wiggin on the same day the five-day order was made public. The telegram was as follows:

Doctor Harry A. Garfield,
Fuel Administrator,
Washington, D. C.

January 17, 1918.

This is not criticism but simply a suggestion which I hope may help in the present emergency. Instead of making the workers of the country idle for a certain number of days would it not be better to mobilize them for emergency work in this crisis. For instance, for every plant which will shut down through the issuing of your order there are a number of men who could do work at moving coal and loading and unloading the freight cars. By the daily papers we are told that there is a great accumulation of coal at the Jersey shore of New York Bay. Why not mobilize all trucks—especially the automobile trucks—in Greater New York and send them to Jersey for some of this coal, thus relieving the coal scarcity in Greater New York?

In order to get the trucks across the Hudson River put into service every ferry boat in Greater New York. I believe it is true that most of the ferry lines do not operate to their full capacity during the greater part of the day. If their boats were operated full time they could move across the river an enormous quantity of coal, thus releasing the coal cars to return to the mines for more coal. Strong men, accustomed to, or fitted for, outdoor work could be put to work at unloading freight, and I am sure that each concern in Greater New York and the rest of the country affected by the shut-down would be willing to contribute whatever number of men and trucks that are fit for this work, and pay them their regular wages if, through such arrangement the operation of their plants would not be interrupted, but would be permitted to run with such a force as is left.

I think this plan should recommend itself to you if for no other reason than that it will save the working people the wages which they will lose through the shut-down. This would cause unthinkable suffering. Besides this at this time we should not create idleness but rather use our labor in such a way as to speed up the prosecution of the war. We should follow the example of France at the Marne and under an extraordinary condition do something extraordinary. France by using means unthought of before to move her soldiers stopped the German advance. We should try in this crisis by unusual and unthought of efforts to relieve matters and not sit down and rest in idleness. Our concern offers four motor trucks, 30 men, two men for engine room work on ferry boats and I personally am willing to serve in any capacity should you desire my services.

M. CHARLES SCHWEINERT.

More Mechanics Needed.

The Ordnance Department of the Army urgently needs several thousand civilian workers and is issuing a poster defining the positions, salaries, etc. The mechanical trades positions are as follows: 2,500 machinists, $4.00 a day; 500 machine operators, $2.75 a day; 200 drop forgers, $5.75 a day (piecework), and 300 tool makers at $4.50 a day. For further information apply to the representative of the United States Civil Service Commission at the post office or custom house in any city, or to the Civil Service Commission in Washington, D. C.

Increase Prices for Work.

At the annual meeting of the Bloomington, Ill., Automobile Trade Association it was voted to increase the charge of work by first class mechanics to 90 cents per hour, and for helpers to 70 cents per hour. The former charges were 75 and 50 cents respectively. Increasing overhead expense is the reason for the advance. The following were elected officers for the ensuing year: J. E. Lockwood, president; F. H. Cole, vice president; E. E. Pierson, secretary; J. E. Clark, treasurer.

Flechter Opens Branch.

L. V. Flechter & Co., well known New York carburetor manufacturers, have opened a factory branch in Detroit at 790 Woodward avenue. George K. Parsons has been appointed manager in charge of all factory sales.

The Flechter carburetor has been known to the trade since 1910 and is manufactured in the plant of the Neptune Meter Co., Long Island City, N. Y. The capacity is 2,500 carburetors per day.

J. Herbert Ballantine and J. Bayard Kirkpatrick are president and treasurer of the Flechter company, and Andrew Kirkpatrick, vice-president and secretary, has spent 17 years in the automobile business.

The company manufactures a special model for Fords known as the Trident, in addition to models for all cars.

Red Cross Wants Drivers, Etc.

More than 1,000 motor truck drivers, mechanicians and helpers are needed immediately by the American Red Cross for service in France. The duties of these men will be to operate and repair the Red Cross motor trucks which transport supplies to war hospitals. Men in this service will receive pay and expenses.

A recruiting office has been opened at the headquarters of the Atlantic Division, 44 East 23rd street, New York City, under J. Lee Skelly, of the Red Cross Foreign Transportation Department Recruiting Service. Applicants must be over thirty-one years of age.

Dealers Close Evenings.

The leading dealers of Grand Rapids, Wis., have eliminated night and Sunday service in order that overhead expense may be reduced. The dealers afford service by designating a down town garage as an emergency service station for all dealers, and have notified car owners of the plan. About 5,000 owners are affected by the new arrangement. The down town garage makes minor repairs and adjustments, but work that cannot be accomplished in a short time is turned over to the proper dealer at the beginning of the next working day.

Indiana Votes for Cash.

Dealers in Vincennes, Ind., have adopted a cash basis of doing business. They ran a display advertisement in the newspapers announcing the new plan to the motorists. It was stated that by paying cash any raise in prices can be avoided. It was also pointed out that the elimination of bookkeeping cuts down the dealer's overhead. The majority of the dealers signed the statement appearing in the press.

To Drive Cars Over the Road.

The shortage of freight cars is to be discounted by one well known Detroit manufacturer of passenger cars. Beginning March 1 cars will be driven over the road and the cost is to be charged to the customer. It is estimated that the expense attached to this method of delivery will be about $150 for New York buyers.

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Figuring the Tractive Resistance on Various Road Surfaces

The draft required to move a loaded wagon on different types of road has, of course, been made the subject of repeated investigation, but so far as is known no determinations have been made with reference to the various types of road which are to be found in California under soil and weather

TYPES OF ROAD TESTED.
EARTH ROAD, dust ¾ to 2 inches deep.
EARTH ROAD, stiff mud, firm underneath.
GRAVEL, compact, in good condition.
GRAVEL, loose, not packed.
WATER-BOUND MACADAM, good condition.
OIL MACADAM, new, good condition.
CONCRETE, unsurfaced, smooth.
CONCRETE, ⅜-inch top, asphaltic oil and screenings.
CONCRETE, 1½-inch Topeka top.
TOPEKA TOP, 1½-inch, on plank. Approach to causeway.

conditions which here exist. It is common knowledge that cheap makeshift patchwork road building and maintenance are expensive, and in California, perhaps more than in any other place, the public conscience has awakened to the economic value of the good road. But, insofar as relates to the waste of power and the waste of money incident thereto, which result from hauling heavily loaded wagons or trucks day after day and year after year, over bad roads, no report is extant which attempts to picture, in popularized form, the economics inherent in the high-type, modern, hard highway as opposed to mud or dust or ruts.

An Efficient Committee.

In planning the tests herewith reported, the good roads bureau of the California State Automobile Association was fortunate in securing the interest and co-operation of Professor J. B. Davidson, of the Agricultural Engineering Division of the University of California; his assistant, L. J. Fletcher, with Austin B. Fletcher, Engineer of the California Highway Commission, and a national figure among road builders; C. H. Sweetser, District Engineer of the U. S. Office of Public Roads and Rural Engineering, and W. H. Lynch, Senior Highway Engineer, of the same office.

Same Equipment Used.

The purpose of the tests was to determine the tractive resistance of a standard farm wagon, when loaded, on various road surfaces. As far as possible all factors influencing the tractive resistance of a loaded wagon, except the road surface itself, were either eliminated or maintained constantly throughout the tests. Thus one wagon with the same load was used and was drawn by a team in all the tests reported here, except those on an oil macadam road, where a motor truck was used. The tests were made on June 13, July 9 and 10. The weather was bright and sunny in each case and the highest temperature for each day was about 105 degrees. The warm weather was the occasion for an increased tractive resistance on the oil roads over that for average temperatures.

Used a Dynamometer.

An appliance known as the Iowa dynamometer was used. This dynamometer was designed by Professor Davidson while on the staff of the Iowa State College.

In order to insure absolute accuracy in these tests, the particular instrument employed was subjected to careful inspection in the Engineering Laboratory of the University of California at Berkeley before being utilized.

The tests were made in part at the University Farm of the University of California, near Davis, Yolo county, and upon the State highway in the vicinity and over various county roads and stretches of the State highway in Sacramento county near Sacramento.

Various Roads Tested.

The various roads chosen for experiments fairly represent the roads of California under summer weather conditions, the readings made on the muddy earth road being made possible by an overflow from an irrigation ditch on the University farm at Davis and merely intimating, rather than conclusively picturing, the pull per ton necessary to move a loaded wagon over, or rather through, mud.

The tests were held uniformly with a load of 6,000 pounds gross, which was made up of a standard farm wagon loaded with California rice in sacks. The motive power used in the tests at Davis was supplied by a fine team of draft horses weighing about 1,600 pounds each, wagon and horses being the property of the University of California. In the tests made in the vicinity of Sacramento a standard two-ton truck, the property of the California Highway Commission, was used, through the courtesy of Austin B. Fletcher, Highway Engineer. So far as possible, all conditions were kept uniform except road surface, the same wagon, the same load, the same driver and the same horses being employed

PULL IN POUNDS PER TON	
Over a level, unsurfaced concrete road	27.6
Concrete base, ⅜-inch skin top asphaltic oil and screenings	49.2 to 51.6
Water-bound macadam, level, good condition	64.3
Concrete base, 1½-inch Topeka top, level, good condition	68.5
Gravel road, good condition, level	78.2 to 81.3
Earth road, fine dust, level	92 to 99.3
Earth road, stiff mud on top, firm underneath, level	218
Loose gravel, not packed down, new road, level	263

and practically the same speed being maintained in the horse-drawn tests, while the same man drove the truck when it was utilized as motive power.

Factors in Tests.

The rate of travel was decided in each case and averaged 2.4 miles per hour for the team. On grades

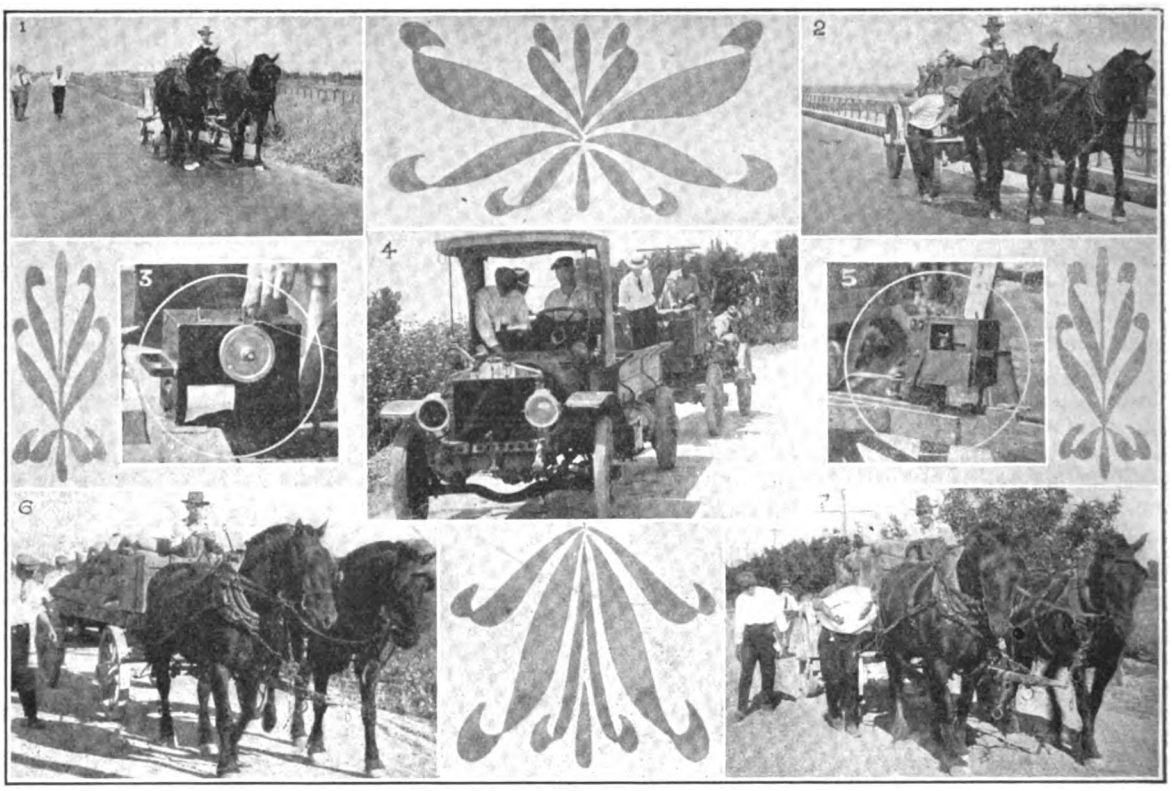
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tests were made both up and down grade and the results averaged.

A standard farm wagon with steel axles of equal length with wheels 38 and 46 inches in diameter and four-inch tires was used.

The load was drawn with a motor truck in the tests on oil macadam.

The dynamometer was of the integrating and recording type known as the Iowa. The force representing the tractive resistance of the loaded wagon acting through the instrument compresses a spring carefully calibrated to indicate the force acting. The average resistance over a uniform distance, measured automatically, is indicated directly by the instrument at the end of the run. A record of the resistance is also made on a strip of paper drawn under a recording pencil; this record so provided is used to check the average results furnished by the instrument. The tests were started after the load was in motion and moving at a uniform rate.



Ascertaining the Tractive Resistance on Various Road Surfaces: 1—Concrete, Asphaltic and Screenings; 2—Concrete Base and Topeka Top; 3—Showing Arrangement of Dynamometer in Horse Drawn Tests in Which Pull Is Transmitted from Doubletree Through Dynamometer to Clevis; 4—Unsurfaced Concrete; 5—Showing Arrangement of Dynamometer for Motor Drawn Test; 6—Water-Bound Macadam; 7—Gravel Road, Packed.

Upsets Earth Road Theory.

In reviewing the tests made, it is to be regretted that it was impossible to get a comprehensive series of readings over muddy roads, such as the average farming community is blessed with in winter, the "muddy road" tested being a mere hint of the hub-deep mud which wet weather brings.

In testing the pull necessary to move the load over the earth road the results arrived at upset the theory once expressed by the Governor of one of our States, who declared that "the good earth road" was easier to pull over than any other type of road. This contention did not prove up, for the tests made by Professor Davidson showed that the pull required was 3 1/3 times as great as over unsurfaced concrete and nearly twice as great as over concrete with the ⅜-inch skin top.

How Energy Is Wasted.

Comparison between the lowest pull recorded, that necessary to keep the three-ton load moving, after it was started, over the level, unsurfaced concrete road, which amounted to 83 pounds or 27.6 pounds per ton, and the pull through stiff mud, which was 654 pounds for the load, or 218 pounds per ton, furnishes ample food for thought. Over the concrete road the horses pulled together 83 pounds, each horse pulling only 41½ pounds, while over the mud the team pull was 654 pounds and the pull on each horse was 327 pounds. The difference in pull between the concrete road and the mud road was 571 pounds, a difference of 285½ pounds pull for each horse, which is wasted energy, wasted as absolutely as if it never had existed; and this energy, wasted day in and day out, in the winter in every part of almost every State in the United States, is what is meant when Bradstreet's Agency, with its fingers on the business pulse of the nation, says: "Bank clearings (in New York, Chicago or San Francisco) were affected by the usual seasonal condition."

How It Affects Business.

The "usual seasonal condition" is mud. Mud makes business bad in the country store because the farmer cannot get to town either to buy or sell. Bad business in the country store makes bad business in the country bank, and bad business in the country bank finds immediate reflection in financial centers, where bank clearings fall off and the city merchant finds his business dull because the country merchant, 200 miles away, perhaps, has found his business dull on account of bad roads.

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When forced to go to town in winter through the usual "seasonal mud" the farmer can haul only one-eighth the weight, so our tests prove, that would be possible had he concrete roads to travel over such as the California Highway system supplies. His marketing costs are therefore increased eight times, this increased cost being passed along to the average ultimate consumer, whose good wife, engaged in stretching his salary to limits that no rubber band would stand, ponders on the high cost of living, makes one dollar do the work of two, performing miracles of finance, never realizing that she is affected even in the most remote degree by the "usual seasonal condition" which commercial agencies speak of as affecting "bank clearings."

Why the Good Roads.

Yet she is. Supply the farmer with a modern road that he can travel over every day in the year instead of when weather permits, that he can haul over with absolute economy instead of never-ending waste, and the resultant decrease in hauling costs, estimated by the United States Office of Public Roads and Rural Engineering as more than $200,000,000 every year which we pay out in tribute to bad roads, would enable that greatest of our institutions, the American Wife and Mother, to take a little additional comfort for herself, to give a better education to her children, to make the wages of the family's breadwinner go farther with something left over to tuck away in the savings bank for that rainy day.

In extension of the tests here pictured it is the plan of the Good Roads Bureau of the California State Automobile Association to make a series of tests of muddy roads, under usual "seasonal conditions" common in winter, that the high cost of mud may be made yet more plain. Professor Davidson has pledged his co-operation in this plan and a supplementary pamphlet will be published in due time.

PRACTICE ECONOMY.

Boil Greasy Units in Soda Solution, Reclaim Oil and Old Rags.

The grease removed in the cleaning of wheels, axles and other parts of motor omnibuses, trucks, and other motor vehicles, is now utilized by the London General Omnibus Co., London, England.

Before the war kerosene was largely employed for the cleansing of engines and other parts of vehicles, but now its consumption is restricted to the barest minimum, the net effect being the saving of five-sixths of the former consumption. Kerosene, as a matter of fact, is now only employed on certain parts of the mechanism for the cleaning of which there is no practical substitute. For the cleaning of wheels, axle casings, and front axles, a weak solution of hot caustic soda is employed.

When engines, transmissions, rear axles, or any other parts are stripped for overhaul, a very great saving is effected over former practice.

Use Soda Process.

The unit is dismantled and the parts are placed in a cradle and dumped into a tank of water into which a jet of steam is turned so as to bring the water to boiling point. Custic soda is added to the water until a solution of about three per cent. strength is obtained. The whole of the grease is removed from the parts in the process of boiling and comes to the top of the water. Before the contents are removed the grease is drawn off the top. This is done through an overflow pipe of large diameter which leads into a barrel.

The cradle of parts is then transferred to a second tank of clean, boiling water, which finishes the cleansing, and, as the parts are drawn out quite hot, they drain perfectly dry and absolutely clean.

The result, so far as cleanliness of parts is concerned, is considerably better than if kerosene had been used. All minute parts of metal, dirt and grit go to the bottom of the first cleansing tank, where there is a large drain cock, the tank occasionally being washed out and all the sediment drawn away.

Reclaim Oils.

The London General Omnibus Co. has a central depot for reclaiming oil and washing rags, and to this depot the barrels of waste oil, as they are obtained from the various garages, and the rags, are sent.

At this depot there is a battery of three tanks erected over a furnace, each of which is filled to about two-thirds with water, which is brought up to the boiling point. The barrels of oil as they come in are drawn off into the first boiling tank, a little being added at a time. The oil is thoroughly boiled, and when it overflows into the second tank (by the adding of more oil to the first) it has become almost fit for use again, but it passes into the second tank and is given a second boiling, and then on to the third tank, where it goes through its final stage of cleansing, and from the last tank it is drawn off and run into barrels.

Renovate Oily Rags.

As to rags, their price today is much higher than before the war, when they were thrown away after being used. At present every rag is collected in each garage and sent once a week to the central cleaning depot. The first process through which they go is the extraction of all grease and oil in a centrifugal steam-heated chest like those in the ordinary dry-cleaning establishments in this country. All oil, by the rotary action of this chest, is expressed from the rags, whence it runs into barrels for the reclaiming process already described. The rags are then put into a washing machine and later into a rotary drying machine.

Oil Used as Fuel.

The oil gained by the reclaiming process is not entirely suitable for use again as a lubricant, but as so much of it comes from a solid grease, it is of a better quality than cleansed engine oil. It still has a value as a fuel, however, as can be gathered from the fact that at the North Road coach factory of the London General Omnibus Co., two 80 horse-power Diesel engines are run from the output of the oil reclaiming depot, leaving a certain quantity in excess available for sale. This oil is particularly good for Diesel engine work. It leaves the cylinder heads and valves very clean and is entirely satisfactory.

The cleansing plant of the London General Omnibus Co. has paid for itself in a very short time, because oil reclaimed may easily be sold for blending or fuel. A small plant can be easily put up in any garage, fuel for the furnace being rubbish and shop sweepings, or if the "raw material" is too small in quantity for economical handling on the spot, it could be collected and dealt with in larger bulk at some central collecting place.

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This department is maintained for the protection of our readers—especially our reckless readers, if we have any.
The object is to encourage every operator of a motor vehicle to be careful and avoid accidents, especially the inexcusable accident of a collision at a railway crossing.

Skidding and carelessness in attempting to cross railroad tracks ahead of trains were responsible for the usual crop of accidents that could have been avoided. Accidents caused by failure of the brakes to hold as well as those due to failure of other components, were noted during the past month. Skidding can be avoided by the use of chains and proper driving. At this time of the year when the city streets and country highways are covered with snow and ice, one should not only proceed with caution, but should see that the wheels are equipped with some device affording safe traction.

Too Much Speed.—A new and slippery pavement proved the undoing of a driver near South Keyport, N. J., recently. Five persons were injured when the vehicle turned turtle. It is said that the car was being driven at a high rate of speed in a fog and that a sharp turn in the road started the skid.

Brakes Failed to Hold.—Failure of the brakes to hold was responsible for an accident just outside of New York City. The machine crashed into the rear of a car going in the same direction, injuring several persons.

Drives Into Street Car.—One killed and two hurt is the result of a driver attempting to cut in back of and around a street car in Chicago. The motor car crashed into a trolley approaching in the opposite direction.

Struck by Freight Train.—Failure to notice the approaching freight train and attempting to cross railroad tracks, were responsible for the destruction of a car and the injuring of two persons near Bucyrus, O., recently.

Skid Into Pole.—Four persons were injured and a car demolished near Youngstown, O., when the driver lost control when making a turn at high speed. The car skidded into a pole.

Struck Soft Spot in Road.—A driver of a small and popular type of machine reached over to adjust the robe about his companion when the car struck a soft spot in the road. The vehicle turned turtle, injuring three persons.

Sideswiped Other Car.—The tendency to pass another car and going in the same direction resulted in the death of one person and the injuring of others at Sacramento, Cal., recently. The driver, in attempting to crowd the other vehicle, crashed into it, and both cars left the road.

Curtains Obscure Vision.—Driving with curtains up and failure to hear the whistle of an approaching train, caused the death of a driver of a motor car and his companion near Burlington, Ia. The engine struck the automobile, completely wrecking it.

Skid Fatal to Pedestrian.—The skidding of a motor car not equipped with chains resulted in the death of a well known business man at Baltimore, Md. He was standing at the curb when the automobile skidded into him. It appears the car was taken out by the 17-year-old son of the owner.

Blown From Car.—An unusual accident took place near Littleton, Mass. The car was struck by a train at a crossing and the force of the collision burst the fuel tank, the contents of which exploded, blowing the occupants of the automobile several feet. Both were dead when picked up.

Made Too Quick a Turn.—A skid that is believed to have been caused by the driver making a quick turn when he realized he was about to take the wrong road, was the cause of the death of one person and the injuring of two others near Columbia, O. The car turned turtle.

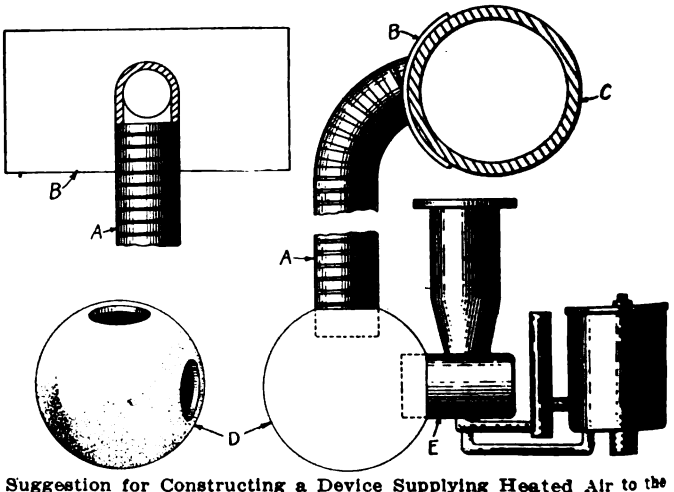
HEATING THE AIR.

Simple Method of Conveying Heat of Exhaust to the Carburetor.

A novel and ingenious method of conveying the heat of the exhaust manifold to the air intake of the carburetor is described by a writer in the Autocar. The arrangement of the parts has been slightly altered in the accompanying sketch, a tube of flexible metal being employed instead of that suggested.

The stove partially encircling the exhaust pipe or manifold is constructed of sheet tin as shown at B and attached as indicated at C. The flexible tube is secured to the stove and wires can be utilized for attaching the stove. A slight space should be left between the exhaust pipe and the stove.

The connection between the tube and the air intake of the carburetor is obtained by the use of a tennis ball. Two holes are cut in the ball and at right angles, as shown at D. The free end of the



Suggestion for Constructing a Device Supplying Heated Air to the Intake of the Carburetor.

tube is inserted in one opening and the other aperture of the ball is slipped over the air intake, as at E. With some types of carburetors and where the air valve used for choking interferes with applying the ball as suggested, it will be essential to use a short length of tubing. The entire construction can be made up in about 30 minutes, and hose can be substituted for the flexible metal tubing.

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Record Display of Accessories Expected at Boston Show, March 2-9

The sixteenth annual show of the Boston Automobile Dealers' Association will be held March 2-9, inclusive, as originally planned. The suggestion that the dates be advanced, owing to the fuelless Monday, did not prove acceptable to the scores of car, truck and accessory exhibitors, the majority of



Chester I. Campbell, Manager of the Boston Show.

whom had signed contracts and completed arrangements for their exhibts. There is every reason to believe that the fuelless Mondays will be a thing of the past by the time the opening day of the show arrives.

New England Prosperous.

Although not officially a national show, Boston has come to assume almost as great an importance among manufacturers as the New York and Chicago events. New England is a field carefully cultivated by the manufacturer, for it represents a big purchasing power that is steadily increasing. Dealers predict that the season of 1918 will be unusually prosperous, that there will be a big demand for popular and medium priced cars, and that the majority of sales will be to persons making their initial investment in a motor vehicle. These predictions are based on the assumption that skilled labor is receiving an unprecedented wage. New England is well known as a manufacturing center. Dealers and garagemen also anticipate a big demand for accessories and equipment as the result of a decreased production of passenger cars.

Big Show for Dealers.

Boston enjoys the distinction of being a dealers' show, although the manufacturer displays a keen interest in it. Not only do the individual exhibits afford an opportunity for the display of individuality and ingenuity, being free as is the show from the restrictions governing shows held under the auspices of the National Automobile Chamber of Commerce, but the Boston event draws the dealer, garageman and repairman, large and small, for miles around.

From the standpoint of exhibits and interest taken the Boston show is a surety of success. Every inch of the 125,000 square feet of space in Mechanics building has been taken, the "all sold" sign having been displayed for the past month. The overflow will be housed in Horticultural Hall, several blocks distant.

Best Commercial Car Show.

Boston enjoys the distinction of being the only big show where commercial vehicles are displayed, and in large numbers. Last year over 50 makers of trucks were represented and a number of new models were displayed for the first time. There is every reason to believe that a number of manufacturers will wait until the Boston truck show to exhibit new vehicles, a practice indulged in by makers of pleasure cars, accessories and equipment.

With favorable weather it is expected that the attendance of last year will be exceeded. In 1917 approximately 200,000 visited the two buildings, in which there were 512 passenger and commercial vehicles displayed. The number of exhibitors of passenger cars was 92, while accessory makers to the number of 170 were represented. These figures are exclusive of the separate display of enclosed bodies, etc., held at the Copley Plaza. In addition to the events enumerated there will be the usual exhibits by large dealers, etc., at their show rooms.

The display of accessories, equipment and those devices of interest to the trade will be much larger and more comprehensive than it in the past. This is due to the fact that the Motor and Accessory Manufacturers' Association has recognized the show, and placed its seal of approval on it. This means that many manufacturers will display, whereas formerly their products were shown by agents, etc.

"Florentine Fete" Decorations.

Chester I. Campbell, manager of the Boston Show, has always enjoyed the distinction of staging a beautiful background for the exhibits. The scheme of decoration this year in the grand hall will be Florentine, and the designer, E. W. Campbell, describes it as a "Florentine Fete," founded on the bronze and art work of the city of Florence, Italy.



Exterior of Mechanics Building, Boston, Where the 16th Annual Show of the Boston Automobile Dealers' Association Will Occur, March 2-9.

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The balconies will be draped in old rose fabric with large gilded and modeled frames holding Florentine bas reliefs in bronze. Between the frames will be place bronzed torchholders filled in with ferns and festooned in color. The balcony opposite the stage will be treated with finely modeled statues.

Bronze Gates and Cherry Blossoms.

Three sculptured fountains with running water will be placed at the entrance to the stairway to the stage, which will be lined with boxes of trimmed hedges with marbleized panels. The rear wall of the stage will be covered with artistic panels having an old rose velour effect. The main division lines on the floor will have bronze gates 12 feet high, with cherry trees in bloom on either side and meeting across aisles. The lighting effect, from huge electroliers, electric ball and electric festoons, will produce a dazzling scene.

A Patriotic Tone.

In Exhibition Hall all the posts will be treated with highly decorated medallions, the windows and side walls to have fretwork design and rich coloring. Panels with rich decorative color scheme will extend from the floor upward to reach festoons clear around the hall. The exhibits will be set in shrubbery. The entrance corridors will be decorated in national and allied colors, with new palms and colored drapings.

AN IMPORTANT QUESTION.

Must Subscription Rates Be Raised to Offset Increasing Costs?

We are beginning to hear from our subscribers with respect to the inquiry we made in the January number as to whether very many of them would object to a raise in our subscription price from $1.00 to $1.50, in case that should become necessary the first of July next, when the new second-class postage law becomes effective and increases our postage to a point where it will be unprofitable to accept subscriptions at old rates.

We are receiving some very encouraging letters. One subscriber, B. E. Riker, Branchville, N. J., writes as follows:

"In regard to the increase of subscription to The Automobile Dealer and Repairer, would say that I do not hesitate when my subscription expires to send the dollar with pleasure, and if it was $1.50 or $2.00, it would be the same, as I am sure I am getting big value for the price. Further, the information that I get from the 'Trouble Department' in one issue is worth more than the price of subscription. I had trouble with my car for over a month when by accident I discovered the difficulty and repaired it. At another time I had to be towed in on account of a little wire trouble that could have been fixed in five seconds, but I was green and didn't know much about automobiles, though I had run a locomotive for a number of years, and considering myself somewhat of a machinist, thought I would have no trouble, and I didn't as long as the car went; but when the car stopped, there I was and had to be towed in. It was one of those short-circuits which could be repaired quickly. A short time after this little trouble I have described, I received a sample copy of The Automobile Dealer and Repairer and in the Trouble Department I found the same inquiry, and you bet that I was not long in sending in my subscription. The Trouble Department in one issue has been worth five times the subscription price to me."

We hope our readers universally will comply with the requests made in our previous issue (and repeated now) to give us their opinion of the proposed increase in subscription rates. It is well known that everything has advanced in price and in some cases the increase is pronounced. White paper costs nearly twice as much as it did before the war. Printers are charging considerably more for their work, and postage is going to be very much higher.

It would seem as though there should not be any serious objection to a reasonable increase in the subscription price of The Automobile Dealer and Repairer, but we want to know what our readers think about it, because to increase the subscription rate is rather a serious step to take. We do not want to make any mistake. Although a good many readers have responded to our request, there are numbers of others that we should like to hear from as soon as possible.

Jellinek-Mercedes Is Dead.

Emile Jellinek-Mercedes, the man responsible for the name Mercedes in the automobile, motorboat and airplane industry, is dead. He was a wealthy Austrian who from 1880 to the outbreak of the war resided at Nice in Southern France. He secured control of the Daimler Motor Co. of Caunstatt, Germany, claimed credit for having inspired Mayback, chief engineer of the Daimler works, with the construction of a light but powerful chassis. The chassis weighed less than 2200 pounds and was equipped with an engine developing 40 horsepower. The Daimler product weighed over 4,000 pounds and developed but 28 horsepower. The car was named after Jellinek's daughter, Mercedes.

TO CARRY LOAD BOTH WAYS.

Plan for Motor Trucks to Operate Efficiently in Several States Approved.

That economical operation of a motor truck depends largely upon the vehicle carrying a capacity load both going and coming, is the basis of the plan to be adopted by four states, New York, Pennsylvania, Massachusetts and Connecticut.

Representatives of the Council of National Defence of these states met recently in New York and laid the foundation of a plan whereby trucks operating between two given points will be so employed that a load will be carried both ways.

The plan includes the forming of central bureaus where truck drivers may report and be assigned loads for return trips instead of returning empty as is now the case. The practice of using trucks as above stated is indulged in by a few concerns and there is every reason to believe it will become very general before spring.

Ford Dealers Organize.

Dealers handling the Ford in northwestern Wisconsin have organized. The Fox River Ford Dealers' Association, as the new organziation is termed, elected W. C. Dicke, Manitowoc, as president. H. M. Bradford, Appleton, at which place the meeting was held, is secretary and treasurer.

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Adapting the Incandescent Lamp to the Needs of the Motor Car

Part 1—Describing the Early Attempts to Utilize Electricity for Lighting Purposes and the Development of Filaments and Lamps

BY AUGUSTUS A. WEST

The utilization of electricity as an illuminant for motor vehicles is now so general that the average motorist accepts its conveniences as a matter of course. Electric lighting was not developed by the automobile industry. As a matter of fact, the compact dynamo, storage battery and incandescent bulb were perfected long before the public demanded a more convenient form of illuminant than the kerosene lamp or acetylene gas.

The history of the development and use of electricity for lighting purposes is an interesting one, particularly that dealing with the perfection of the lamp or bulb. While it may appear to the novice, the person purchasing his first electrically equipped automobile, that all bulbs or lamps are similar, such is not the case. These bulbs vary in size, capacity and construction, and a practical or working knowledge is of value to the owner, dealer and repairman.

Knowing how to select the proper bulbs and to wire a car will be of service to those motorists whose cars are not equipped with electric lighting as well as of value to owners who wish to attach some device, a spotlight, for example. The reader will find the article on pages 49 and 50 of the January issue of value in that many of the electrical units herein referred to are explained in detail.

Bulbs, globes and incandescent lamps are one and the same thing, and when we go to the dealer or garageman for them we seldom give a thought to their construction. It is the intention of the writer to explain how lamps may be selected for a specific purpose. While the dealer and garageman have charts showing just what lamps should be used for certain makes of cars, the owner, as a rule, is not aware what voltage, amperage capacity, etc., should be adhered to.

The Ediswan Lamp.

Prior to Thomas A. Edison's commercial incandescent lamp there was a somewhat similar lamp used in England in a limited way by Swan. When Edison sent his new lamps to London, about 1881, he met with opposition in the courts by the Swan interests, but later these clashing elements were merged and the combined feature lamp has since been known as the "Ediswan." Because the incandescent lamp was antedated by the electric arc lamp a description of the latter will be of interest.

The Electric Arc Lamp.

The first invention in electrical lighting was with he electric arc shown at E at Fig. 1. Its principle s that a flaming incandescent arc is produced at he junction of a break in any current carrying onductor of electricity. In 1809 Sir Humphrey)avy, whose lamp is shown at Fig. 1, A, connected ,000 cells or primary batteries to two rods of harcoal and by slightly separating them he obained the first electrical arc light. It created a temperature of 4,800 degrees Fahrenheit. The next step was the replacing of the expensive, zinc-consuming primary battery with the mechanical production of electricity, the dynamo. In 1878 Charles Brush patented his arc lamp and dynamo. He made a good commercial arc lamp having an electrical-gravity carbon rod feed, and a dynamo and motor of peculiar design. About this time Edison was marketing his system of electric incandescent lighting and these two American inventors were great commercial rivals for a while, but it was soon found that the arc was especially valuable for street lighting, using as it did a series, direct current. The incandescent lamp proved best for interior lighting, using a direct current in multiple wiring. Later the alternating current supplanted the direct for central

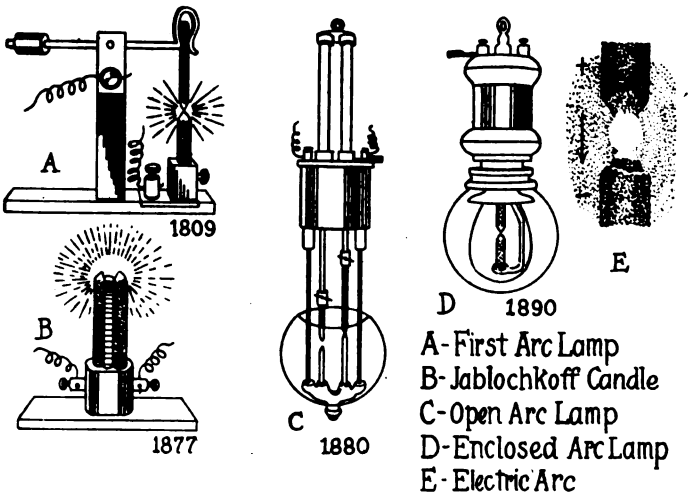


Fig. 1—Early Forms of Electric Lighting, Showing the Development of the Arc Lamp.

station distribution because of its great saving in copper wire size, the feeder mains using high voltage, intermediary rotary converter sub-stations and transformers to lower the voltage on its entrance to buildings. The alternating current motor is a recent improvement, but the speed control of the direct current motor remains superior to the alternating current unit. Thousands of volts are used on main line distribution, whereas automobiles use from six to twelve volts for lighting and a direct current as storage batteries are employed. Referring once more to an enclosed arc lamp, one is shown at Fig. 1, D. It has a partial vacuum and its carbons last about 200 hours as against six to eight hours for the single carbon, open arc type of lamp.

The Incandescent Lamp.

The incandescent lamp owes its lighting quality to its filament opposing a high resistance to the passage of current so that the filament becomes white hot or incandescent when the current flows through it. If this were tried without an air ex-

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hausted globe the oxygen in the air would burn up the filament, there would be a flash and the filament would be consumed. To overcome this a glass globe is used to surround the filament and the air is pumped from the globe. With the filament in a vacuum the light continues to shine as long as the current flows, assuming the proper voltage is maintained.

The filament material is very important and carbon was formerly used. Carbon is the heat charred remains of certain materials and comes in various forms. Coal is carbon formed by nature from vegetables, plants, trees, etc., under great pressure and heat. Common charcoal is made from logs of wood burned in ovens or buried in the ground. In the process the air is largely shut off. This results in charred wood or charcoal. A diamond is pure carbon crystallized. Other precious stones are partly carbon with mineral additions which give them various colors. Bamboo fiber was chosen by Edison for his early lamps, which he patented in 1878.

The First Incandescent Lamps.

The Philosophical Magazine, 1845, describes a

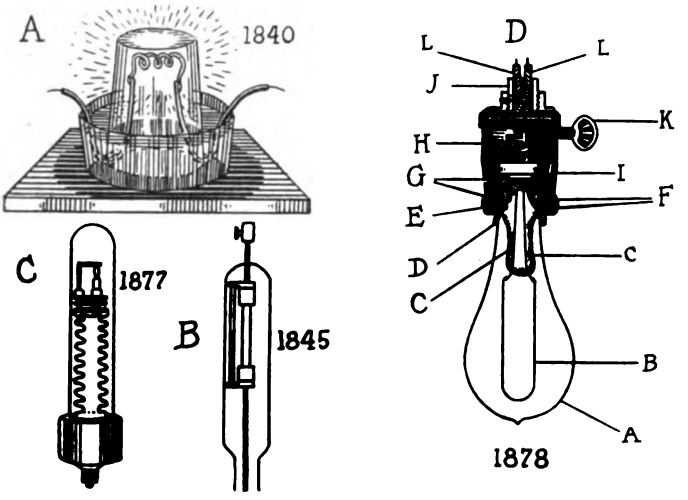


Fig. 2—Illustrating the Early Attempts, A, B and C, to Construct Incandescent Bulbs or Electric Lamps and the Edison Carbon Lamp at D.

lamp invented by William Robert Grove. This lamp is shown at Fig. 2, A.

"A coil of platinum wire is attached to two copper wires, the lower parts of which, or those most distant from the platinum, are well varnished; these are fixed erect in a glass of distilled water, and another cylindrical glass, closed at the upper end, is inverted over them, so that its open mouth rests on the bottom of the former glass; the projecting ends of the copper wires are connected with a voltaic battery (two or three pairs of the nitric acid combination), and the ignited wire now gives a steady light. Instead of making the wires pass through the water, they may be fixed to metallic caps well luted to the necks of a glass globe."

In 1845 August King in England, assisted by the American inventor, Mr. Star, used a platinum and also a carbon burner in a vacuum. They selected a barometer tube for a globe and brought the lamp to a white heat or state of incandescence by electric current from primary batteries. The device is shown at Fig. 2, B. In 1859 Moses G. Farmer, of Salem, Mass., by a series of subdivided electric lamps, lighted his residence. This is said to be the first record of electricity being used to illuminate a house.

In the Sawyer-Man lamp of 1877, shown at Fig. 2, C, a rod of carbon was brought to a state of incandescence in a globe filled with nitrogen gas. In the last few years nitrogen lamps have become popular, due to their great economy of current.

The early lamps of Thomas Alva Edison, those made about 1878, used a very thin, thread-like filament of carbon, made from a great variety of material, including paper, bamboo and carbonized cellulose. His experiments extended over many years and he sent a man around the world collecting material for filament experimentation.

Special Electric Lamps.

The Nerst lamp employs for its incandescent element certain oxides of rare earths; in this respect, somewhat like the Welsbach gas mantle. The oxide is mixed in a form of paste, then squirted through a die into a string, roasted and used as a filament in a vacuum globe.

The mercury vapor lamp, invented by Peter Cooper Hewitt, has no filament. It uses a mercury vapor brought to a state of incandescence in a long glass tube by the passage of electricity. The Hewitt lamp is more economical of current than the filament lamps, but it lacks the red rays of light. Not being fully actinic, it gives objects strange colorings, but is a helpful light for photography and has many special advantages.

The Moore lamp is a development of the Geissler tube for commercial purposes. Geissler tubes are sealed glass tubes of varied shapes, containing highly rarefied gases and provided with platinum electrodes which usually extend through the glass to a short distance beyond the interior surface. When a static electrical discharge, as from a spark coil, is passed through the tube, luminous colored lights are produced.

Filaments and Material.

Among the compounds with carbon may be mentioned "helion" and osminum. The tantalum filament has been found useful. Tungsten is universally employed for incandescent lamp filaments. Tungsten is a metal of the chromium group, it has a very high melting point. It is unworkable as a metal and appears as a dark powder of a gray tint. The Kuzel process of working tungsten consists in forming a colloidal solution of the metal by maintaining an electric arc between tungsten terminals under water. The solution is then brought to a pastelike consistency and squirted through a die into a filament which is afterward treated by heating with the electric current. Its melting point is high, 5,792 degrees Fahrenheit, which is desirable in lamps, but the filament is easily broken by jar, requiring especially strong supports. Further benefit is obtained by using nitrogen gas in the globe instead of simply burning the filament in a vacuum.

The Edison carbon lamp is shown at Fig. 2, D. A is the exhausted globe, B the carbon filament, CC wires sealed in glass, D line of fusion of two parts of the globe, E and F insulating material, G screw threads, H and I metal socket, J fixture arm, K circuit controlling key, LL current supply wires.

(To be continued.)

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MAXWELL TRACTOR.

Maxwell Company Announces Three-Plow Machine With Enclosed Drive.

Indicative of the general trend of the automobile industry is the announcement of the Maxwell Motor Co., Detroit, Mich., that it is to manufacture and market a tractor. The announcement was made at the Maxwell-Chalmers dealers' dinner during the week of the Chicago show, and the new vehicle was shown by means of motion pictures. These displayed the use of the tractor under the most severe conditions of service.

The new Maxwell tractor is a three-plow machine, employing enclosed drive. Wheels are 48 inches in diameter. The engine dimensions are 4¼-inch bore by 6-inch stroke. A cone clutch is used. Crankshaft has three bearings of the following dimensions: Diameter, 2½ inches; lengths, front bearing, 3¾ inches; middle bearing, 3½ inches; rear bearing, 4¼ inches. Pressure oil feed with splash is used. There are three oil pumps to take care of the tilting of the tractor. Magneto is used for ignition with impulse starter. Governor and fan are gear driven. The governed speed is 900 revolutions per minute. Make of carburetor is undecided. Gasoline is fed by gravity from a tank of 26-gallon capacity. The cooling system contains nine gallons of water.

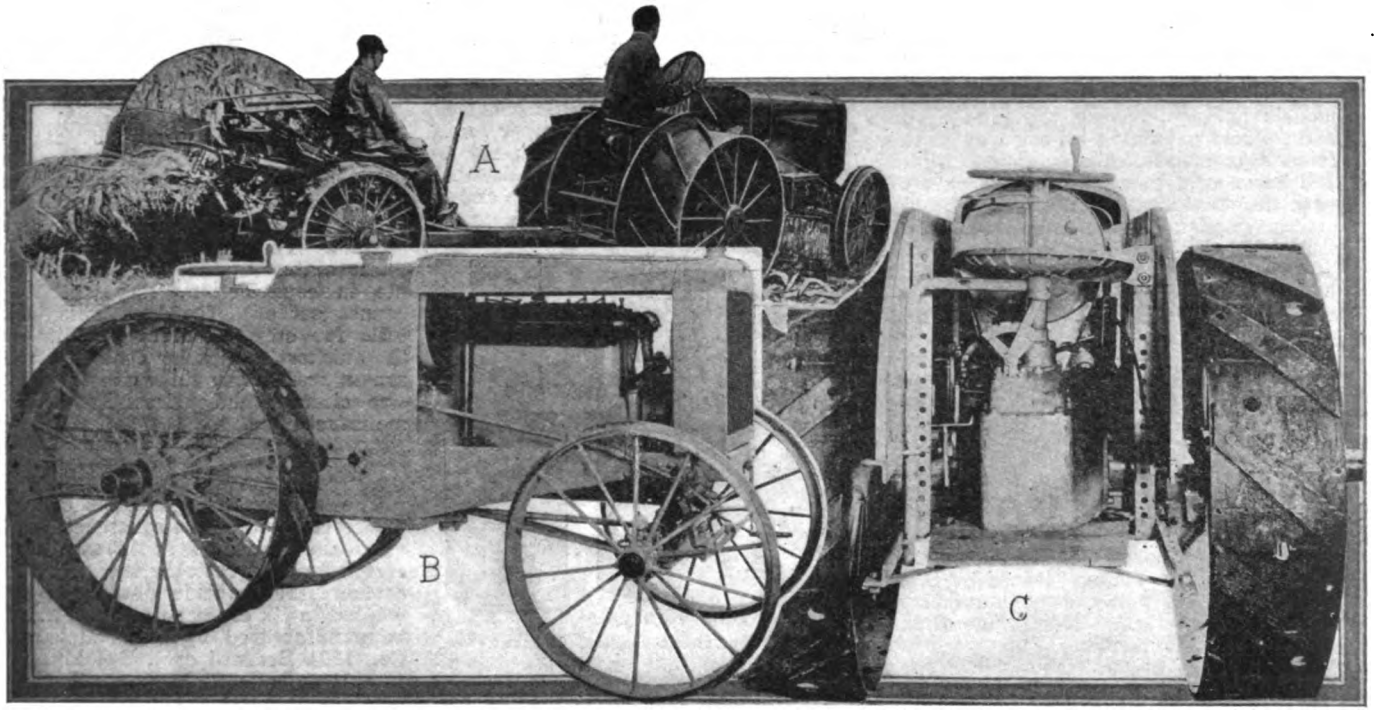
The drive is taken from the clutchshaft to a transverse shaft by bevel gear. A pulley is placed on one extremity of the transverse shaft and a cable hoist between the frame and the transmission case is on the same shaft. Reduction gearing, through shafts, back of the transverse shaft.

The tractor has three speeds on either drive or pulley gear reductions. A speed of six miles per hour is attained on high at 900 r.p.m. The intermediate or plowing speed is 2¼ miles per hour at 900 r.p.m.; low speed, 1¼ miles per hour at 900 r.p.m. Transmission bearings are all anti-friction type with narrow center-to-center distances, not exceeding 14 inches at any point. The frame is the accepted tractor construction, of pressed steel, having a depth of seven inches. Oil tubes of the engine can be taken out and cleaned. This is an example of the accessibility of the entire tractor.

The Maxwell tractor has been thoroughly tested and some of the tests were made on sugar and rice plantations in Louisiana under the supervision of P. R. Janney, the Maxwell field engineer. The price of the new vehicle has not been fixed, but the figure will be low, it is said.

Car Price Increase Trend.

One way in which motor cars have been slow is in following the world-wide price-increase movement in nearly all lines during the last three years. This fact has been developed in a surprising way by a comparative analysis of price fluctuations of automobiles and leading commodities just made by the National Automobile Chamber of Commerce, as shown in the accompanying table. The average wholesale price of all the automobiles and motor trucks produced in the United States during the last six years shows a decrease each year ranging from 4.7 per cent. to 16.5 per cent. until last year, when there was an increase of 4 per cent. Prices of 13 principal commodities, as reported by Bradstreet's index, decreased slightly until 1915. In that year they increased 18 per cent.; in 1916 more than 28 per cent., and last year more than 30 per cent. English commodity prices have increased 87.5 per cent. since 1913.



Features of the New Maxwell Tractor: A, Pulling Corn Binders, a Difficult Task for Horses or Mules; B, Three-Quarter View Showing Municipal Tread and Hood Removed to Show Power Plant; C, Rear View and Showing How Gears Are Protected from Dust, Mud, Etc.

	Motor Vehicles Average Wholesale Prices.	Per Cent. Increase or Decrease.	Bradstreet's Commodity Index.	Per Cent. Increase or Decrease.	London Economist Commodities Index.	Per Cent. Increase or Decrease.
1912	1000	.....	9.54	.....	2721	.....
1913	877	—.123	9.23	—.032	2661	—.022
1914	806	—.081	9.03	—.022	2760	+.032
1915	770	—.047	10.65	+.180	3500	+.271
1916	640	—.165	13.66	+.282	4779	+.365
1917	666	—.040	17.81	+.305	5768	+.207

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NEW AND INTERESTING THINGS IN MOTORDOM

The Oro Formost Bumper.

The Au-To Compressor Co., Wilmington, O., manufacturers of the Oro line of automobile accessories and air compressors, has recently placed on the market a new bumper known as the Oro Formost, with a universal fitting.



The Oro Formost Bumper.

The bumper is adapted to all recent models of cars, having the mud apron and fenders extending all the way to the front tips of the chassis frame, width and curve of frame being taken care of with the special adjustment. The brackets are made of malleable iron, sturdy and well balanced. The springs are concealed in housing and are finished in baked black enamel. The bars are finished in black and nickel, specially rust-proof treated.

This bumper comes complete with drop forged hook bolts ready to attach, packed in individual cartons. Illustrated literature will be mailed to dealers upon request.

"Keep Your Car Young."

We wish to acknowledge receipt of an interesting 16-page booklet entitled "Keep Your Car Young," issued by S. C. Johnson & Son, well-known manufacturers of auto products. This is one of the most attractive booklets that we have seen. It gives full particulars in regard to the Johnson products and emphasizes their great convenience for the use of automobile dealers, repairmen, garage men or individual car owners. The line illustrated and described inciudes Johnson's Cleaner, Johnson's Prepared Wax,



A Useful and Attractive Booklet.

Johnson's Stop Squeak Oil, Johnson's Black-Lak, Johnson's Auto-Lak, Johnson's Carbon Remover and Johnson's Freeze-Proof. A large majority of dealers throughout the country have already secured this very extensively advertised line, and any dealers who do not carry the line should communicate direct with the manufacturers, who would be pleased to furnish prices and terms. As for the booklet, this will be mailed free and postpaid to any readers of our magazine who will write for it, addressing their inquiry as follows: S. C. Johnson & Son, Dept. AD, Racine, Wis.

Permatex Gasket Cement.

All repairmen appreciate the value of a good gasket cement. The Permatex heat resisting gasket cement is manufactured by Constant A. Benoit, Brooklyn, N. Y. This cement, the manufacturers state, will prevent leaks where leaks cause greatest losses. This product has been used for many years in the assembling departments of the leading manufacturers of automobiles, motorcycles, farm tractors, marine and aeroplane engines, and it is of equal value to the users of these machines when repair work has to be done. This cement has no harmful action on paper, cardboard, cork, leather, canvas, felt, rubber, asbestos or metal gaskets which are used on all types of gasoline, kerosene and oil engines. In fact, it prolongs the usefulness of these gaskets because of its resistance to gasoline, oil, water and heat. This cement is placed on the market in two-ounce bottles or cans containing ¼-pint, one pint, one quart or one gallon. The illustrations give an idea of the two-ounce bottles and the quart cans of this cement. For prices and full particulars readers should write direct to the manufacturer.



The Permatex Gasket Cement.

The Peteler Auto Jack.

We illustrate the new Peteler jack which has been placed on the market by the Coe-Stapley Mfg. Corp., 115 Broadway, New York City. Some of the good points of this jack are as follows:

Its stroke is very short, in fact, so short that the overhang of the car in any case cannot possibly interfere with the up and down movement of the handle. With this jack you do not have to crawl under the car or even get on your knees to place it in position. It has a long, telescoping handle, by means of which it can be slid to any point under the car. When not in use the handle is detached and occupies very little space in the tool box. The lifting action of this handle is extremely quick. It raises ⅜-inch with each stroke, which is considerably faster than ordinary jacks. Its easy operation is a very good point. The load may be lowered without touching the jack as a turn of the handle operates a small lever which reverses the action and the load

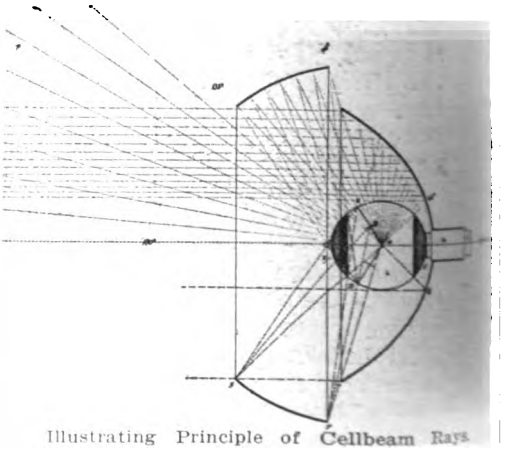


The New Peteler Auto Jack.

comes down quickly, step by step, just as it went up. The lifting bar cannot drop out, even when the jack is turned upside down, which means that no part of the jack can be separated and lost or mislaid. This jack is built of the very finest materials throughout. It is simple in construction, very durable and cannot get out of order. This jack retails for only $6.00, making it one of the quickest sellers for dealers. All who are interested should write for descriptive circular and prices direct to the manufacturers.

Right Side Up This Time.

The accompanying cut, showing the principles used in the construction of the Cellbeam concealed spot lamp was inserted by a regrettable error, in the December issue, upside down. It is now printed in its correct position. This lamp is manufactured by the Cellbeam Mfg. Co., 1101 Bedford ave., Brooklyn, N. Y. It is a compact light which has an exceptionally powerful projector of both spot and diffusive illumination. The concentrated beam of projected light extends 500 feet, while the objects close at hand



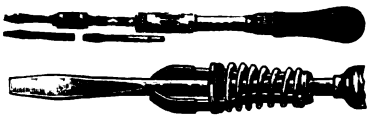
Illustrating Principle of Cellbeam Rays

are illuminated by a diffusive glow of indirect and transmitted light, devoid of the annoying direct filament glare. This lamp is a good seller and should be stocked by every live dealer.

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"Yankee" Spiral Ratchet Screwdriver.

The incessant jarring, jolting and straining to which an automobile is subjected in its every part, constantly operates toward loosening of screws. Going over a car to tighten up screws brings the repairman or car owner up against locations where it is impossible to work



Showing Construction of "Yankee" Spiral Ratchet Screwdriver.

with an ordinary screwdriver. The advantage of the "Yankee" spiral ratchet screwdriver lies in the speed with which a screw-driving job is accomplished, under any and all conditions. A direct line push on the handle, and the screw is driven home, and much tighter than with the old handle-twisting type.

"Yankee" spiral ratchet screwdrivers are made in various sizes, from little No. 35, 7 inches long without bit, to big No. 31, 17½ inches long with bit. Among them is the "Yankee" quick return. This model has a spring in the handle which brings the latter back automatically, maintaining a sufficient pressure to hold the bit securely in the groove for the next push.

The ratchet shifter, easily changed at a finger-touch while tool is in place, produces right or left-hand movement of bit for driving or drawing; or with shifter in the middle, the driver instantly becomes rigid.

For setting screws in cramped places or at long reach, where only one hand can be used, the "Yankee" screw-holder attachment is available. This grips the screw while it is being started. Hold is



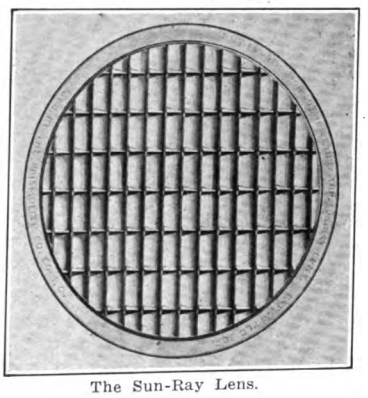
lustrating Use of "Yankee" Spiral Ratchet Screwdriver.

ıtomatically released as the screw-head nks into place.

But that isn't all: The "Yankee" spiral ıtchet screwdriver makes an excellent push drill. It is provided with a chuck to take various size bits. Bit is revolved rapidly with each push. With a "Yankee" you can drill holes in places absolutely inaccessible with a brace, breast or hand drill. Undoubtedly one of the handiest time-saving tools a repair shop, garage, mechanic, or automobile owner can have. Made by the North Bros. Mfg. Co., Philadelphia, Pa.

The Sun Ray Lens.

Dr. C. W. Waggoner, illuminating engineer of the University of Virginia, spent more than a year working out the principle and construction details of the new Sun-Ray lens introduced at the New York automobile show by the Prismolite Co., Columbus, O. Dr. Waggoner was seeking a lens that would at all times and under all conditions meet the requirements of all the states and at the same time give the maximum of road



The Sun-Ray Lens.

illumination. He observed that the lens which concentrates the light on the road ahead frequently throws the beam into the eyes of approaching motorists because of the uneven surface of the road. Moreover, he pointed out that the concentrated beam did not give any light at the side of the road, making it extremely dangerous to drive at night. On the other hand he argued that the lens designed to avoid the direct beam by diffusing the light rays over 360 degrees of a circle is not economical because the light thrown skyward is wasted.

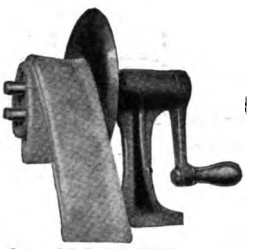
With these two objections in mind, Dr. Waggoner set about to find a lens that would illuminate the road in front and throw sufficient light to the side of the road to make safe driving without wasting light in the air above.

The Sun-Ray lens is the result. After a year of careful calculations, Dr. Waggoner succeeded in refracting the rays downward by a series of horizontal prisms so that double the amount of light is thrown on the road ahead.

By a second series of vertical prisms, he also threw the light on the sides of the road. These vertical prisms break up the concentrated beams, eliminating all glare. Thus, the lens gives all the advantages of total diffusion with none of its disadvantages, and also gives all the advantages of deflection without its faults. The Sun-Ray lens is said to meet the requirements of every state in the Union, and has been officially approved by several of them, including New Jersey.

A Tube Deflator.

The Williams Foundry and Machine Co., Akron, O., is marketing the improved tube deflator illustrated herewith, for repair shop use. With it the tube is slipped over one of the projections on



Tube Deflator Made by Williams Foundry & Machine Co., Akron, O.

the plate; then by turning the handle the tube is wound tightly around the two projections and the air exhausted in a jiffy. It is a handy size and will deflate any size tube.

A New Auto Lamp.

We take pleasure in describing a new automobile lamp which will be put on the market this coming season. It is not an electrical lamp. It has stood the test of years in actual use. The energy for the lamp is derived from magnetism, not electricity. The radium or light is produced by a gas and not a filament.

By its great convenience this lamp is bound to create a large demand. These lamps will not be sold, but will be rented on a deposit from the car owner, sufficient to cover their manufacture, and it is expected that these lamps will be leased at a nominal charge of $2.00 per lamp per year. Two head lights or side lights would cost $4.00 and one tail light $1.00, making a total charge of the ac-



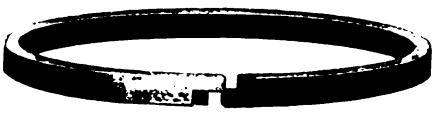
A New Motor Vehicle Lamp.

tual necessary lamps on a car $5.00. The makers maintain all renewals and repairs at their expense. This lamp will be manufactured by the Carbo-Gas Co., Gardner building, Kansas City, Mo.

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The Taylor Leakage-Proof Ring.

The Taylor Leakage-Proof ring is made for the Ford and 500 other makes and models of engines. These rings sell for 50 cents each in standard and oversizes. The Taylor is a strong, absolutely round, one-piece ring carefully machined



The Taylor Leakage-Proof Ring.

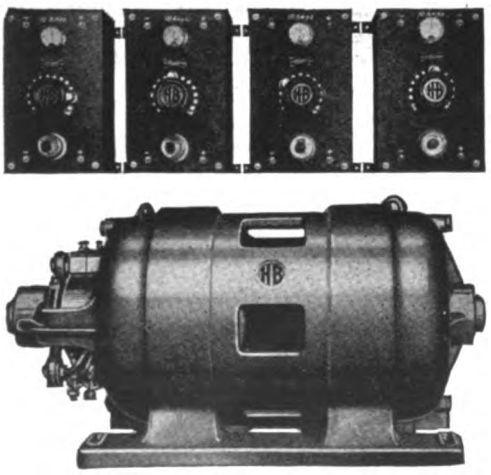
and ground to size. It is an eccentric ring with a joint which is absolutely leakage proof, compression tight and which is designed to compensate for wear and yet be gas-tight and oil-tight when the joint is open ⅛-inch. Manufacturers claim that this ring will stop loss of compression, oil throwing and carbon troubles. Also that more miles per gallon of gasoline and oil will be obtained. The danger of an accumulation of carbon, it is claimed, is largely obviated by the use of this ring. Readers who are interested should write direct to the manufacturers, G. H. Dyer Co., 155 Brookline street, Cambridge, Mass.

A New Charging Outfit.

For the garage man going into battery or service work on an ample scale, or for the garage that has outgrown its present equipment, Hobart Bros. Co., Troy, O., have brought out a new 32 battery capacity charging outfit shown herewith.

With the HB outfit batteries in all stages of charge can be handled by the four charging lines of this equipment, caring for eight batteries in each line. Batteries requiring different charging rates can be handled according to their individual needs, due to the ample output of the machine. Different voltage batteries can also be charged in the same line, due to the automatic voltage control of the generator.

With this ample capacity outfit, battery charging work is claimed to be very profitable, and the makers state they have designed the outfit wholly with the



38 Battery Charging Outfit Made by Hobart Bros. Co., Troy, O.

idea of bringing the garage the largest profits possible from battery charging.

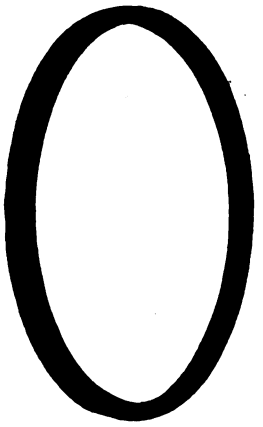
The outfit is sold on a payment plan, that should enable the equipment to pay for itself while being used. The selling plan calls for a reasonable initial payment and the balance to be paid in 10 monthly payments. Write the makers for full particulars.

A New Piston Ring.

The Albany Hdwe. Spec. Mfg. Co., Albany, Wis., have after years of study and experience with piston rings of various types, developed a ring held to be entirely new and radically different from anything of the kind yet produced.

The ring is a combination of two real eccentric rings, the kind most universally used, and fitted together sideways in concentric form by cutting each ring down to half its width or thickness, but leaving a part of each ring full width, which is in the form of a crescent shaped flange running nearly half way round and forming the inner surface on the thick side of each ring.

When the two rings, which are exact duplicates, are placed together the openings come diametrically opposite, the outer walls of the flanges lie against the inner surface of the thinner tapering end portions of each engaging ring section,



New Piston Ring Made by Albany Specialty Mfg. Co.

and thus seals the opening of each ring perfectly and completely at all times regardless of the amount of opening between the two ends, due to wear or when used in old cylinders worn large. The combined sections exert equal if not greater pressure on the cylinder wall than the single solid eccentric ring.

The makers claim that this type of construction completely eliminates the prevailing weak points in other forms of two or three-piece concentric ring construction, namely:

First, there are no pins to wear out, or break or weaken the ring. Second, no breakage from installing or removing so common with two and three-piece rings and easier to install than any common single piece ring. Third, no dragging of one section upon the other as with other multiple rings, thus leaving each section as free and quick of action as a single piece ring, so necessary in high speed motors, or in old worn cylinders. Fourth, no open ports to permit gas or carbon to get under the ring. Fifth, no unequal wear on the cylinder walls as with multiple rings of concentric type sections, or solid concentric rings, even when expanded to fit worn or rebored cylinders. Sixth, no short lap milled joints whose rough contact surfaces can never be made gas tight. The long lapped joints of this ring are practically as smooth and close fitting as a ground joint. There are many other good claims to be mentioned, and the makers declare the claims are all open to any criticism.

Krom-Nik Gears for Ford Cars.

Dealers could earn good profits by acting as agents for the Krom-Nik gears, which the manufacturers state will easily add 20 per cent. more power to the Ford car. The Krom-Nik-Anderson 4.2 to 1 ratio gear has a special type of tooth, unlike any other, which gives it additional strength and efficiency when needed. The 4.2 to 1 ratio of this gear is the lowest gear reduction possible in a Ford axle. The manufacturers claim that this device will save any Ford driver many dollars in repairs and loss of time and accomplish work impossible with the standard gear. For prices and particulars readers are referred to the attractive full-page advertisement published in this issue by the Krom-Nik Gear Co., Chicago, Ill. This advertisement contains a special offer to dealers, and no doubt a great many of our readers will be glad to fill out the coupon and send it in so as to take advantage of this very liberal offer, which gives an opportunity to try this gear on very favorable terms with a guarantee of workmanship and material for one year.

To Stop Ford Thieves.

The Security auto lock is being put on the market by the Security Auto Lock Co., New York, which company is owned by White Bros., 187th street and Grand Concourse, Borough of Bronx, and they are now appointing borough, city and county distributors.

The Ford Relief Spring Co., 7 East 42nd street, are the distributors for New York City, while Morris & Smith, 1995 Bedford avenue, are the distributors for the Borough of Brooklyn.

The Security auto lock is an innovation in the way of safety devices to protect a Ford and make it thief-proof. The lock is simplicity itself. The lock is a permanent part of the Ford, being placed directly under the steering wheel, applied by a special tool, and when locked cannot be removed even though you have the tool.

The principle of the lock is that it disengages the wheel from the steering post when the key is removed from the lock. In order to operate the car it is necessary to leave the key in the lock. When the key is removed the steering wheel is disengaged from the steering post and free to spin around like a top, and the front wheels of the car are wild. It is impossible to tow the car away.

The lock sells at the nominal price of $5.00, easily within the reach of every Ford owner, and is an insignificant amount to have your mind set at ease that your car is not being taken from the street or garage. The Yale tumbler, in conjunction with the lock, is an article of well-known quality.

The Vacuum Muffler.

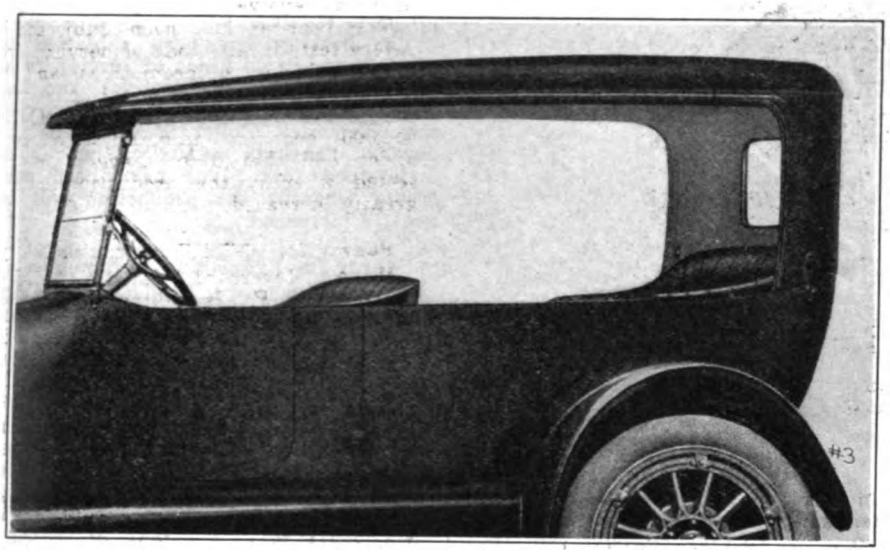
The manufacturers of the Vacuum muffler state that an engine develops more power and uses less fuel with the attachment than with a free exhaust. In this muffler the violent force of the charge is deflected against a series of cone, and split up into numerous small discharges, each of which is separated and evenly expanded to atmospheric pressure. These small discharges are delivered to the atmosphere one by one with scarcely any perceptible noise. It is claimed that no carbon gathers in the muffler and its construction does away with muffler explosions. It is rust-

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teed against blowouts. Readers who are interested should write for prices and particulars direct to the manufacturer, the Vacuum Muffler Corp., 154 Nassau street, New York City.

Rex All-Season Tops.

An innovation in tops in that it combines all of the advantages of a winter



For Summer Driving, All Panels of the Rex Sedan Are Removed and Stored Away. Note the Unobstructed View Afforded Passengers.

enclosure with the conveniences of the summer or touring car is the Rex all-season top, which is made by the Rex Mfg. Co., Connersville, Ind., and comes in sedan, coupe and roadster types for all makes of standard cars. A feature of the construction is that the side sections are removable and can be stored away when not in use, eliminating excess weight.

During the winter season the Rex-equipped car is entirely enclosed with all side panels snugly in position. Door windows have upper glass panels which may be lowered by the seated passengers; non-rattle fasteners hold these upper panes and simply turning screw heads causes these to free the glass and allow it to slide down in velvet-covered channels and rest on rubber bumpers, which also support the bottom glass. Practically any desired kind of ventilation can be obtained by opening the door-windows in combination with the windshield. The tonneau is illuminated by means of a rosette dome light.

In spring or fall all the sides may be removed, or the rear window panels may be left in place for back seat protection. As a summer car the Rex-topped automobile has sides unobstructed from windshield to the broad back window, giving a fine free effect of clean lines and complete ventilation.

The Rex top is specially designed and built for each different make of car on which it appears—to harmonize with the body lines and preserve the individuality of every model. Otherwise, the actual construction of the top, its mechanical features and general appointments are largely standard.

The Rex top is built of hard wood, is mitred and mortised, glued and screwed together and substantially ironed and braced. The deck is constructed of transverse bows which are covered with light wood strips. The back and rear section of the roof are reinforced with sheet steel.

The hard wood panel frames receive a rich satin finish as the result of many operations, including painting, varnishing and hand-rubbing. Door windows are of polished plate glass—stationary windows of crystal sheet glass—or furnished according to the specifications of buyer. Interior linings are made to match leather upholstery, gray cloth, or as specified. These are edged with braid or lace.

An Interview With F. C. Milhoff.

"Why should the motorist have his buying pervaded with the gambling element any more than any other type of buyer? Certain well-known brands of shoes, for instance, are known to give a definite service. Not one pair out of a hundred, possibly, falls short of expectations. We buy certain types of cars with the knowledge that a given mileage may be expected of them. Why potshot luck with tires? If you are fortunate you may get a tire that runs 5,000 miles. The next may close its career with a paltry thousand to its credit."

This was the vein in which Frank C. Milhoff, general sales manager of the Miller Rubber Co., Akron O., was discussing the tire situation of today. He justified the motorist in expecting tires of the same kind, subjected to like conditions, to render approximately the same mileage. He said that just such tires as these was Miller announcing in its big, powerful, national campaign. He said:

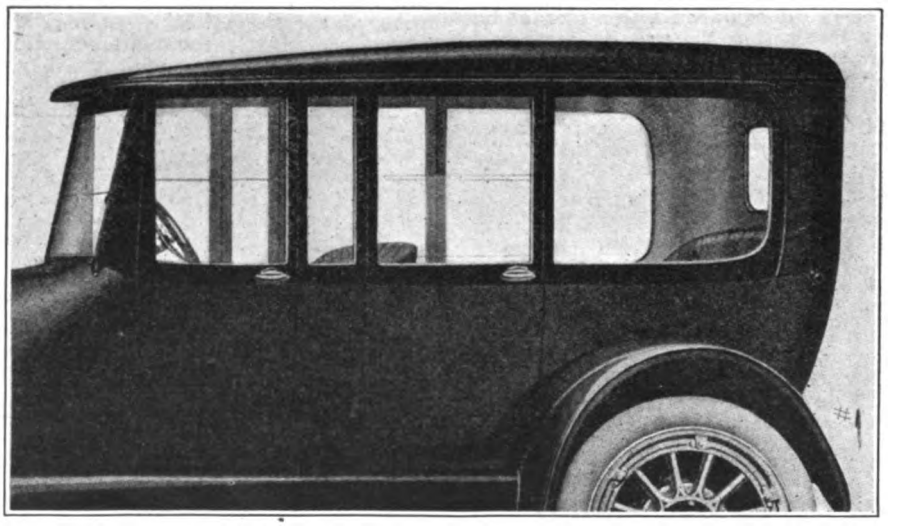
"Tires that are built uniformly, and as they are built in the Miller factory, do give uniform mileage—and the maximum. Exceptions may be found in any line. They're the lucky tires. They may give between five and 10,000 miles. But the manufacturer's problem has been to make every tire as good as his best.

"Miller, by confining the building of its tires to carefully recruited men, men whose ability has been proven by records scientifically kept, has at last solved the problem of making uniform tires. Now every Miller tire is made by master builders, whose average personal efficiency is 96 per cent. Not more than one tire in a hundred ever calls for adjustment.

"Such tires," the "Miller Man" concluded, "are indeed down to the instant tires. They are tiredom's finest example of conservation."

Hudson Motor Specialties.

An unusually useful and attractive line of automobile specialties is made by the Hudson Motor Specialties Co., 1606 Real Estate Trust building, Philadelphia, Pa. This line includes the Hudson universal jointed valve grinder, which is especially useful in grinding the valves on the fourth cylinder of the Ford engine, which is very difficult to reach with the ordinary grinder. Another Hudson specialty is the Hudson crankcase repair arm for Ford cars, which is a great time and money saver in making crankcase repairs. The Hudson automatic manifold air adjuster, made by the same company, automatically adjusts the air supply through the manifold, at all speeds from idling to highest engine speed. The Hudson demountable hub enables the car owner to change four demountable hub wheels while one demountable rim is being changed. The Hudson specialties were exhibited at the New York and Chicago shows and they will also be shown at the Boston show at the booth of the Motor Car Equipment Co.



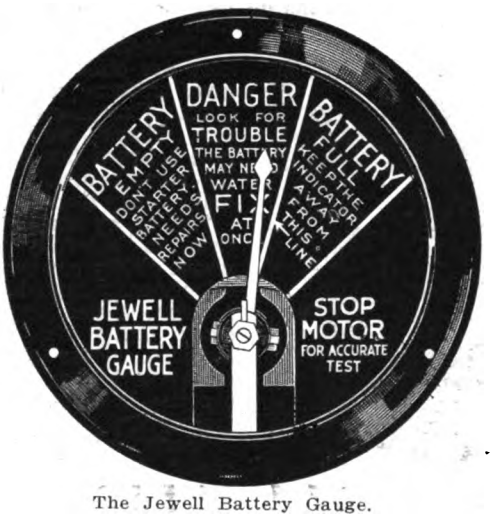
The Rex Equipped Sedan Completely Enclosed for Winter Driving.

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Jewell Battery Gauge.

Among the many automobile conveniences offered there is none so near an actual necessity as is the Jewell Battery Gauge, made by the Jewell Electrical Instrument Co., of Chicago, Ill.

The purpose of this instrument is to keep the car user constantly informed of the condition of the storage battery. This it does, not in a technical statement of volts and amperes, but in plain English that quickly warns the car user of any approach of trouble from any cause.



The Jewell Battery Gauge.

It also notes any discrepancy in the charging current. Indicates the existence of a short circuit, or insufficient water in the battery.

The instrument is made either flush or extension type, and can be located at any convenient point on the car, either on the instrument board or elsewhere. The wiring necessitates only connecting the two terminals on the instrument to the two poles of the battery. The current passing through the instrument is so slight (less than one-hundredth ampere) that the storage battery standing idle will discharge through the atmosphere faster than it could through the Jewell battery gauge. That this gauge is needed is clearly indicated by the warnings posted in every car equipped with a storage battery instructing the user to inspect the battery at least twice a month. The Jewell battery gauge gives this information constantly without the trouble of hydrometer tests and with far greater accuracy than is possible with such tests.

Electric Soldering Iron.

If any of our readers have had unsatisfactory experiences with an electric soldering iron, it can be confidently predicted that it was not made by the Dover Mfg. Co., Dover, O., New York office, 30 Church street. The Dover electric soldering irons are thoroughly practical and entirely reliable. See their announcement on another page and write for descriptive circular.

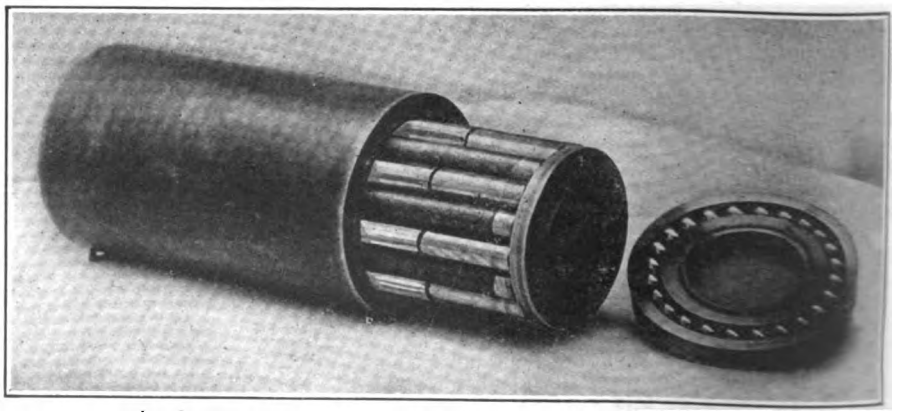
Important Correction.

In the January issue, also in a few copies of the December number, a very regrettable error was made in the advertisement of Chas. E. Miller, Anderson, Ind. In this announcement the price of the new 1918 model "4 Cavity" Miller vulcanizer was given as $50.00, although the correct price is $150.00. Of course Mr. Miller has been considerably annoyed by the replies to this advertisement and naturally he could not afford to sell this excellent vulcanizer for one-third of the regular price. This is one of the best tire vulcanizers for tire repair shops ever placed on the market, and it is only one of the 53 kinds and styles made by this manufacturer. Readers who are interested should write for price list and full particulars, also new 80-page catalog, to Chas. E. Miller, Anderson, Indiana, Dept. H.

Planetary Rubber Bearings.

A new type of bearing, one consisting of rollers operating without lubricant, and a construction that is claimed eliminates friction, is being marketed by the Planetary Roller Bearing Co., 53 West Jackson blvd., Chicago, Ill.

This roller bearing in its construction involves simplest mechanical principles. It consists of a number of plain bearing rolls, divided and fitted end to end, which revolve within a casing or box and bearing upon a shaft, spindle or axle. These rolls are alternated with an equal number of idlers, floating or separating rolls of a slightly less diameter at ends, and reduced to a still less diameter between each end, affording space for free circulation of air through the bearing, also reducing friction to the minimum, eliminating sliding contact with shaft and boxing, and making the bearing practically dust-proof.


The Planetary Roller Bearing Operating Without Lubricant and Held to Be Free from Friction.

The bearing works equally well at any rate of speed or under any load necessary. The load rests upon a small proportion of the rollers, which are constantly turning when in operation, rotating forward with the direction of travel of the wheel or shaft, the intermediate idlers, or separating rolls, revolving in an opposite direction without contact with shaft or axle, and lightly rolling upon the inner surface of the box. It will be understood from this that there is merely a contact at points upon which all parts revolve.

The bearing has been subjected to severe tests in all kinds of service, from motor vehicles to locomotives, and has proven efficient. The annual capacity of the Planetary Roller Bearing Co. is 500,000 bearings annually, but it is understood that plans have been perfected whereby the production will be greatly increased.

Panvar for Refinishing Automobiles.

H. A. Meyercord, Bulletin building, Philadelphia, Pa., is making a great campaign in the interest of Panvar, which is a wonderful refinishing flow-on material that anyone can apply to an automobile with assurance of complete success. Panvar is similar to the high gloss finishing varnish which body builders use as a final coat to give the car its luster. Unlike varnish, however, Panvar can, it is claimed, be applied by any amateur with assurance of complete success, as it is quick flowing, self-leveling and no experience is required. Panvar will not discolor from water or steam and is not affected by weather changes. It will not crack, craze or peel, and resists heat, acid and rust. It can be applied with a brush, spray or cloth and dries with a hard glossy finish in from six to eight hours. Panvar is a great seller and many dealers who read this will be interested. Mr. Meyercord is also pushing a carbon remover called Auto Power, which will be described later.

Carborundum Valve Grinding Compound.

This is a mixture of carborundum which is the hardest, sharpest and fastest cutting material known, and a high-grade grease. The manufacturers state that this compound is clean and free-cutting and that it quickly and easily cuts away the carbon and pit marks. It grinds with absolute uniformity, leaving a true, clean and unscored valve seat. This compound is put up in one and five-pound tins, coarse, medium and fine. A sample can will be sent on request if you write to the manufacturers, the Carborundum Co., Niagara Falls, N. Y.

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The Minute Wheel.

This picture shows "The Minute Man" in the act of removing a "Minute Wheel."

"One nut to unscrew"
That's all you do."

Does it sound too good to be true? However, with Minute Wheel equipment, the tires can be shifted very quickly. Only one tool is used—a large wrench.

Demountable rims drove out the old clincher rims. Now comes something better. By removing one nut, a spare wheel can be brought into action instantly. A tire can be changed in a minute—hence the name—Minute Wheel.



"The Minute Man" Removing the "Minute Wheel."

Instead of pounding, tugging and getting covered with dirt, Minute Wheels can be shifted by a boy or girl in a few seconds—no bother, no ruffled temper, no vexatious delay.

The new wheel is made by the Hill-Smith Metal Goods Co., Boston, Mass., to whom all inquiries should be addressed.

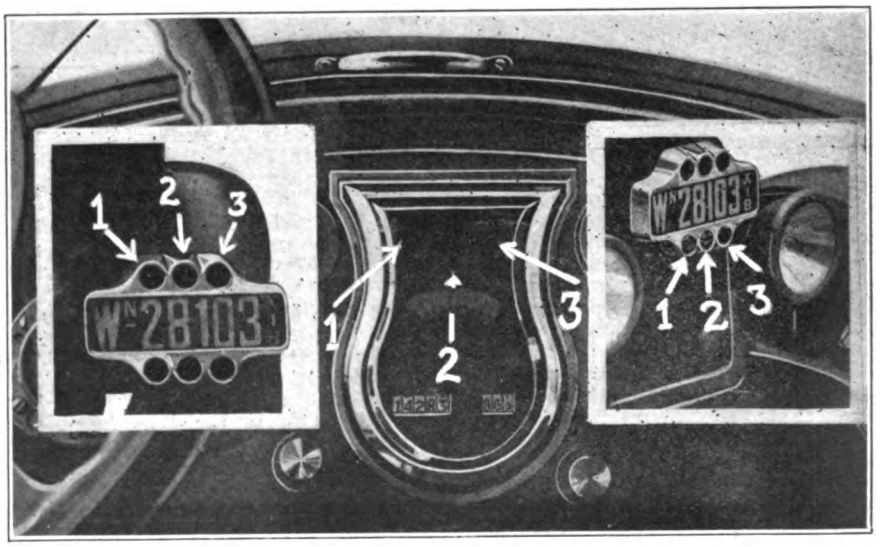
Benson Automatic Speedometer Signal.

A novel application of the block signal so successful in railway service is noted in the device being marketed by the Motors Appliance Co., East Moline, Ill. It is known as the Benson signal speedometer and permanent license number and has a number of useful features.

Not only is it a traffic signal, but it incorporates a speedometer, a bumper, and a transparent license number, above and below which are two series of eyes which indicate the speed at which the car is traveling at all times. Since there is nothing intricate to the signal, all the wiring being within a cable, installation is simple. A housing of sufficient size to accommodate a license number with enough margin above and below for the colored bull's-eyes is made for both the front and rear of the car. The speed-indicating part of the device attaches to the dash the same as any speedometer. The lower end of the arrow, which indicates the speed, travels across electric fields as the speed increases and lights the bulbs back of the bull's-eyes. Thus, when the speed reaches five miles per hour the light in the upper left burns and when the speed increases to 10 miles per hour the one beneath burns also. The same action takes place for varying speeds up to six lights, the last light coming on when the speed gets up to 40 or 50 miles per hour, according to the setting. Lights can be arranged to cover a wide range of speeds to conform with statutory limits.

Another feature which is in the interest of the car operator is an attachment to the bumper which, when pressure is put upon the bumper, closes an electric circuit and locks the pointer of the speedometer as well as the lights indicating the speed at which the car was traveling when the impact came. Only the traffic officer's master key can open the speedometer and release the pointer. Thus, when an accident occurs the operator of the car is protected if he is innocent and exposed if he is guilty of excessive speed.

The permanent license plate feature is designed to bring about a reduction in the theft of cars. Not only would it save the State a large amount of monev in the annual making of license plates, but if all cars once were given a permanent number, then none but new cars would have to be licensed and no one could get a number for a car that once had been registered without proving ownership.



Showing the Benson Signal Attached to Rear of Car at Left and In Front at Right. Center Illustration Shows the Device.

Important Consolidation.

There has been a consolidation of the Moline Automobile Co., makers of the Moline-Knight cars, and the Root & Van Dervoort Engineering Co. into Root & Van Dervoort Engineering Co., East Moline, Ill. The officers and management remains the same and there is no change whatever other than in the name of the company. In the past these two companies have always been virtually synonymous, operating, however, under the two firm names under the control of the same general officers.

The Root & Van Dervoort Engineering Co. was established in 1898, and since then has been extensively engaged in producing high-grade gasoline and kerosene engines known as "R. & V." engines.

The officials of the Root & Van Dervoort Engineering Co., realizing in 1904 that there was a big future for the automobile, took advantage of their extensive gasoline engine experience and founded the Moline Automobile Co. that same year. The product of this company was known as the Moline and later as the Dreadnought Moline, winning fame for the makers by winning a number of the prominent reliability contests in this country.

In 1913 the Moline Automobile Company adopted the Knight Sleeve valve motor as the power plant for their passenger cars, using the trade name "Moline-Knight." This car sprang quickly into prominence as the result of a public test under the auspices of the Automobile Club of America at New York in December, 1913. World records for power, endurance and economy were made during this 337 hour non-stop run under full load.

In 1916 the Root & Van Dervoort Engineering Company branched out into the manufacturing of special munition lathes and also filled a large contract on 8 inch high explosive shells for the British Government. When the United States entered the war, Mr. W. H. Van Dervoort, President and General Manager of Root & Van Dervoort Engineering Company, immediately offered to turn his entire plant over to the Government. This offer was accepted in part so today the huge factory is turning out large quan-

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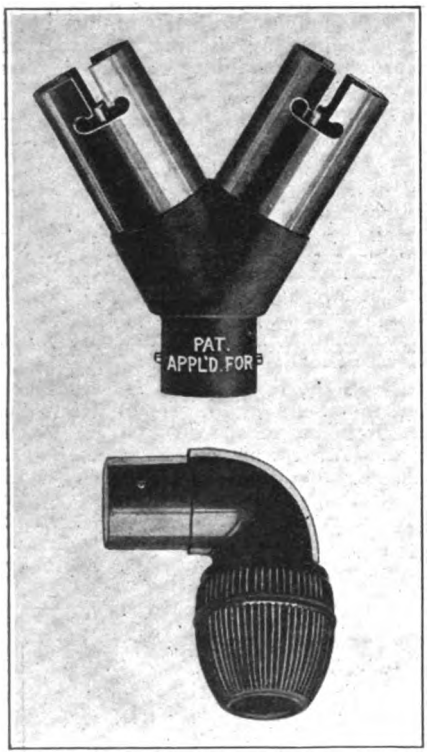
tities of necessary war material for the Government.

For the season of 1918 Root & Van Dervoort Engineering Company in addition to building Moline-Knight automobiles will have a big production of stationary engines, tractor and automobile motors, besides filling large United States Government contracts.

The Moline-Knight automobiles will be built in two chassis, one 40-H.P. and the other 50-H.P. known as the Models "C" and "G" respectively, with prices running from $1,650 to $2,280.

A Unique Accessory for All Cars.

The Metal Specialties Mfg. Co., Chicago, Ill., have again surprised the accessory trade by placing on the market the new and unique article illustrated herewith known as the 3P Double Outlet Y plug socket for automobile dashboards. This article has already demonstrated its usefulness and merits to many automobile owners. Unlike the straight plug socket, the little member of the well-



The 3P Double Outlet Socket.

known Presto accessory family is made in a Y shape. This shape converts a single outlet into a double outlet. By using this Y plug socket the owner uses his single dash lamp socket for two purposes at the same time; for example, one side of the plug may be used for spotlight and the other side either for an inspection lamp, regular dash lamp or cigar lighter.

The Presto Y plug has a standard Ediswan type plug connection on one end which can be plunged into any dash lamp socket on the dashboard of an automobile. The Y plug is neat and ornamental with the exposed parts handsomely nickel plated. It is made in the following styles: double contact, single contact, and double to single contact.

The factory of the Metal Specialties Mfg. Co. is located at 338-352 North Kedzie avenue, Chicago, and is the home of all the 101 useful Presto accessories.

A Large and Growing Wholesale House.

A. J. Picard & Co., Inc., who started business in a small way at 1720 Broadway, New York City, many years ago, and who have grown to be one of the largest automobile accessory jobbing and distributing houses in the United States, announce the discontinuance of their retail store at 1700 Broadway. Their business in future will be exclusively wholesale, and will be handled in their new building, Sixty-first street and Broadway. A. J. Picard, head of the company, has been identified with the automobile industry for 20 years and is the dean of the dealers. He at one time was the representative for the Darracq, when the motor car was looked upon as a curiosity, and drove one of the first road races ever held in this country. He has remained in the business continually and has seen it grow to be the second largest industry in America.

Picard & Co. cover all of the Eastern part of the United States with a sales force of 24 men, handling the entire line of motor car accessories, serving several thousand dealers. They are also Eastern distributors for the Stromberg carburetor, Gabriel snubber, Apollo Rubber Co., besides being national distributors of the Genemotor starting and lighting system for Ford cars, manufactured by the General Electric Co.

Worm Drive Axle.

The Standard Worm Drive Axle Co., 1801-1809 Belmont avenue, Chicago, Ill., is placing on the market a worm drive axle in two types. Type A being suitable for Ford truck attachments converting the Ford into a 1½-ton truck, and type B being suitable for trucks of any type of 1 to 1¼ ton capacity. These axles are made of the best materials and up to the highest engineering standards. Any of our readers who may be interested should write for quotations direct to the manufacturers.

Pasco Wheel Good Investiment.

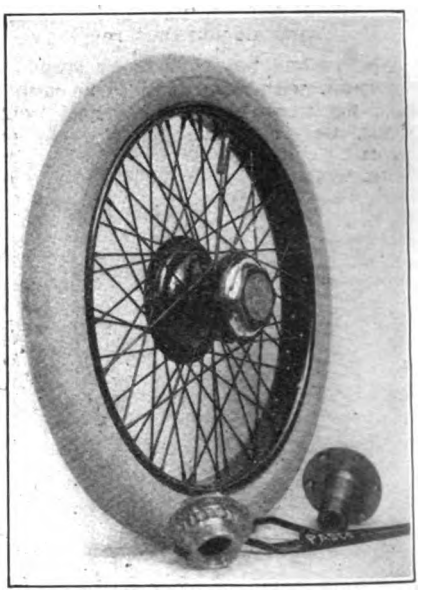
"Pasco" quick-change wire wheels prove of unusual appeal because of the three following distinct qualities claimed by the makers, the National Wire Wheel Works, Geneva, N. Y.:

First—The "Pasco" wire wheel has a patented method of rim punching and spoke lacing which makes it stronger than any other wire wheel and 60 per cent. stronger than wooden wheels. All spokes cross four others in both the front and rear rows, forming a strong double web in the spoke lacing of the wheel hub and rims. Previous methods only allowed two or three crossed spokes.

Second—The "Pasco" hub cap is made of a strong indestructible metal that stands up in crowded traffic collisions, where aluminum, brass, and other soft metal compositions will strain or break.

Third—The "Pasco" patented safe-locking hub cap positively locks itself and wheel on to the threads of inner fixed hub and axle and will never work loose or allow wheel to come off moving car under any circumstances. To remove the cap a safety lock must first be released, and then a wrench used.

"Pasco" wire wheels may be considered an investment. Due to their heat radiation, their lightness at the rim, and their resiliency, they are a great saver of tires and gasoline. They are designed for beauty as well as durability, and on account of the large beautiful hub used, they add a great deal to the appearance of the Ford car. The wheels are interchangeable on all hubs of the car, and the hub caps all have right-hand threads,



Pasco Quick-Change Wire Wheel.

making it very simple and easy to change a wheel.

A complete set is comprised of five 30 x 3½ plain clincher wheels, together with four inner hubs, four hub caps, dust cover for spare wheel and wrenches—everything needed for immediate installment on the car. Bearings are included with front inner hubs.

For details, etc., write Dept. K of the maker.

The Mayhew Curtain.

The Sutter-Mayhew Co., Detroit, Mich., is marketing the Mayhew adjustable curtain for motor vehicles, which presents a number of interesting as well as practical features. The device enables the driver to control the temperature of the engine by so adjusting the curtain that the amount of radiator surface ex-



The Mayhew Adjustable Curtain Regulating from the Seat the Amount of Radiator Surface Exposed to the Air.

posed to the air is regulated. The curtain is controlled from the seat, the actuating member being attached to the dash and out of sight. The curtain

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$3
per set of 3

Saves Ford Rear End

Rear end trouble! That's a big bugaboo with Ford owners. One of the chief contributing causes is inefficient transmission lining. It gets hard and polished —then grabs and slips—and *then* there's *trouble to pay*. The Ford comes to a stop amid heavy vibration and noisy chattering. The back end vigorously jumps up and down. The *direct shock* of this vibration is communicated through the drive shaft and gearing to the rear axle. No mechanism can stand such strain indefinitely. Rear end trouble is the *natural result*. Cork Insert Transmission Linings stop the grab and slip—eliminate the chatter and permit velvety smooth transmission action. They *save* the Ford rear end—prolong greatly the life and efficiency of the car. This alone would make the use of these linings economical and advisable. In addition they outwear two to three sets of ordinary linings.

A Non-Slip Fan Belt for Fords

Cork Insert Products Exhibited at New York and Chicago Shows



One Dollar for 1917 Fords
85c for preceding models

Authorities say that up to 50% of the "drive" goes to waste from slippage in the ordinary Ford fan belt. It gets so hard and glassy that the fan speed is reduced, the engine is not properly cooled and overheats. Cork Insert Fan Belts do not slip—they keep the fan fanning, keep the engine cool, are very long lived and economical.

Advance Automobile Accessories Corporation
Dept. B 5-1
56 East Randolph Street
Chicago

Dealers:

Order Cork Insert Transmission Linings and Fan Belts from your jobber. Ask him how Cork Inserts are moving. He will tell you they are a BIG WINNER. Stock them — recommend them — push them. They will make you a lot of profit.

Dealer's Coupon

Check and Mail today

Advance Automobile Accessories Corporation
Dept. B 5-1 56 E. Randolph St., Chicago

- ☐ Send one dozen sets of Advance Cork Insert Transmission Linings for Fords.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford.

(Regular dealer discounts to apply.)

Name .....

City ..... State .....

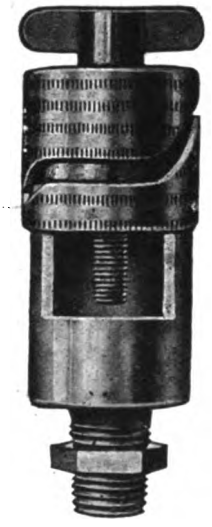
Jobber's Name .....

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proper is mounted on a neat bracket that is attached quickly and easily to the front of the car by means of two simple brackets. As may be noted by the accompanying illustration, the curtain when installed is hardly noticeable. This device is not for winter use alone, but can be employed on cool days. Details and prices of the Mayhew adjustable curtain will be supplied by the makers.

Noreca Grease Cups.

We wish to call the special attention of the trade to the Noreca grease cups manufactured by the Greist Mfg. Co. New Haven, Conn. The illustration shows the Noreca Gun-Kup, style A, showing plunger. It is a grease gun as well as a grease cup. When open it holds twice as much grease as closed. The act of closing it, which is a simple half turn, forces one cupful of grease at once into the bearing, leaving a cupful to be injected with the plunger as needed. The same company also manufactures several styles of plain cups. The Noreca, as illustrated, has several exclusive features, including a non-removable



Noreca Gun-Kup Grease Cup.

cap, half turn to open or close, cam action; no threads, positive lock, fills from the side, grease gun action in closing, multiple seal with expanding sleeve and opening for filling is in the most convenient position. Many of our readers are likely to be interested in this product and all such should write for prices and particulars direct to the manufacturers.

New Compound for Preventing and Removing Carbon.

A new preparation has been recently put on the market by Grace & Co., 3205 W. Washington street, Los Angeles, Cal. This compound, it is claimed, when mixed with the lubricating oil in an internal combustion engine will positively remove and prevent the further accumulation of carbon. It provides a harmless film on pistons, rings and cylinder walls, thereby increasing compression, and keeping the lubricating oil and fuel separate prolongs the usefulness of both.

Where this compound is used it is said to obviate the frequent cleaning of spark plugs, grinding valves, etc., as well as increase the power and mileage and save oil and fuel. This compound contains no acids, alkalis or chemical ingredients, and it is absolutely guaranteed to have no action on metals of any kind. The manufacturers are willing to send a sufficient amount of this compound to neutralize five gallons of lubricating oil for the small sum of $1.00 with simple directions for using, and they state that while this five gallons lasts there will be no trouble with carbon in the engine.

The Roof-Peugeot Cylinder Heads for Fords.

This is a cylinder head designed to increase the speed and pulling power of the Ford engine. Every Ford owner is a likely prospect for this specialty and dealers, garage men and repairmen throughout the country are selling a large number of these heads. The Roof-Peugeot cylinder head can be quickly and easily installed by any mechanic. It replaces the old cylinder head and has rocker arms, which are operated by the regular or Ford camshaft. Readers who are interested should write for prices and particulars direct to the Roof Auto Specialty Co., Union building, Anderson, Indiana.

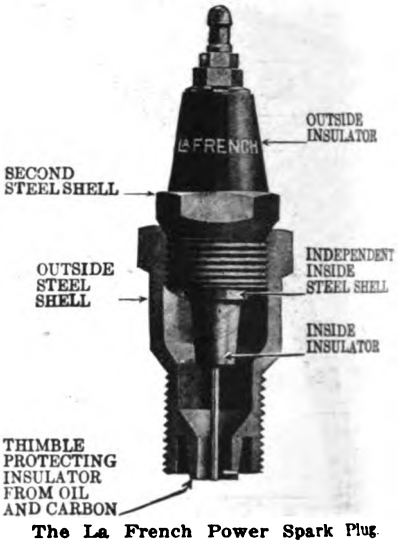
A Million Dollar Organization.

The Acme Motor Truck Co., Cadillac, Mich., formerly known as the Cadillac Auto Truck Co., manufacturers of the Acme truck, has increased its capital stock to $1,000,000. A very substantial dividend on the old capitalization was recently declared which is indicative of the company's growth in 1917. This company plans to double its production in 1918. Substantial additions to its present well designed plant are contemplated in the early spring. The affairs of the company are being conducted on a safe, sane basis. Every dollar of its capitalization has represented a dollar paid in. There has been no stock exploitation and no solicitation of stock sales. It is a home-owned organization and as the company has developed, each succeeding stock issue was quickly taken with local capital.

A program of building and expansion covering a period of five years has been mapped out by the officials of the organization. The Acme line consists of 1, 2, 3½ and 4-ton worm drive trucks. The company also specializes in body building in its own plants.

The LaFrench Spark Plug.

An accompanying illustration shows in detail the LaFrench power spark plug which has just been placed on the market. This plug is of unusual design and is built with telescopic tapered fittings which are assembled from the bottom up by hydraulic pressure, making the plug absolutely compression tight. The insulator is a mica composition, perfectly compressed and confined and which the manufacturers claim is not affected by heat, moisture or oil. It is stated that this plug produces the hottest spark ever produced by a plug; that it ignites the maximum amount of pocketed gas, thereby developing a remarkably increased power and mileage. The LaFrench has an independent inside steel shell which likens the plug to a dynamo and creates an electrical current that is transmitted with the least possible resistance. At the bottom of the plug there is a unique thimble arrangement which is devised to reduce to a minimum the accumulation of carbon within the plug. The complete plug is of two independent parts which can be taken down and cleaned in the most simple manner. On actual tests in engines of all kinds, LaFrench has proven a remarkable success even when used with very low test gasoline. After a motor boat test was made at Minneapolis



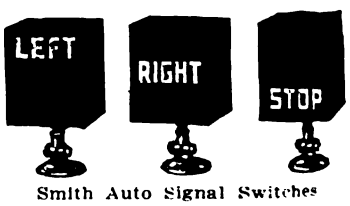
The La French Power Spark Plug.

recently, one of the engineers stated that he believed LaFrench will revolutionize ignition. Interested parties can secure additional information regarding this new accessory by writing the LaFrench Power Spark Plug Co., E. First avenue, Columbus, O.

Smith Auto Signal.

We illustrate herewith the new Auto Signal, which has recently been brought out by the Smith Signal Corp., 5355 West 66th street, New York City. This signal is not automatic, signalling electrically only when you want it to, giving definite information and warning when needed in ample time to guide both those in front and back of you. It operates from plainly marked, single handle, three-way switch, as shown in the illustration.

A front view of the car with the Smith Auto Signal installed is also



Smith Auto Signal Switches



Front View of Car Showing Smith Signal.

shown. This device provides cheap insurance known against accident and the fear of accidents. This is a quick seller and readers who are interested should write direct to the Smith Signal Corp. for prices and full particulars.

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Now Travel in Safety

Your journey is safeguarded. There's comfort in the knowledge that delay and accident will not befall. As you choose the railroad which assures you greatest safety, so insure against serious trouble and delay when motoring by insisting on guaranteed Titanic Springs.

Three out of four automobile springs break in the center—because center bolt holes or center nibs weaken the spring at this vital point. Tuthill Titanic Springs have no center hole bolt or nib, and are guaranteed *forever* against center breakage. If you value safety and economy, replace with

TUTHILL TITANIC SPRINGS
LUBRICATED

More replacements are made with Tuthill Titanics than with any other makes of springs combined. There is a Titanic dealer within your easy call. Nowhere in the United States can a garage man or motorist be more than thirty minutes to three hours away from a stock of these better springs.

Strongest Where Others Are Weakest

Our new stock room maintains constantly the largest and most complete stock of automobile springs in the world. We carry in stock springs for all leading makes of cars and can supply in a very short time, springs on almost any car made.

Don't take a long chance on springs weakened by center bolt or nib holes. Replace with Tuthill Titanic Springs now—before that accident occurs.

DISTRIBUTORS AND DEALERS: Write at once for complete new price list. Tuthill Titanics mean quick money and the lasting confidence of your customers. Complete list of Distributors in Chiltons and Auto Trade Directory.

Tuthill Spring Co.
(Established 1880)
760 Polk Street Chicago, Illinois



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Tuxedo Tires.

The Tuxedo Auto Tire Exchange, 304-K West 54th street, New York City, has an announcement in this issue in which they state that big money can be earned by live dealers by handling their line of Tuxedo tires. These tires are guaranteed for 3,500 miles, but they are low in price. A complete stock of these tires is always carried in all sizes, plain and non-skid. Only one dealer in each town is allowed to handle this product and dealers who are interested should write for prices, discounts and full particulars.

Halladay Standardized Bumper Unit.

The small dealer has heretofore been confronted with a serious problem in the way of meeting the immediate requirements of his trade without carrying an extensive and consequently expensive stock. Numerous bumpers have been produced with an idea of universal adaptability, but with only limited success.

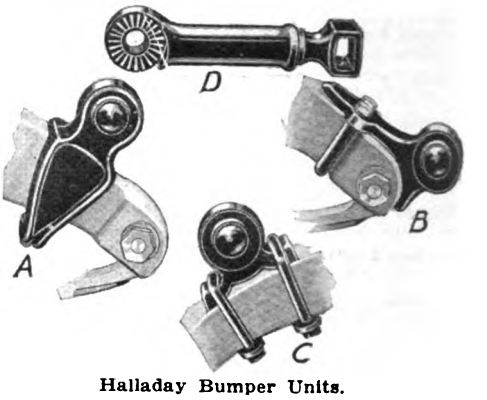
The Halladay standardized unit is not a single bumper built with an attempt to fit any kind of car, but consists of four fittings, three frame clamps, and a bar support. One of these clamps, fitting A, is designed for use on any frame the outside of which is exposed for a distance of four inches or more back of the spring connections, regardless of splash aprons on the outside.

The next fitting, B, is an under thrust support, and may be used on any frame on which there is room for a single clip, directly back of the spring connections.

The third fitting, C, is primarily designed as a rear fitting and works equally well on three-quarter elliptic springs and rear frame extensions. On rear frame extensions placed so close to the gasoline tank that no room is allowed for the clip part of fitting C, fitting A will often be found to work perfectly. The bar support, D, fits all these frame connections and, being pivoted, may be adjusted to any frame angle. This support fitting is furnished in both eight and 16-inch extensions for cars carrying one or two tires.

The small dealer provided with these four fittings, and a stock of Halladay bars, is in a position to meet the requirements of practically all cars provided with front frame extensions, and with a decided selling advantage from attempts at universal adaptability, that the bumper to his customer becomes one special design for that car.

The Halladay line also includes special

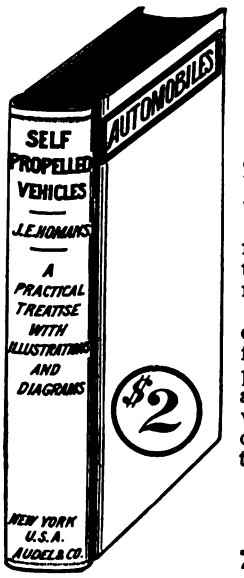


Halladay Bumper Units.

bumpers, designed for the front and rear of cars such as the Briscoe, Buick, Cadillac, Chevrolet, Cole, Dodge, Overland, Packard, Saxon, and others of such distinctive frame constructions as to require bars especially and exclusively therefor.

For prices and particulars write to L. P. Halladay Co., Chicago, Ill., or branches.

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$1.00 Per Year



Auto. Educator.

EVERY OWNER, OPERATOR AND INTENDING PURCHASER SHOULD HAVE THIS WORK.

This book was written to meet the need for a simple but comprehensive treatise of motor car construction and care—a book that is not only a necessity to the motor car owner, but also useful to the skilled engineer and mechanic.

Being clear and concise in its treatment of the subject, and is comprehensible to the most inexperienced man. At the same time it is so thorough and detailed that the expert will learn much from its pages.

The treatise on gasoline cannot fail to prove valuable to any one interested in explosive motors, which are daily coming to the front as the readiest and most convenient source of power. ¶The price of this popular edition is $2.00, and as an insurance against accidents, caused by ignorance of the principles of operation—of which there are a lamentable number recorded every day—no one interested in the subject can afford to do without a copy of this timely volume.

Sent Postpaid Upon Receipt of Price, $2, by
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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

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(CLUTCHES)

TO FIT

ABBOTT

Model	Net Each
44 H.P. Disc complete	$3 00
44 H.P. Facing (Raybestos)	.90
44 H.P. Facing (Cortex)	.60
44 H.P. Plain	1.00

BERGDOLL

30 H.P. Disc complete	2.00
30 H.P. Facing (Raybestos)	.90
30 H.P. Facing (Cortex)	.50
30 H.P. Plain	.90

CHALMERS

30 H.P. Copper	.30
30 H.P. Steel	.15
36 H.P. Steel	.15
36 H.P. Copper	.30

GRABOWSKY

Two cylinder complete	3.50
Two cylinder facing (Raybestos)	1.00
Two cylinder facing (Cortex)	.60

HUDSON

1911—33 H.P. Plain	1.00
1912—33 H.P. Plain	.50
1913—37 H.P. Plain	1.00
1911—33 H.P. Corked	3.00
1912—33 H.P. Corked	1.25
1913—37 H.P. Corked	1.25

We Also Carry Discs in Stock To Fit:

Alco	Velie
Case	Ewing
Speedwell	Lozier
Maxwell	Jordan
Mercer	

Diamond T Truck and others

Cortex) linings listed above are a special hemically treated cork compressed into lin-1. Contains no wire, and will eventually upplant the Raybestos type which causes ie clutch to slip after very little use. (Note w cost of same.)

'e also maintain in stock complete clutches fit these cars.

ll parts are brand new and can be fur-shed at once, as we maintain a complete rvice for over 40 makes of cars at dis-unt.

Bulletin No. 2

I. C. Gorey & Co.

Pioneer Parts Experts

54 West 50th St., New York

Telephone 9489 Columbus

Tires

BUY EARLY AND SAVE MONEY

Double Tread Tires and Tubes

GUARANTEED

Come to the Tire Clearing House—here are prices—clear cut and plain as daylight. We buy wholesale the best "try out" Tires—and you get the benefit—you want truthful tires, and truth is never crushed to earth if given a square deal—real truth is puncture proof—

SO ARE OUR TIRES.

Size	Plain	Non-Skid	Tubes
28x3	$4.40	$4.95	$2.00
30x3	5.50	6.05	2.00
30x3½	6.60	7.15	2.50
32x3½	7.15	7.70	2.75
34x3½	8.25	8.80	3.00
30x4	7.70	8.25	2.75
32x4	8.80	9.35	3.00
33x4	8.80	9.90	3.50
34x4	8.80	9.90	3.50
35x4	9.90	11.00	3.60

Get your order in quick for goods listed here—by all means get in touch with us for further information about our special process—it means money in your pocket. Get in right—write today—yes—today.

Look up rating in Dunn's or Bradstreet's.

Size	Plain	Non-Skid	Tubes
36x4	$9.90	$11.00	$3.60
32x4½	9.90	11.00	3.75
34x4½	11.00	12.10	4.00
35x4½	11.00	12.10	4.10
36x4½	11.00	12.10	4.25
37x4½	12.10	13.20	4.35
34x5	11.00	12.10	4.50
35x5	13.20	14.30	5.00
36x5	13.20	14.30	5.00
37x5	13.75	14.85	5.00

For (non-skid) sizes up to 32x4, 50c extra; all other sizes $1.00 extra.
For rebuilding your old tires we charge you 60% of the above prices.

B. LIBEN & COMPANY

261-A West 54th Street **NEW YORK CITY** **112-A East 110th Street**

THE HOME OF DOUBLE TREAD TIRES

The Junk Man Won't Pay What We Say Old Tires Double Treaded Are Worth

Two of your worn tires double treaded by the McDaniel process make the cheapest known new tire. Doubles strength and thickness. Puncture and blow-out proof for thousands of miles.

Size	If you furnish 2 Casings	If you furnish 1 Casing	If I furnish Both Casings	Gray Tubes
28x3	$3.00	$4.75	$6.50	$2.50
30x3	3.25	5.00	6.75	2.60
30x3½	4.00	6.00	7.25	2.95
32x3½	4.25	7.25	9.00	3.10
34x3½	4.50	7.50	9.25	3.25
31x4	4.50	7.75	9.50	4.05
32x4	4.75	8.00	10.00	4.20
33x4	5.25	8.25	10.25	4.30
34x4	5.50	8.50	10.50	4.40
36x4	5.75	8.75	11.00	4.60
34x4½	5.75	9.00	11.50	5.50
35x4½	5.75	9.25	12.00	5.60
36x4½	6.00	9.50	12.50	5.70
35x5	6.25	10.50	13.50	6.70
37x5	6.50	11.50	15.00	6.95

Ship Your Old Tires by Prepaid Express
McDANIEL RUBBER CO.
613 Ohio Street **Cairo, Ill.**

Double Tread Tires

Notice Our Prices Before Going Elsewhere

PRICE LIST

Size	Plain	Size	Plain
30x3	$5.00	35x4	$9.00
30x3½	5.50	36x4	9.50
32x3½	6.50	36x4½	10.00
32x4	7.00	36x5	10.00
33x4	7.50	37x4½	10.00
34x4	8.00	37x5	10.50
34x4½	8.50		

For Non-Skid, 50 cents more on all sizes.

We Carry a Full Line of New and Used Tires & Tubes

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Wonderful Opportunity!

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inner armor for automobile tires. Double mileage. Prevent punctures and blowouts. Details free. Agents wanted. Big profits.

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NEW AND SECOND HAND

Tires and Tubes

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fitting with light grey iron pistons, leakless rings, hardened and ground pins, our work has no comparison with the ordinary, now obsolete heavy type pistons and rough boring jobs. We grind our cylinders to one-half thousandths, mirror finish. We grind our pistons on the highest grade machines to fit, two and one-half thousandths clearance. We use the McCadden leakless piston rings. Work all re-assembled ready for installation. All work positively guaranteed.

Patterns and castings in stock for every make of motor.

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Quality work. Get our prices.
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CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

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FOR SALE—Various makes of 4, 6 and 8 cylinder Magnetos, headlights, sidelights and searchlights for automobiles which have been used for experimental work. Also several types of watthour meters which have been used for testing purposes. Write for particulars to P. O. Box 1027, Rochester, N.Y.

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Lighting Systems and Self Starters.
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Bosch High Tension, $15 up
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PAIGE-DETROIT
rear axle bevel gears and pinions
These are all new parts.
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SAVE 50% TO 75% ON PARTS—Parts for Pope-Hartford, Columbia, Reo, Buick, Overland, Chalmers, Mitchell, Thomas, Oldsmobile, Maxwell, Stoddard-Dayton, Stevens-Duryea, Corbin, Cadillac and all others. Eiseman, Splitdorf and Remy magnetos, $5.00 to $10.00. Bosch high tension magnetos, $15.00 to $25.00. Also the Mea, Connecticut National, U. & H. and K. & W. magnetos in stock. Springs, wheels, axles, etc., for all cars. Connecticut Auto Parts Co., Inc., 1676 Main St., Hartford, Conn.

Patent Attorneys

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

WANTED—AN IDEA! WHO CAN THINK of some simple thing to patent? Protect your ideas; they may bring you wealth; write for "Needed Inventions" and "How to Get Your Patent." Randolph & Co., Dept. 251, Washington, D. C.

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Attorney at Law and Mechanical Engineer
470 Whitaker Bldg. Washington, D. C.
Inquiries Invited

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RADIATORS REPAIRED
We also make and repair
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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 317 West 57th St., New York City.

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All sizes in stock

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Houpert Machine Co.

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Personal

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New Branches for Staybestos.

The Staybestos Mfg. Co., Philadelphia, Pa., well-known manufacturers of brake linings, packings, radiator hose, etc., for the automobile trade, have opened two new offices, one in the Kerr building, Detroit, under the management of W. C. DuComb, Jr., and another at 608 South Dearborn street, Chicago, Ill., with Edwin E. Coith as manager. The factory and main office of the Staybestos Mfg. Co. is at 5518 Lena street, Germantown, Pa.

Dayton Wire Wheels for Chevrolet Cars.

The Dayton Wire Wheel Co., Dayton, O., is now manufacturing the Dayton wire wheels for Chevrolet cars. These wheels are constructed after the design of the wire wheel for Ford cars, which this company has been manufacturing for some time. It is claimed that the patented triple-spoke lacing of the Dayton wire wheels makes them five times as



Dayton Wire Wheel for Chevrolet Cars.

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Just a Pull of the handle of The Simplex Starter

The luxury and safety alone worth many times its price. A boon to women drivers. Easy to operate and starts motor instantly. All except the handle under the hood.

Fits any Pleasure or Commercial Ford

No complicated parts or gears. Proven satisfactory by more than sixteen thousand Ford owners in past three years. Guaranteed.

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your lights with lenses, DON'T turn out your lights with dimmers.

TILTING increases your light, eliminates glare and is legal everywhere.

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The Highest Achievement in Spark Plug Construction—Master Calorite Spark Plugs ultra sturdy will endure the severest requirements of legitimate service—They anticipate the possibility of mechanical carelessness—Generously guaranteed.

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Pays for itself many times in gasoline saved. Eliminates leg strain on long trips. $1.25

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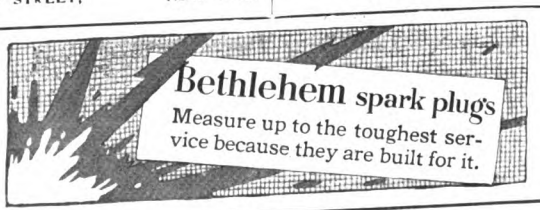
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Branches in All Principal Cities

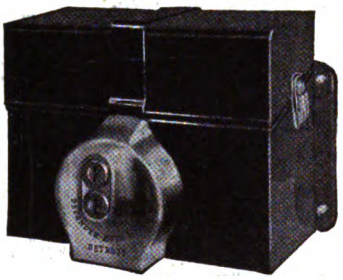
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A beautiful, polished, solid Aluminum case locks over switch. (Patent pending.)

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and costs no more than others

Operates against the ignition by special grounding device. (Patent pending.)

Guaranteed for the entire life of a car, and backed by a company fulfilling every sound business principle to the last ditch.

Recognized and used as a standard of perfection by Insurance Underwriters, and saves 15% on insurance.

The DEFENDER Lock is a double protection for FORD cars left at the curb, or in an unprotected garage. Its hold is secure. Yet it in no way changes the equipment, ignition or wiring of the car.

Locks the Ignition Off and the Coil Box Shut

It takes less than 10 minutes to install the DEFENDER Lock on any Ford car. There are no holes to drill or bolts to fasten, and when the lock is on no screws are exposed. It is indestructible, and cannot be broken with a hammer.

No automobile thief—regardless of how well he may know the mechanism of a Ford car—can tamper with this lock and beat it. It is the simplest, yet the strongest lock made. With it more than a million combinations are possible.

The DEFENDER key gives you easy access to the coil box for adjusting vibrators—but this access is obtainable in only one way, WITH THE DEFENDER KEY.

DEFENDER LOCK SELLS FAST

DEALERS know what lock sales are once they handle the DEFENDER. The price is right for Ford cars. The protection is complete. Ford owners demand DEFENDER. Thousands are ready for Spring sales.

Write for free illustrated literature and complete details.

Defender Auto-Lock Co.

Manufacturers of

Defender Locks for Automobiles

506-8 Marquette Bldg., Detroit Mich.

Canadian Address: No. 3 Ouellette St., Windsor, Ont.

Ford

AUTOMOBILES ACCESSORIES SUPPLIES AND REPAIRS

Ringsrud's Fireproof Garage

A. H. RINGSRUD, PROP

Elk Point, So. Dak.

December 5th, 1917.

The Defender Auto Lock Co.,
Detroit, Mich.

Gentlemen:

Enclosed please find my check amounting to $80.32 to pay your invoice #1524 for $82.80, less your 3%.

The locks are the best we have ever seen and sell like Hot Cakes. We have handled other locks but have never found one that is as good as yours.

Yours very truly,

Ringsrud's Fireproof Garage,

By _____ Prop.

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No gap!

Gas cannot get through or past the Inland.

Expands in a perfect circle

against the cylinder wall, making a complete seal.

It seats quickly

because the elliptical ends are bent in.

The Inland is not only mechanically perfect, but its simple one-piece construction allows a low selling price, so that dealers can save car owners $5 to $10 per set over any other type of gas-tight piston ring. This exclusive combination of advantages featured in our full pages and half page ads in

The Saturday Evening Post
Literary Digest **Collier's**

is making the Inland the biggest seller everywhere—already 1,500,000 in use.

INLAND
1 PIECE PISTON RING

If you are not handling Inlands, you are not getting the big business that would come to you if you had the Inland sign on your store. *Get it there.* Write for our proposition today.

Inland Machine Works,
802 Mound St.,
St. Louis,
U.S.A.



Low priced

because of its simple one-piece construction.

Its Spiral Cut is patented—

its advantages cannot be duplicated in any other ring at *any* price.

Strongest and most durable

because equal width and thickness all around.

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Makes Night Driving Sa

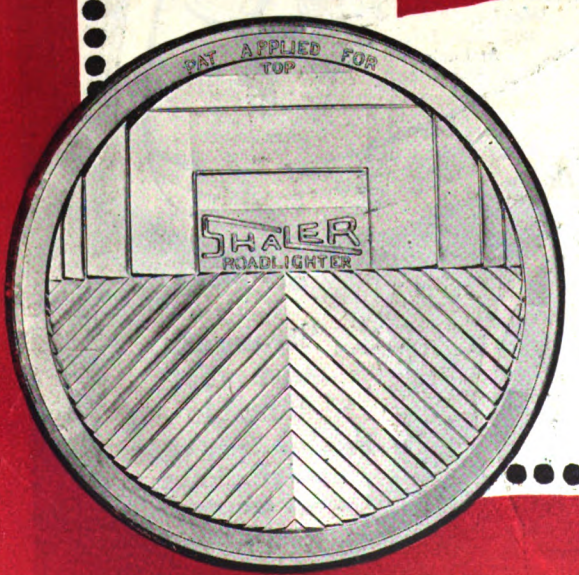
The motoring public has been waiting for a headlight front that performs three distinct functions:

1. To prevent glare from the lights on your own car.

2. To give you a *strong* driving light — so strong that no matter how intense the glare from the approaching car, you will not be blinded but can see the edge of the pass in safety without sl

3. *To make night driving* intensified bright white lig distributed by prismatic road where you need it, s the road, ditches and da plainly as in daytime.

SHALER



The SHALER Roadlighter light—which with an ordinary extra light on the road. At feet ahead of the car the li approximately twice the intens bulb of the same candle powe a clear glass headlight.

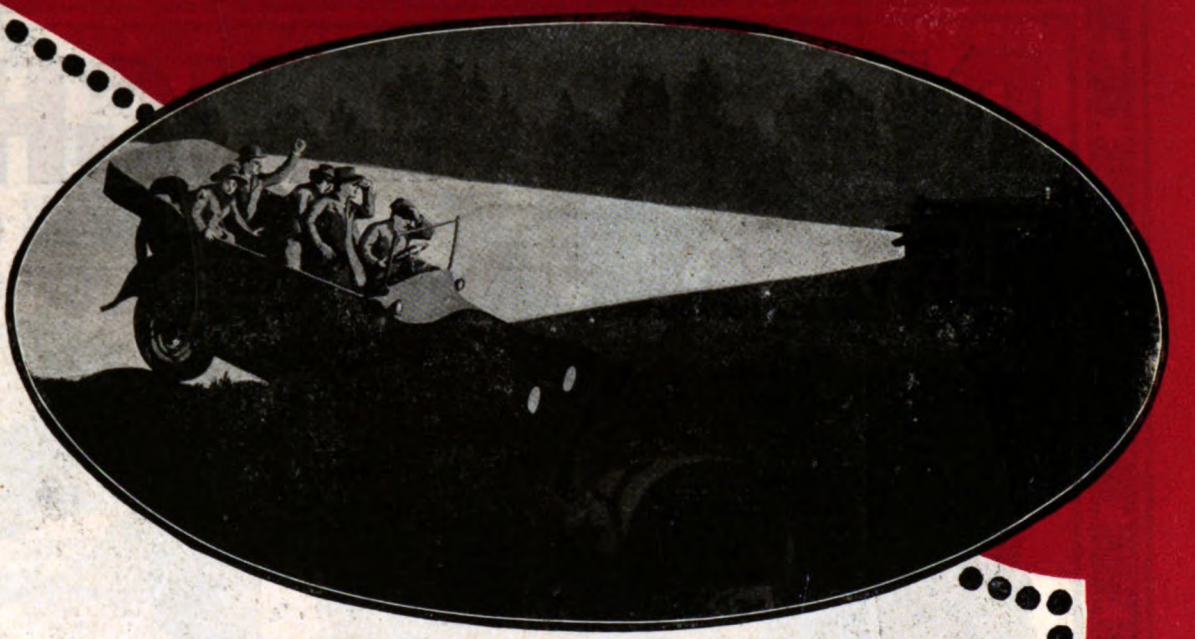
It obviates the need of d auxiliary headlights and high c which drain the batteries and im

It pierces fog farther than yo it by daylight. Its smooth fro mud, snow or dirt.

C. A. Sh

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SHALER Roadlighters on Either Car Would Insure Safety



Prevents Accidents Like This

The danger of night driving is banished because *the other fellow's glare can't blind you* and your light cannot bother him, if your car is equipped with SHALER Roadlighters. You have intense light from fence to fence that enables you to pick the best part of the road and drive at daylight speed in perfect safety.

The SHALER Roadlighter throws concentrated beams on the edges of the road such as could only be obtained by using a spotlight on each side of the car. This beam is so strong that it counteracts the glare from approaching headlights and enables one to keep a clear view of the edges of the road while passing.

ROADLIGHTER

Pierces the Glare of Approaching Headlights
Illuminates the Ditches
Accurate Focusing Unnecessary
Easy to Keep Clean

Shoots the Light Far Ahead
Legal Everywhere
Rays Penetrate Fog and Dust
Easy to Install

Limited Offer to DEALERS ONLY

Regular retail prices of the SHALER Roadlighter are $2.75 per pair for Ford size and smaller; $3.50 for larger sizes. Packed ten in a carton.

We want every automobile accessory dealer in the United States to try out a pair of SHALER Roadlighters on his own car—*at our expense.*

Mail the coupon for full particulars regarding this big offer. There is no obligation—don't put it off—clip and mail coupon *now.*

9802 Fourth St.
Wisconsin

Dealers' Offer Coupon

C. A. SHALER CO., 9802 Fourth St., Waupun, Wis.

Gentlemen: Send me full particulars about your offer to let dealers try out a pair of SHALER Roadlighters at your expense. This obligates me in no way.

Name .....

Address .....

City and State .....

My Jobber's Name Is .....

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DREADNAUGHT TIRES



NEVER in the history of this country has conservatism been so forcibly urged. In all walks of life the individual is seeking the utmost for the dollar expended. The DREADNAUGHT TIRE is a supreme example of the spirit of the times. Its very name proclaims its ruggedness, doggedness and its ability to withstand the hardest wear and tear.

GUARANTEED 5,000 MILES

but good for many hundreds more.

Made in two treads—the DREADNAUGHT VACUUM and the DREADNAUGHT RIBBED.

SUPER-DREADNAUGHT RED INNER TUBES are likewise the best buy on the market.

MANUFACTURED BY

The Dreadnaught Tire and Rubber Company

Baltimore, Maryland

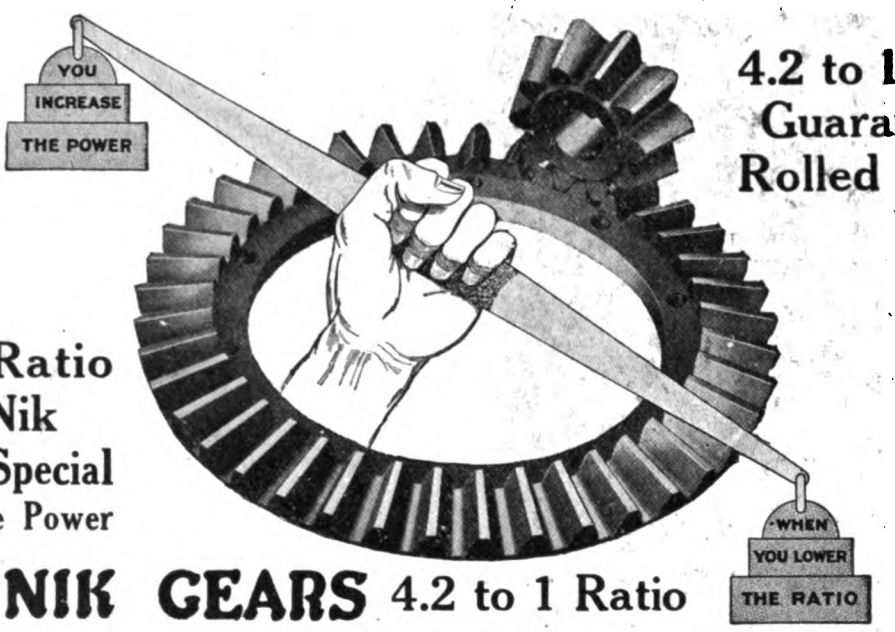
We have an exceptional proposition for dealers and assure excellent service and territorial protection with intensive co-operation from our organization. Write or wire, Department "I."

CHAS. F. U. KELLY, Inc., *Sales Department* 1834 Broadway, New York

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EASILY 20% MORE POWER FOR FORD CARS

Price $12.00



4.2 to 1 Ratio Guaranteed Rolled Gears

4.2 to 1 Ratio Krom-Nik Anderson Special Gears Increase Power

KROM-NIK GEARS 4.2 to 1 Ratio

There are profits to be earned in your territory from the sale of Krom-Nik-Anderson 4.2 1 ratio special gears.

Every Ford owner is a prospect. The price is low—$12 retail, with liberal discount to dealers.

You can actually show the Ford owner how this device will add 20 per cent to his car's power. The Krom-Nik-Anderson 4.2 to 1 gear ratio is a special type of tooth—unlike any other—which gives it additional strength and efficiency when needed. The 4.2 to 1 ratio offered in the Krom-Nik is the lowest gear reduction possible in a Ford axle.

It will save any Ford driver many dollars in repairs and loss of time and accomplish work impossible with the standard gear.

It solves the rear axle problems for Ford trucks, increases the life of your heavy duty Ford two to five times.

Special Racing Gear 3 to 1 Ratio $12.00

M & S Locking Differential

This differential is standard equipment on some of the best known trucks in the country. It is used in Government trucks, Nash trucks, Republic trucks, and many others. Prevents skidding and spinning of wheels, keeps the truck going when the roads are slippery and muddy.

Further information will be sent on request. Send for Sample—Liberal discount to dealers. Price - - **$20.00**

KROM-NIK GEAR COMPANY, 910 Michigan Avenue, Chicago, Illinois

Special Offer—Use Coupon

Send for a Krom-Nik Anderson 4.2 to 1 ratio gear—put it in a Ford—try it out. **Workmanship and material absolutely guaranteed for one year.** $12.00, less dealer discount. Order today.

KROM-NIK GEAR COMPANY, CHICAGO, ILLINOIS

Send me { Parcel Post..... Krom-Nik Anderson 4.2 to 1 Ratio Gears, price $12.00
Express ..... M & S Locking Differential..... .....price $20.00
less dealer discount. Enclosed find check or ship C. O. D.

My jobber is.....

Name.....

Address .....

City.....

It is understood that you guarantee workmanship and material for one year.

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NEW—DRY FUEL ADAMSON

MODEL "E"

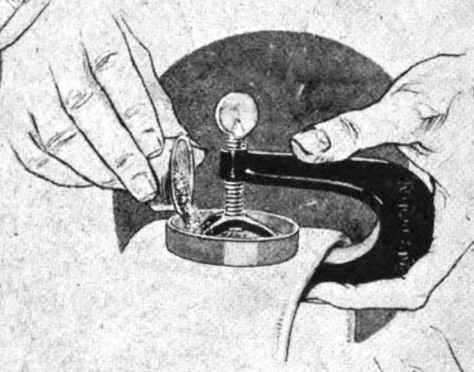
5-MINUTE VULCANIZER

For Tube Punctures

NO FLAME IT GLOWS



Fill the measure with Dry Fuel—



Empty it into the Vulcanizer—





Touch a match and the Dry Fuel burns with a hot glow—no flame. Gasoline can be used instead of Dry Fuel if desired.

$1.00

Complete Outfit includes 5-Minute Vulcanizer, can of Dry Fuel, box of 12 Patches, Measuring Cup, and directions for repairs. Extra box of 12 Patches, 25c. Extra Fuel, 12 charges, 50c.

AND NOW—the only vulcanizer for tube punctures that is sure in its work, whether you use common gasoline or dry fuel. Vulcanizes a patch ***permanently*** in five minutes. Adamson Dry Fuel is flameless; it burns with hot glow; is furnished in a handy can; does not absorb dampness; and remains uniform under all conditions. This handy outfit weighs, complete, only one pound. Every motorist will want a New Adamson 5-Minute Vulanizer.

NEW PRICES ON

ADAMSON VULCANIZERS



Model "U" For Cases and Tubes. **$2**



Model "T" For inner tubes only. **$1.50**

Greatly Increased Production

and the fact that we make Adamson Vulcanizers complete in our own plant, has cut down our manufacturing costs and enables us to make a substantial reduction in prices.

Adamson Vulcanizers are universally known as the simplest and surest in operation. More than a million motorists are now using and recommending them today.

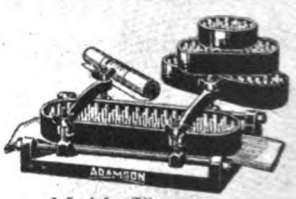
At the old prices, they outsold all competing makes. At these new prices, and with the Dry Fuel feature of Model "E," Adamsons will sell faster than ever. They will pay you a handsome profit.

Ask your Jobber for Adamson Vulcanizers, and Adamson Repair Gum. Write us for Adamson Catalogs, Displays, and Selling Helps.

ADAMSON MFG. CO.

EAST PALESTINE, OHIO

We also make Adamson Ford Brake Shoes, Lined and Unlined.



Model "S" For private garages and repair shops. **$12**

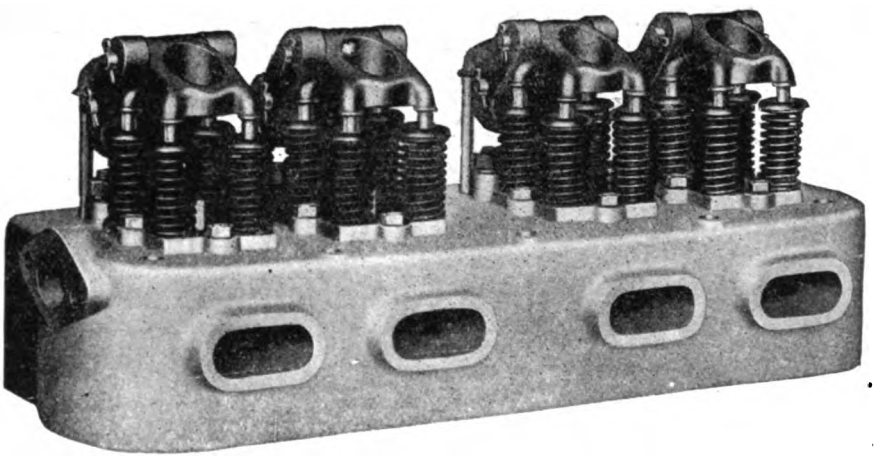


Adamson Repair Gum for all portable vulcanizers

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Photograph of converted Ford truck owned by Shapiro & Lemdowski, stock buyers of Joliet, Ill., after just returning from an eighteen mile trip and carrying 3600 lbs. of live hogs. Most of the drive was over roads that had not been broken and had snow up to the radiator, yet truck was continuously on high gear during the entire trip. Motor carries Roof sixteen over-head valve equipment. The pictures of Messrs. Shapiro and Lemdowski, and of Mr. Shea of the Shea Auto Company of Joliet, Central Illinois distributors, are also shown.



Price $95

16 Overhead Valves for Fords

Double the Value of Your CONVERTED FORD TRUCK

By Equipping with Roof's Peugeot Type Sixteen Over-Head Valve Equipment

Speed—with special gears, all the way up to 87 miles per hour—with regular gears, normal to 57 M. P. H., is as easy to get in a ROOF-equipped Ford as it is in any high-priced, high-power car on the road or race course.

Or in place of speed, there is extra power—reserve force for trucks and passenger cars—that takes you up hills and through mud or sand without a wheeze or falter, and at a distinct saving in fuel.

Actual test shows a reduction of one-fourth to one-third in gasoline consumption on touring cars and trucks and the most surprising increase in power.

ROOF-equipped Fords won race after race last summer. They brought back to life hundreds of old Ford passenger and commercial cars, and put new dealers on the map.

The demand for ROOF 16 Overhead Valves for Fords increases every day and so does the supply. They put new pep into Ford motors.

Complete equipment for installation goes with every head. Installation is easy and any good mechanic can make the change in a few hours. $95 gets the complete equipment, furnishing Ford owners with 16-Valve service for which buyers are glad to pay thousands of dollars in other cars.

DEALERS—Know this all-winter, all-year seller. The demand for use on passenger Fords and trucks is enough to put over big and growing profits now, and every day. The racing demand alone swamps dealers in season.

Write or Wire for Territory and Complete Details

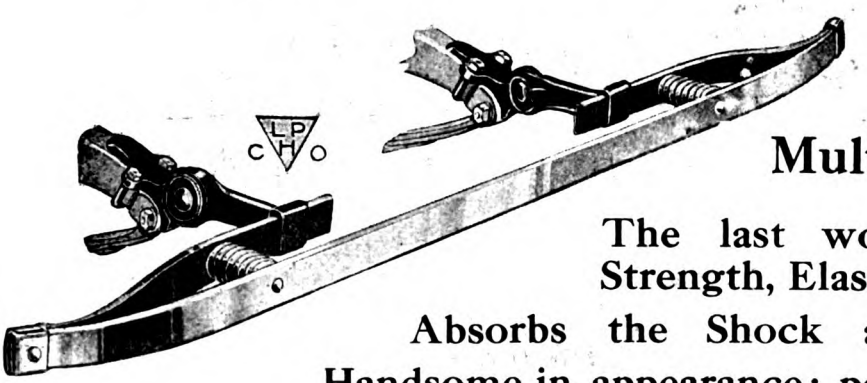
LAUREL MOTORS CORP. ROOT AUTO Successors to SPECIALTY COMPANY **Anderson, Indiana**

Made in the "Puncture Proof" city. Lowest Tax Rate in Indiana. Lowest Power and Water Rate in America. Unsurpassed Railroad Facilities. Banks on every Prominent Corner. Ideal Manufacturing location in the Heart of America.

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HALLADAY BUMPERS

TWO BIG LEADERS FOR 1918



The New Halladay Multiple Spring Bar

The last word in Bumper Bar Strength, Elasticity and Efficiency.

Absorbs the Shock and Saves the Car.

Handsome in appearance; positively non-rattling.

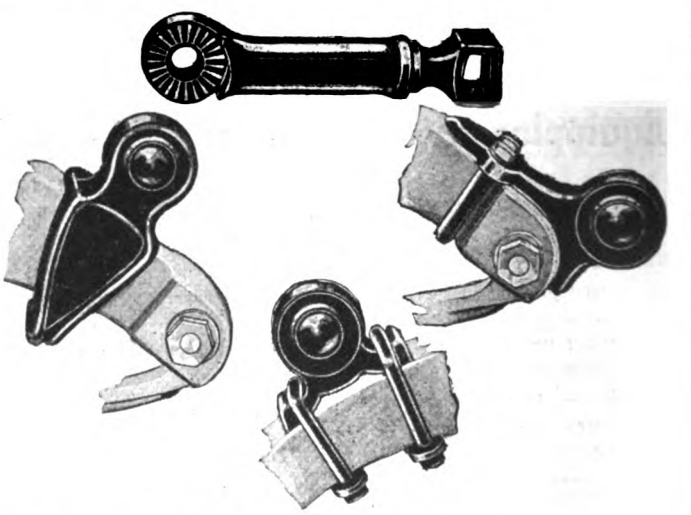
Supplied with special fittings, as illustrated, or with any Halladay fitting front or rear.

The Halladay Standardized Bumper Units

The greatest bumper proposition ever offered the dealer.

By carrying a stock of these four parts, and a supply of our bumper bars, that dealer can assemble and fit perfectly 90% of all the cars on the market with front frame extensions and for the rear of practically all cars with rear extensions of three-quarter elliptic springs.

Write for our new catalog fully describing the Halladay line.



L. P. HALLADAY Company.

DISTRIBUTORS:

ASCH & CO., 16-24 West 61st Street, New York City
E. L. THOMPSON CO., 817 Boylston Street, Boston, Mass.
GRAY-HEATH CO., 1440 Michigan Ave., Chicago, Ill.
SANFORD BROTHERS, Chattanooga, Tenn., Southern Distributors
HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors

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YOU CAN FIGURE IT OUT FOR YOURSELF

TOOLS For Repairing Automobiles



The possible curtailment of the manufacture of passenger cars will naturally bring all cars now in use more often to the Repair Shop. This puts a responsibility upon the Repair Man that must be met – more and more automobile repair tools will be required—are required right now—you can figure it out for yourself.

G. T. D. Tools are favorites the world over because of their easy cutting and lasting qualities.

Our line includes the following:

Taps and Dies, for both hand and machine use.

Screw Plates, both U. S. standard and S. A. E. standard threads, including combination assortments containing both standards.

Threading machines for bolts and nuts.

Reamers, all kinds, single and in sets. Also special Reamer for Ford Cars.



FOR THE MANUFACTURER

We have developed several new and decidedly better tools for machine threading. These are the "Gun" Tap—the "Shear-Cutting Tap," the "Acorn" Die and the Wells Self-Opening Die. These tools will positively boost production and reduce threading costs.

Send for catalog and booklets showing these and other tools for machine use. Ask for Gauge Bulletin "How to Measure Screw Threads."

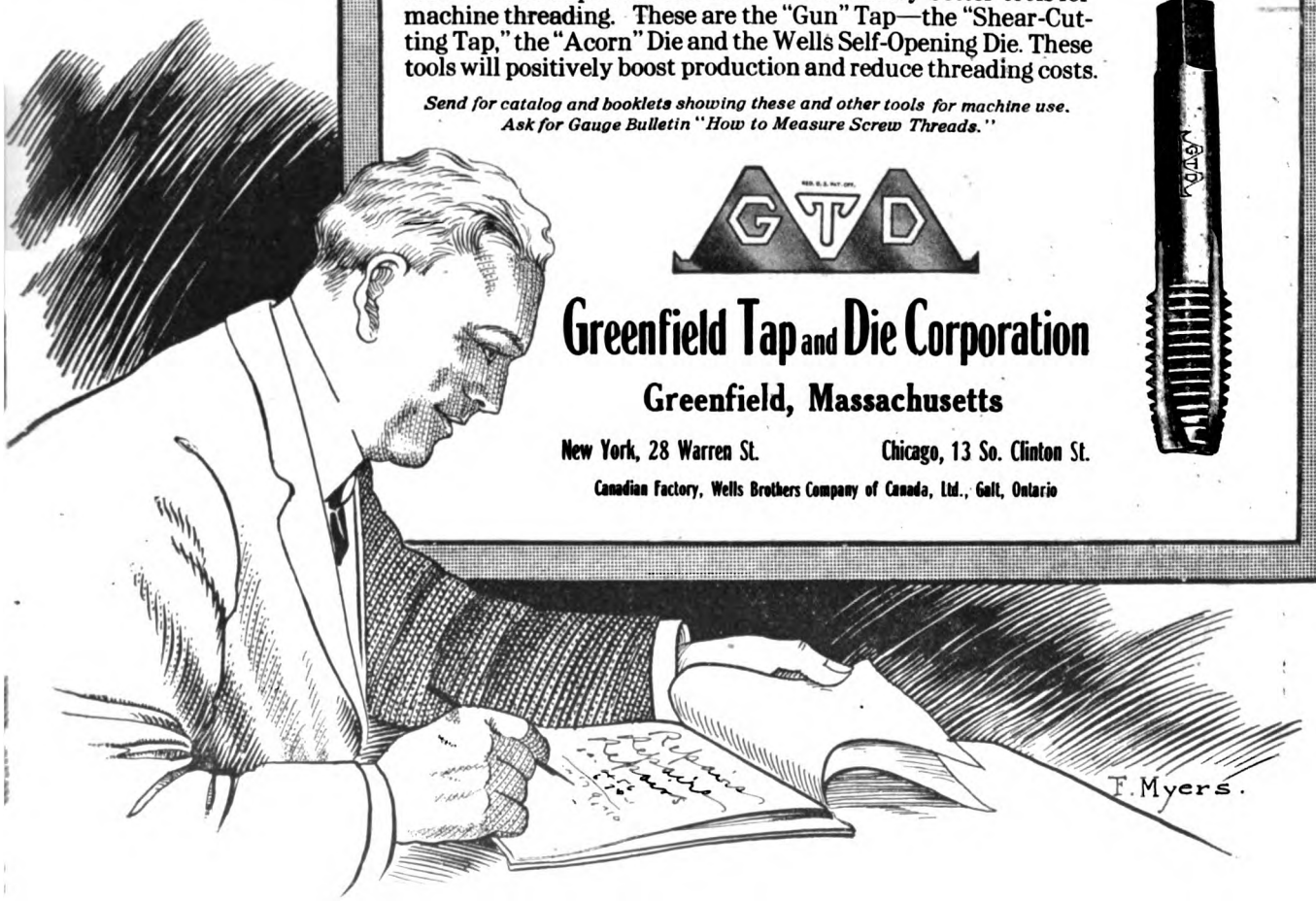
GTD

Greenfield Tap and Die Corporation

Greenfield, Massachusetts

New York, 28 Warren St. Chicago, 13 So. Clinton St.

Canadian Factory, Wells Brothers Company of Canada, Ltd., Galt, Ontario



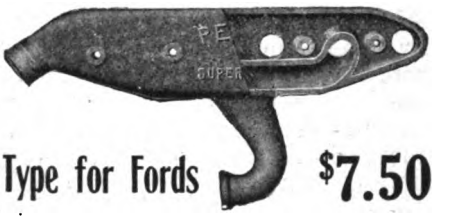
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PECK'S SUPER HEAT MANIFOLDS

Are Doing Their Bit

Enable Your Car to Meet War Time Requirements of Economy and Fuel Conservation.

Some of the things that PECK'S Super Heat Manifolds are guaranteed to do:



Type for Fords $7.50

West of Rocky Mountains, $8.50

If your car is not equipped with a PECK'S Super Heat Manifold, order one today. It is guaranteed to give you from 40 to 60% more miles per gallon, with the same efficiency that could be obtained with high-test gasoline.

Cut fuel costs; increase mileage; eliminate carbon; give more flexibility, greater power; stop over-heat of motor; prevent fouled spark plugs; save trouble and satisfy owners.

With the increased cost of gasoline and with the poor quality, it is necessary to use some means that will vaporize the fuel, so the highest efficiency may be obtained. PECK'S Super Heat is the way.

If Your Dealer Can Not Furnish You, Write to Us Direct.

Dealers and Jobbers Wanted. Liberal Commissions. Write.

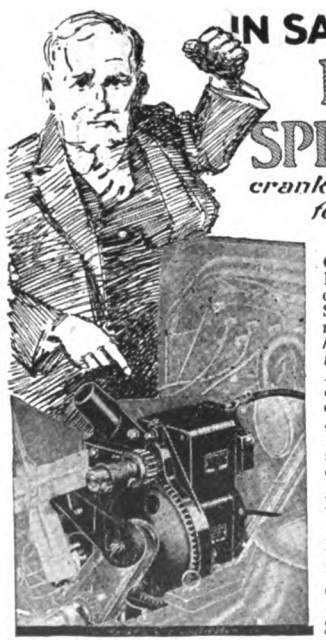
PECK'S SUPER HEAT COMPANY, 640 MIDDLEBURY ST., ELKHART, INDIANA

The "TURNOVER" is there!

IN SALES —*as well as in mechanism*

HEINZE SPRINGFIELD

cranking & lighting system for FORD cars



LEADS IN SALES

Comparative statements from 453 Ford dealers prove that more dealers are handling Heinze-Springfield than any other one make of starter, *and that dealers handling the Heinze-Springfield with other makes sell far more Heinze-Springfields than any other kind.* Comparison also quickly *proves the Heinze-Springfield System the greatest value in its field.* It is the *only* system for Fords selling for $85, complete with Ammeter, Dash Light, Tail Light, Dimmers and Lock.

The Heinze-Springfield dealer arrangement is based on our conviction that the desirable dealer should realize worth while profits.

The John O. Heinze Co.
Springfield, Ohio, U. S. A.

Real Points About the Heinze-Springfield System

1. A Two Unit, Six Volt, Single Wire Cranking and Lighting System Bendix Drive.
2. Nothing visible with hood closed.
3. No interference with engine accessibility.
4. Installed complete in four hours.
5. No power drain on motor.
6. Patented mounting plate and chain adjustment insures *quietness.* Prevents *broken chains.*
7. Highest *quality,* most *compact,* most *convenient* combination Dash Switch, Ammeter, and Dash Lamp.

WALDEN WORCESTER WRENCHES

SPECIALISTS IN MOTOR CAR WRENCHES

GUARANTEED SERVICE TOOLS

JOBBERS—DEALERS EVERYWHERE, ASK THEM

SEND FOR CATALOG No. 100.

WALDEN-WORCESTER, INC., WORCESTER, MASS.

STOP REAR AXLE TROUBLES



BY INSTALLING THE

BAILEY BALL THRUST

The bearing that replaces flat thrust washers at gear side of Ford and Chevrolet differential, the common cause of all axle breakdowns. The Bailey keeps drive and pinion gears in proper mesh, makes them run smoothly and last indefinitely. Prevents axle trouble. Has six times the maximum thrust and is guaranteed to "stand up" under all conditions.

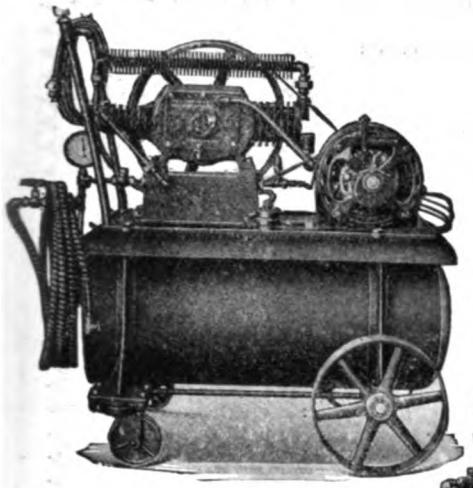
See your dealer today and forestall expensive axle repairs for 1918.

Price, $3.75

DEALERS: Write your jobbers—be prepared

GEO. D. BAILEY CO., 1118 S. Michigan Ave., CHICAGO, ILL.

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This buffing or grinder head is made according to the most approved design and is suitable for handling tire roughing wheels, and polishing or grinding wheels.

It will handle two wheels of 8-inch diameter and the construction is as strong and rigid as could be desired or required.

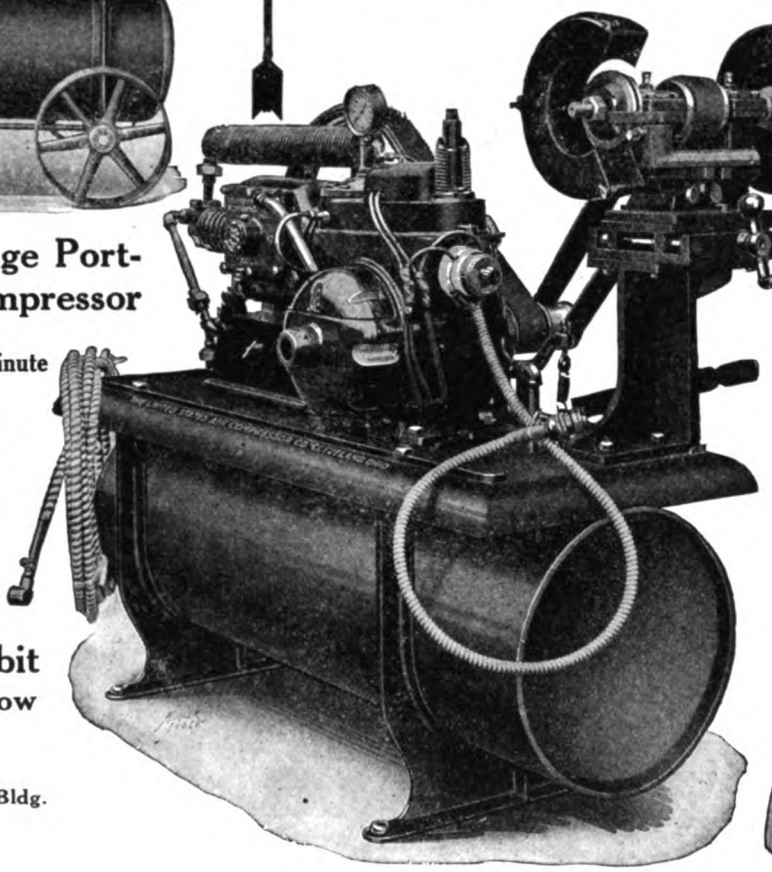
The motor is of sufficient capacity and the entire machine so designed as to permit the compressor and wheel head to be operated together or singly. Automatic controls prevent overcharging of the air tank and the entire construction of the unit is as near fool-proof as possible.

U. S. Two Stage Portable Air Compressor

EQUIPMENT 35

Cap. 4 Cu. Ft. Per Minute

Easily moved from place to place. Adapted for garages where it is sometimes desirable to take the air to the car or for factory use in blowing dust from motors, generators, etc.



See Our Exhibit At the Auto Show

BOSTON
Space 518, Mechanics Bldg.
March 2 to 9

U. S. Single Stage Automatic Air Unit

EQUIPMENT D22

(Illustrated Below)

Cap. 2½ Cu. Ft. Per Minute

An automatic single stage outfit for maintaining a supply of air ready for use at any time. Suitable for garage, free air service, etc.



A New Money Saver for Garage and Tire Shop

AT the New York Auto Show tire repair and garage men saw, for the first time, a machine that exactly meets a crying need they had experienced for a long time. This machine was the **DeLuxe Combined Two Stage Automatic Air Compressor and Buffing or Grinder Head—Two Valuable Machines in One.**

Having known the DeLuxe Air Unit for several years as an unequalled success, and seeing the new improvements incorporated in a manner that assured absolutely satisfactory results, it is needless to say that an unprecedented number of orders were placed at once.

Before the addition of the valuable unit described above the DeLuxe Two Stage Air Compressor was recognized as the most highly refined and improved compressor in existence. With the incorporation of this very necessary unit its advantages are increased manifoldly, which places it in a class unapproached by any similar machine.

Every tire shop requires air facilities and tire roughing equipment, while every garage must have free air service and grinding wheel facilities. The practice has necessarily been to buy an air compressor with a motor and a buffing head with a motor or countershaft equipment from which to run it.

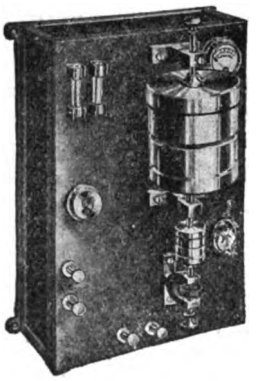
This new DeLuxe unit combines all this necessary equipment in one machine, to the definite and valuable advantage of purchasers. It saves the cost of an extra motor, avoids the necessity of buying a countershaft, conserves valuable floor space, saves expense in installation and gives results not only equal but superior to the old method.

The many advantages of the DeLuxe Combined Two Stage Automatic Air Compressor and Buffing or Grinder Head are described in detail in a special circular just issued. Write for a copy today.

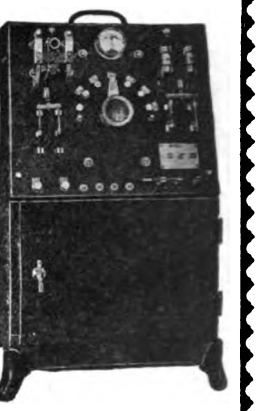
6536 Carnegie Ave. **The United States Air Compressor Co.** Cleveland Ohio

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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GARAGES, SERVICE STATIONS, INDIVIDUAL OWNERS



For charging batteries, breaking down sulphation or for any other purpose where it is necessary to change alternating current to direct current,

The Breco Converter

Is far superior, highly efficient, light and rugged—easy to operate, no expensive installation necessary.

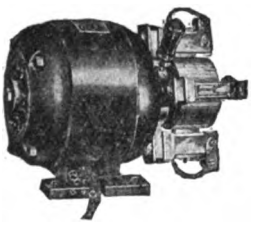
BUILT FOR FROM 1 BATTERY UP

PRICES RANGE FROM $24.00 UP



Fully Tested by Years of Practical Application

Battery charging becomes a very simple, inexpensive and mighty profitable matter with The Breco Charger.



Write for Catalogue No. 21

THE BRECO ELECTRIC CO.

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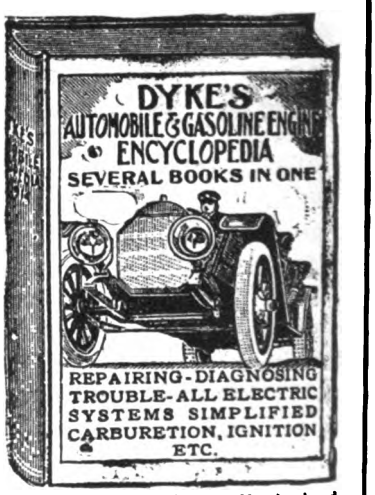
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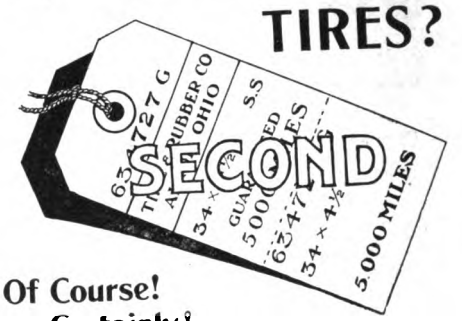
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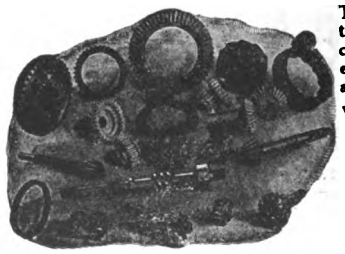
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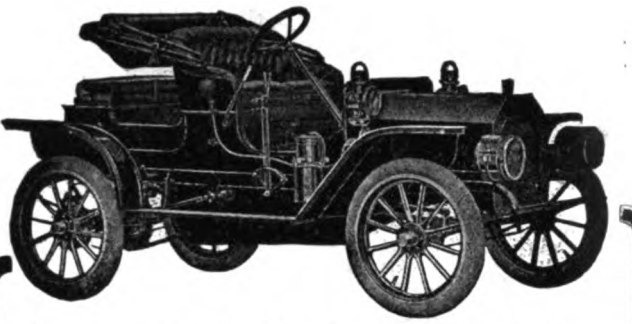
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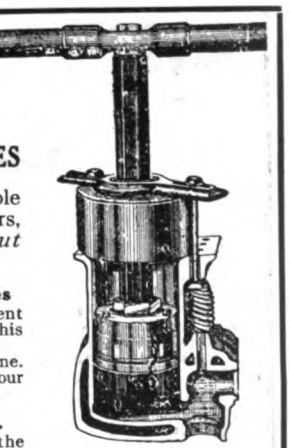
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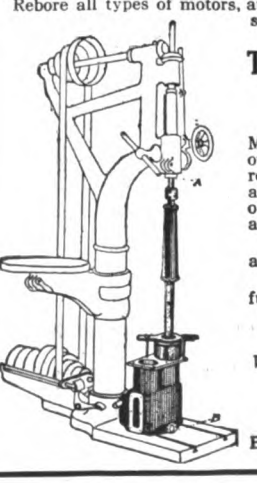
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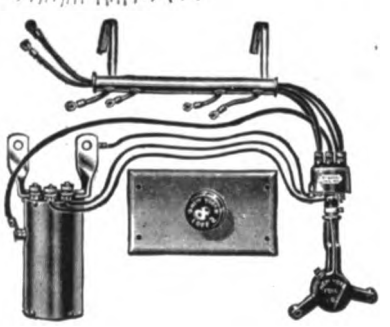
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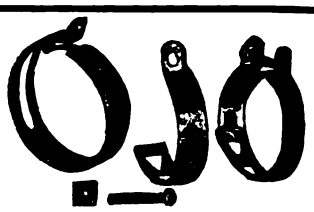
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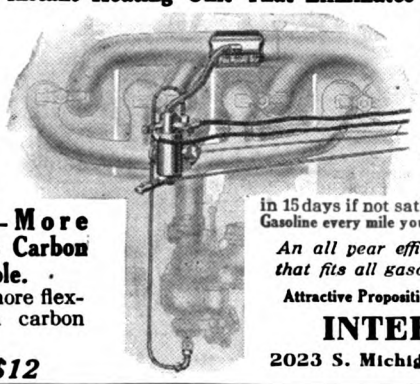
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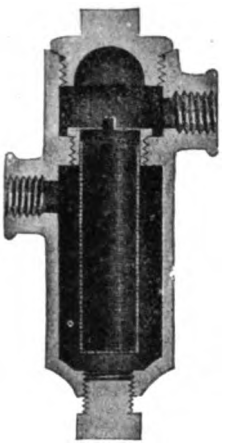
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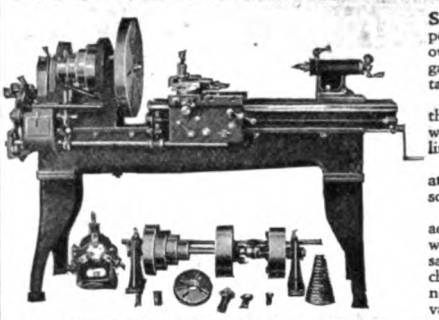
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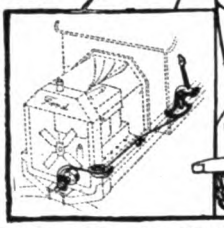
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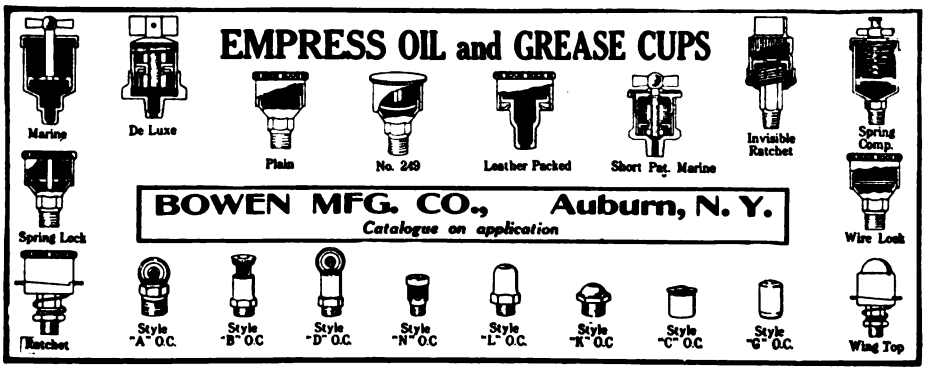
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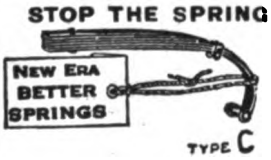
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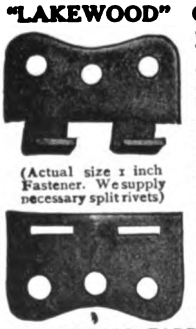
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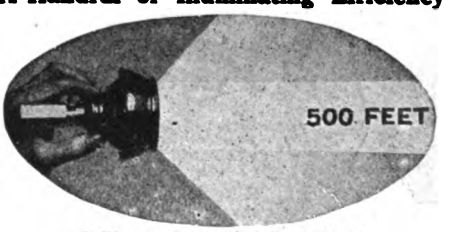
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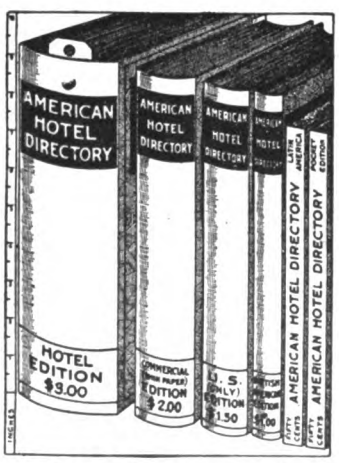
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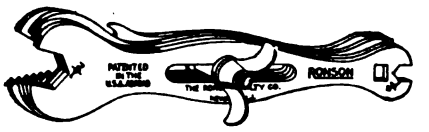
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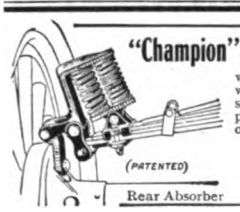
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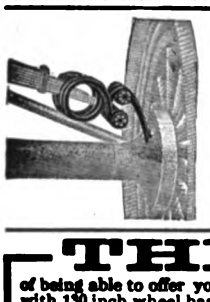
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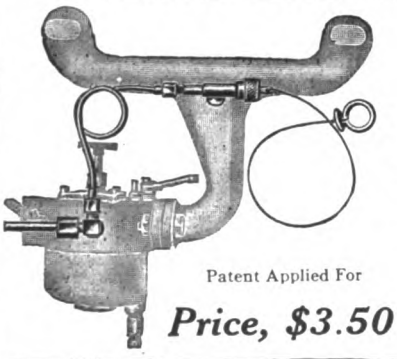
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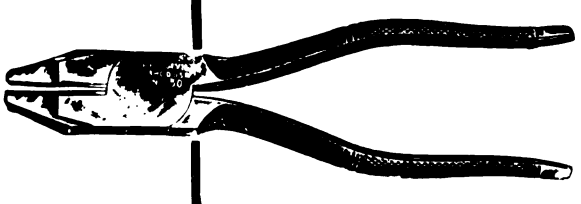


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OBSOLETE CARS—Where to get the Parts for Cars that are No Longer on the Market.

SHORT CUTS—Devices and Tools that the Garage and Repair Man Will Find Useful.

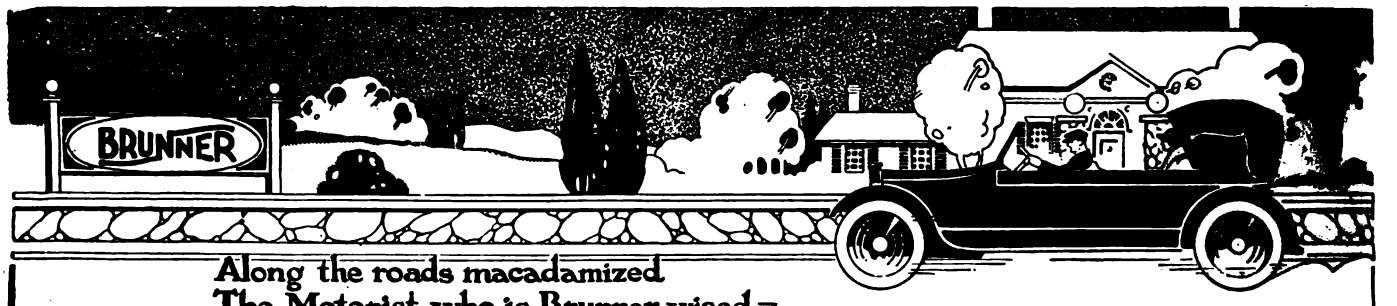
THE COOLING FAN—How to Make it Most Effective for the Purpose for Which it Was Designed.

The Trouble Department, Hot Weather Driving, the Gasoline Situation and a Great Variety of Other Practical Information.

(For Full Table of Contents, See Page 136.)

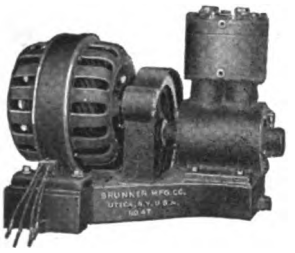
Buyer's Guide and Index to Advertisements, Pages 88, 89 and 90. Table of Contents will be found on Page 136

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Along the roads macadamized
The Motorist who is Brunner-wised—
Speeds smooth-with danger minimized
Because his tires are Brunner-ized—

The pleasures of motoring are enhanced and the dangers are minimized when tires are properly inflated—smooth rides with danger of blow-outs lessened are insured by Brunner Service—and that is why the Brunnerwise Motorist patronizes the garage displaying the Brunner Sign.



Ever since the garage business has been a business the Brunner Air Compressor has been consistently demonstrating its sterling worth to the garageman **—in the garage.** Year after year the demand for Brunner Air Compressor Equipment has been doubling over, simply because the Brunner Air Compressor has always stood up and given satisfactory service. The motorist who patronizes the garage displaying the Brunner Sign always finds an ample supply of clean, cool air at the proper pressure to inflate his tires correctly at his disposal.

The Brunner Sign Attracts the Trade of the Brunnerwise Motorist

Because he knows that the garage displaying the Brunner Sign is always prepared to render him prompt and efficient compressed air service—he knows that when he pulls up under the Brunner Sign he never has to drive away disappointed.

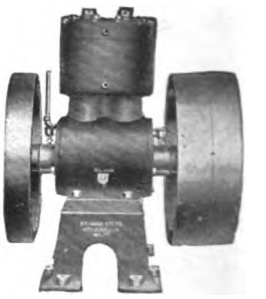


He realizes that clean, cool air, such as he always finds at his disposal under the Brunner Sign, will increase his tire mileage and will reduce the dangers of motoring to a minimum. That is why the trade of the Brunnerwise Motorist follows the Brunner Sign.

The Safe Way Is the Brunner Way

The Brunner Air Compressor has always proven true to the Jobber who sells it—the Garageman who buys it—and the motorist who uses it—are you Brunnerwise?

The Garageman who buys Brunner Equipment is never disappointed for the reason that it has never been necessary to resort to misleading advertising claims in order to bolster up the sale of Brunner Equipment and the garageman purchasing Brunner Equipment always receives just what he expects and "a little bit more."



INVESTIGATE THE BRUNNER AIR COMPRESSOR

Be honest with yourself and investigate the garage air compressor question thoroughly before deciding on your new equipment. The Brunner will stand investigation and the more thorough the investigation the more certain will be your decision in favor of Brunner Service, because it not only insures compressed air efficiency of the very highest order, but it also insures that very desirable and liberal patronage of the Brunnerwise Motorist, which follows the Brunner Sign.

We will be glad to send you the name of the Brunner Jobber who covers your town, also our catalogue and Garageman's Handbook on Compressed Air—a book which every garageman should read carefully. They are all free for the asking.



BRUNNER MANUFACTURING COMPANY

Main Office and Plant:
UTICA,
N. Y.

Cincinnati Branch:
CINCINNATI,
OHIO.



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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 23, No. 5. NEW YORK, JULY, 1917 Monthly, $1.00 per year. Single Copy 10 Cents

PARTIAL CONTENTS

BATTERY RECHARGING—A Continued Discussion of the Subject in its Relation to Automobile Work. Illustrated.

HIGH COST OF AUTOING—How Car Drivers Add to the Expense of Running Their Cars on Busy Streets.

CARBON DEPOSITS—How to Remove Them and Likewise How to Avoid Getting Them.

AMONG INDIANA SHOPS—Welding of a Big Gear Wheel and its Expansion and Contraction.

FUEL CONSUMPTION—How to Run a Car with the Least Possible Expense for Gas. Illustrated.

LESSONS FOR DRIVERS—Instances Where Accidents Were Entirely Due to Carelessness or Ignorance.

THE LEGAL ASPECT—Important Information for All Automobile Owners and Drivers.

TROUBLE DEPARTMENT—Another Installment of Cases Where Cars Seem to Defy the Wisdom of Owner and Repairman.

A Great Variety of Short Articles Giving Useful Information for All Interested in the Automobile and Truck.

(For Full Table of Contents, See Page 120)

Buyer's Guide and Index to Advertisements, Pages 95, 96 and 97. Table of Contents will be found on Page 120

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Prismolite

The Perfected Lens

—Is Backed by the Laws

New York, Maryland, Ohio, Indiana, Iowa, Texas, Kansas, Nebraska, and South Dakota—have just passed laws restricting automobile headlights. Many other states are falling in line. The demand that the legislation is creating for special lenses that will meet the requirements is enormous—and—

Prismolite is the only convex diffusing lens that has been universally approved they meet every requirement—they are legally as well as mechanically perfect.

Prompt Shipment Guaranteed

Prismolite lens are produced by gigantic interests that already make more automobile lens than all other glass manufacturers combined—their capacity for production is enormous—for that reason prompt shipment is absolutely guaranteed on all orders.

4,000,000 Cars in Use

In the United States there are almost 4,000,000 automobiles in use today. Every owner of one of these cars is a prospective Prismolite customer. He must equip his headlights with a lens that is legally approved and *that means Prismolite.* Don't overlook this opportunity to cash in big from a nation-wide demand. Both jobbers and dealers should be stocked with Prismolite lens NOW. The sales are *certain*—the profit is large. Write or wire, today, for unusual Co-operative Sales Plan.



20,000 Perfect Prisms break up the rays—so that you see all the road—all the time.

The Prismolite Company

4th & Gay Streets :-: Columbus, Ohio

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 23, No. 6. NEW YORK, AUGUST, 1917 Monthly, $1.00 per year Single Copy 10 Cents

PARTIAL CONTENTS

MORE BATTERY FACTS—Continuation of the Articles Covering the Entire Subject of Accumulator Batteries. Illustrated.

AMONG NEW JERSEY GARAGES—Although the Information Of Course Is Applicable to all Garages.

STEERING THE CAR—How to Do So Easily and Properly, and How to Avoid Damage and Trouble. Illustrated.

GEAR CHANGING—Something about Changing Gears Downward Which Many Consider a Rather Difficult Art. Illustrated.

AUTOMOBILE ENGINE COOLING—The Water Jacket, Circulation, the Radiator and the Fan. Illustrated.

TO WOMEN FROM A WOMAN—One of the Best Woman Car Drivers in the Country Writes about Running the Car.

THE LINE SHAFT Useful to Those Who Use or Contemplate Using Power in the Garage or Repair Shop. Illustrated.

OVERHEATING THE ENGINE—A Common Fault of Hot Weather but How It May Be Avoided.

The Trouble Department and Much Information of a Practical Nature Expressed in a Simple Way.

(For Full Table of Contents, See Page 116)

Buyer's Guide and Index to Advertisements, Pages 87, 88 and 89. Table of Contents will be found on Page 116

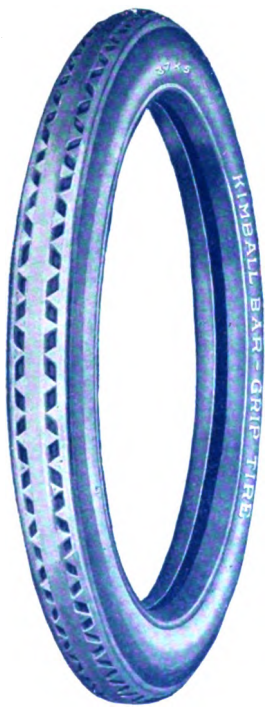
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THE POPULARITY OF
"Kimball Tires"

Is Sweeping the Country. The "KIMBALL" Tire Agency Proposition Means Capital and Business To The Wise Dealer Who Gets It In His Territory.



The Best Territories are Being Snapped Up. Write Quickly.



KIMBALL
Bar-Grip Tire

ARE YOU THE "LIVE DEALER" OF YOUR TOWN—or is your store just a place that must be **PASSED** on the way to the "LIVE DEALER" in **"Kimball Tires and Tubes?"**

"KIMBALL" dealers have the most popular - most prosperous stores in every town. The **"KIMBALL"** dealer is sure to draw the **cream of the trade** from other dealers who do not sell **"Kimball"** Tires and Tubes.

Any **"Kimball"** dealer—anywhere—will tell you that the prices he is able to buy **"Kimball"** Tires and Tubes for are the foundation of his success. Of all the things that go to make a tire shop profitable and prosperous, nothing is so important as having an attractive and durable tire at attractively low prices.

KIMBALL TIRES

NON-SKIDS ONLY

Are Always in Demand by Users and Dealers Alike

Kimball Tires	Non-Skid	Tubes	Kimball Tires	Non-Skid	Tubes
30x3	$7.55	$1.90	35x4	$17.35	$3.30
30x3½	9.85	2.15	36x4	17.65	3.35
31x3½	10.30	2.20	34x4½	20.75	4.00
32x3½	11.55	2.25	35x4½	22.65	4.10
34x3½	13.35	2.35	36x4½	23.75	4.15
31x4	14.25	2.95	37x4½	26.60	4.25
32x4	14.75	3.05	36x5	27.20	4.95
33x4	15.75	3.10	37x5	27.60	5.05
34x4	16.35	3.20			

Do you want Clincher or Straight Side?



KIMBALL
Button-Grip Tire

Buy What You Need

Any order you care to send us will be cheerfully accepted and handled with all the enthusiasm that is accorded the many large stock orders that come every day. It will pay you to order in large quantities on account of the saving to you in express charges.

All orders must be accompanied by deposit of at least 25% or no attention will be paid to same. In order to insure quick delivery CASHIER'S DRAFT on Chicago or New York Banks, Express or Money Order in part or full MUST accompany Order. Allow us first and second choice on our Bar-Grip, Button-Grip or Cord Type Tires, in order to receive immediate shipment.



"Straight-Side" Type as pictured. Made also in Clincher Type

The Kimball TIRE & RUBBER CO.

Dept. 18, 1473 Michigan Ave., CHICAGO

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ACCESSORY FORECAST NUMBER

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. 71-73 Murray Street-New York

Vol. 24, No. 2 NEW YORK, OCTOBER, 1917 Monthly, $1.00 per year Single Copy 10 Cents

PARTIAL CONTENTS

ANTI-FREEZING SOLUTIONS—The Cleansing and Preparation of Cooling System for Winter Service.

OVERHAULING THE MOTOR CAR—Steps Necessary to Prepare the Chassis for Winter Driving.

SOLVING THE GARAGE PROBLEM—How High Cost of Storing Car in Big City Is Avoided.

FORECAST OF MOTOR FASHIONS—What the Fair Sex Will Wear When Motoring.

HEADLIGHT LAWS DISAGREE—Lack of Uniformity Emphasizes Need of a National, Universal Law.

CUSTOM MADE BODIES—Why the Made to Order Enclosed Body Is Increasing in Favor.

COAL GAS AS A FUEL—Three Hundred Cubic Feet Equivalent to a Gallon of Gasoline.

USEFUL WINTER EQUIPMENT—What the Manufacturer Is Providing for the Comfort of the Motorist.

FUEL CONDENSATION—Suggestion for Overcoming Troubles Due to Use of Heavy Fuel.

(For Full Table of Contents, See Page 108)

Buyer's Guide and Index to Advertisements, Pages 77, 78 and 79 Table of Contents will be found on Page 108

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Manufactured by Admirers of the FORD

The Truck That Hauls for Half

Make a 3000 Lb. Truck Out of Your Ford With a $350 Phenix

A GROUP of admirers of Henry Ford, all veterans in the motor field, have organized the PHENIX TRUCK MAKERS INC. for the purpose of manufacturing a truck attachment fully worthy of the Ford Chassis.

The Phenix Truck Maker is built to make the best possible 3000 to 4000 lb. truck out of the Ford. Carefully designed with this end in view, and having heavy frame, ball-bearing sprocket housings, alloy steel springs, and special brakes, it has proved its sturdiness under severest tests by delivering its pay load at a cost of only 5⅔ cents per ton mile.

The Phenix has a guaranteed capacity of 3000 pounds.

The Phenix organization is amply financed, and is backed by business men of undoubted standing. Its purpose is to produce heavy duty truck makers for long service, and to give not only the users but also its dealers the solid satisfaction of good goods and sincere dealings throughout.

A word from you will bring fullest details.

DEALERS: Allow us to present our proposition to you.

PHENIX TRUCK MAKERS INC.
2337 So. Michigan Ave. Chicago

Phenix

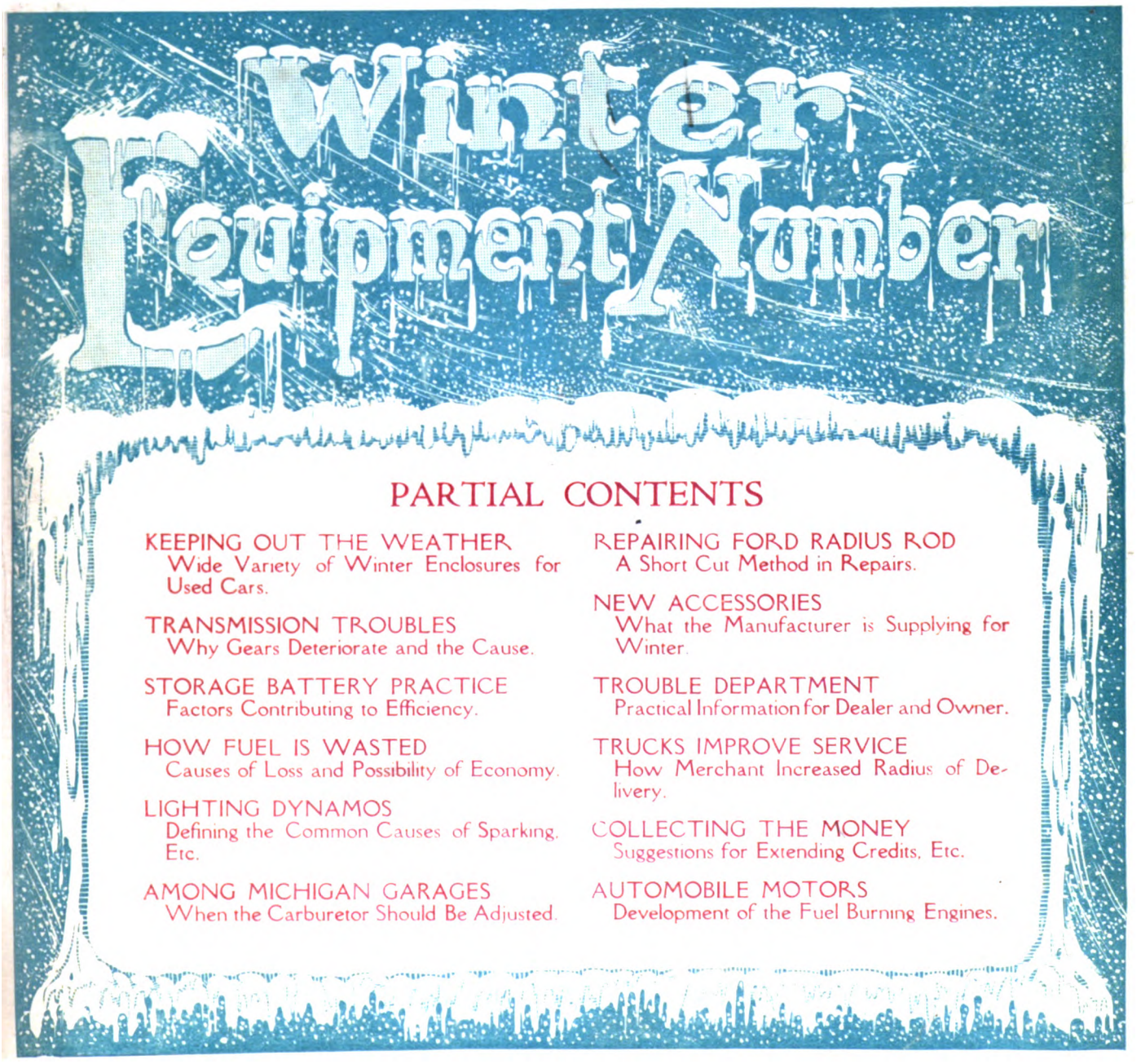
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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. 71-73 Murray Street-New York

Vol. 24, No. 3 NEW YORK, NOVEMBER, 1917 Monthly, $1.00 per year Single Copy 10 Cents



PARTIAL CONTENTS

KEEPING OUT THE WEATHER
Wide Variety of Winter Enclosures for Used Cars.

TRANSMISSION TROUBLES
Why Gears Deteriorate and the Cause.

STORAGE BATTERY PRACTICE
Factors Contributing to Efficiency.

HOW FUEL IS WASTED
Causes of Loss and Possibility of Economy.

LIGHTING DYNAMOS
Defining the Common Causes of Sparking, Etc.

AMONG MICHIGAN GARAGES
When the Carburetor Should Be Adjusted.

REPAIRING FORD RADIUS ROD
A Short Cut Method in Repairs.

NEW ACCESSORIES
What the Manufacturer is Supplying for Winter.

TROUBLE DEPARTMENT
Practical Information for Dealer and Owner.

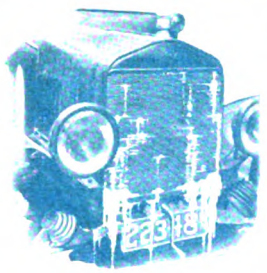
TRUCKS IMPROVE SERVICE
How Merchant Increased Radius of Delivery.

COLLECTING THE MONEY
Suggestions for Extending Credits, Etc.

AUTOMOBILE MOTORS
Development of the Fuel Burning Engines.

Buyer's Guide and Index to Advertisements, Pages 78, 79 and 80 Table of Contents will be found on Page 104

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WHY TAKE A CHANCE?

Adjustable **METAL** Radiator Cover for All Model Ford Cars.

Attach this wonderful **metal** radiator cover and enjoy the pleasures of winter motoring without the troubles and discomforts.

No danger of water freezing with consequent breaking of radiator and cracking of cylinders. No cranking for twenty or thirty minutes in the cold and slush and snow. No fumbling with numbed fingers at a frozen leather roll or blanket.

Drive Your Ford All Winter

In the coldest weather—zero days. Let it stand for hours in the street, then start your engine at once. H-M Adjustable **Metal** Radiator Covers are operated from **the seat**. **When riding** set at quarter, half, three-quarter or fully open. When about to stop, turn the handle in the dash and the cover is tightly closed and your motor and radiator will be warm for hours.

It is made of sheet metal and will last many seasons. One winter's saving in fuel will more than pay for it. Attach it yourself in a few minutes.

Price $5.00

Call at your dealer's. If he cannot supply you, write us direct.

H-M Manufacturing Company
Department 20
122 South Michigan Avenue
CHICAGO



DEALERS

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NEW YORK SHOW NUMBER
This Magazine is represented at Space D-139, Fourth Floor, Grand Central Palace, New York Automobile Show, January 5-12, 1918.

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. 71-73 Murray Street-New York

Vol. 24, No. 4 NEW YORK, DECEMBER, 1917 Monthly, $1.00 per year Single Copy 10 Cents

JOHNSON'S FREEZE-PROOF

One Application Lasts All Winter

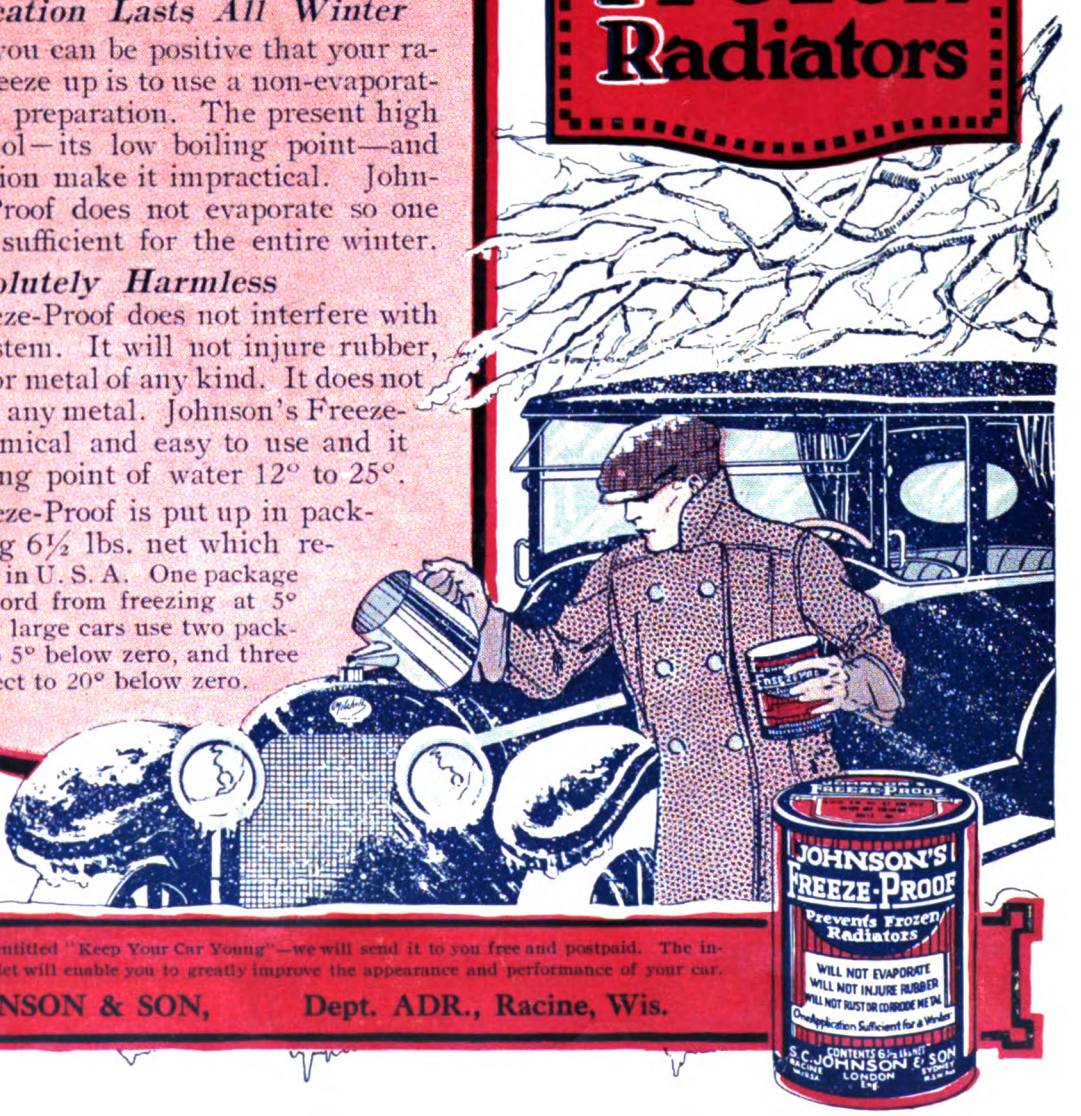
The only way you can be positive that your radiator won't freeze up is to use a non-evaporating, anti-freeze preparation. The present high price of Alcohol—its low boiling point—and quick evaporation make it impractical. Johnson's Freeze-Proof does not evaporate so one application is sufficient for the entire winter.

Absolutely Harmless

Johnson's Freeze-Proof does not interfere with the cooling system. It will not injure rubber, cloth, packing or metal of any kind. It does not rust or corrode any metal. Johnson's Freeze-Proof is economical and easy to use and it raises the boiling point of water 12° to 25°.

Johnson's Freeze-Proof is put up in packages containing 6½ lbs. net which retail at $1.50 each in U. S. A. One package will protect a Ford from freezing at 5° below zero. For large cars use two packages to protect to 5° below zero, and three packages to protect to 20° below zero.

Prevents Frozen Radiators



Write for our booklet entitled "Keep Your Car Young"—we will send it to you free and postpaid. The information in this booklet will enable you to greatly improve the appearance and performance of your car.

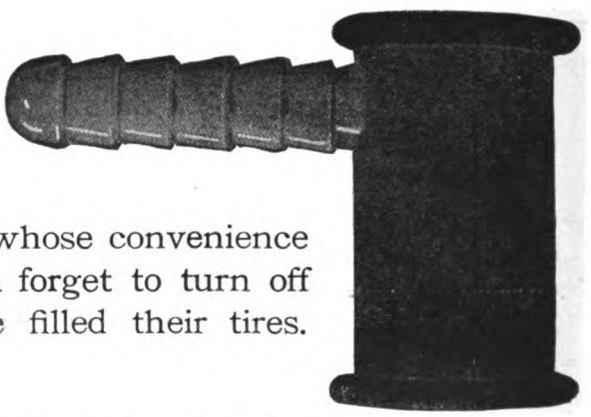
S. C. JOHNSON & SON, Dept. ADR., Racine, Wis.

Buyer's Guide and Index to Advertisements, Pages 85, 86 and 87 Table of Contents will be found on Page 128

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Garage Men!

FREE AIR COSTS MONEY



when the customers for whose convenience you provide an air station forget to turn off the flow after they have filled their tires.

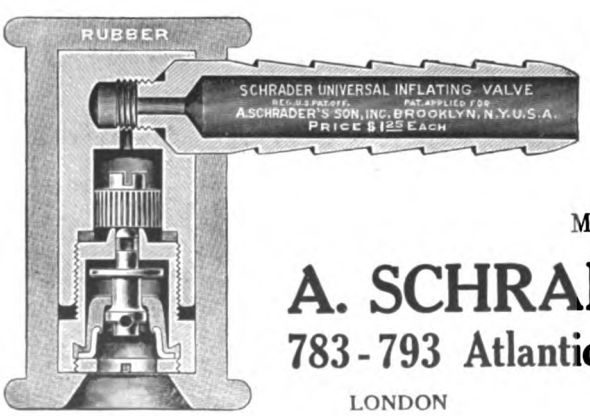
Guard against this waste by attaching a

SCHRADER AUTOMATIC INFLATING VALVE

to your air hose

The Schrader Inflating Valve automatically locks the bottled air into the tank the minute it is taken off the tire valve. You turn on the air by pressing the nozzle of the inflating valve against the tire valve, and you turn it off by removing the device from the tire valve.

It is made to fit any diameter of stock sizes of hose, from one-quarter inch to five-eighths.



PRICE IN U. S. A.

$1.25

Manufactured by

A. SCHRADER'S SON, Inc.

783-793 Atlantic Avenue, Brooklyn, N. Y.

LONDON CHICAGO TORONTO

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. 71-73 Murray Street—New York

Vol. 24, No. 5 NEW YORK, JANUARY, 1918 Monthly, $1.00 per year Single Copy 10 Cents

PUTS NEW LIFE IN YOUR ENGINE

THAT knocking in your engine—the difficulty you have climbing hills—poor pick-up—lack of power—extravagant use of oil and gas—noisy motor—in fact, fully 80% of your engine trouble is caused by the "Black Plague" of motorists—carbon. Clean it out with

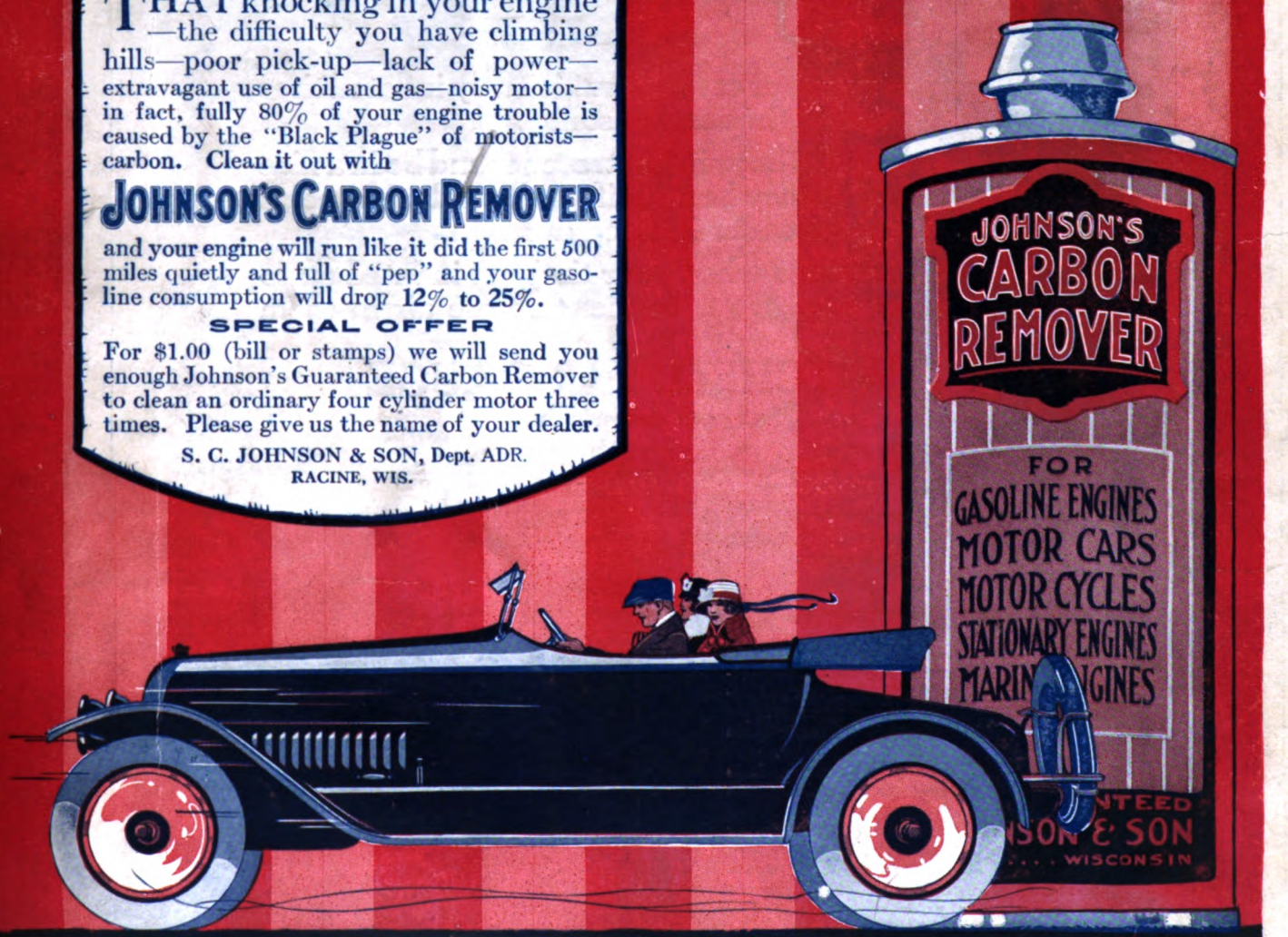
JOHNSON'S CARBON REMOVER

and your engine will run like it did the first 500 miles quietly and full of "pep" and your gasoline consumption will drop 12% to 25%.

SPECIAL OFFER

For $1.00 (bill or stamps) we will send you enough Johnson's Guaranteed Carbon Remover to clean an ordinary four cylinder motor three times. Please give us the name of your dealer.

S. C. JOHNSON & SON, Dept. ADR.
RACINE, WIS.



JOHNSON'S
GUARANTEED
CARBON REMOVER

WITCHELL AIR GAUGE

Tires and Gasoline are War Necessities

Economy of These is a Patriotic Duty

THE LESS YOU USE THE MORE THERE WILL BE FOR SUPPLY TRAINS AND ARMY AMBULANCES.



When you run your car on insufficiently inflated tires you are wasting tires and gasoline.

You can help the boys in the trenches and be in a nice little sum of money besides if you'll make it a point never to run on under-inflated tires.

The way to know when your tires are inflated up to the correct pressure is to measure the air in them with a

TWITCHELL AIR GAUGE

at your dealer's or

The Twitchell Gauge Co., 1516 So. Wabash Ave., Chicago

PRICE $1.25

TO DEALERS

The Twitchell Gauge is now packed in dozen lots for mounting on an attractive counter display easel. Dealers having used this rack for the presentation of Twitchell Gauges report their sales very materially increased thereby.
The Twitchell is as easy to sell as it is to use. We advertise it in a dozen magazines, including the Saturday Evening Post, Collier's, The Literary Digest, Life and Leslie's, and it enjoys in addition even more valuable word-of-mouth advertising which thousands of enthusiastic purchasers have been giving it for the past seven years.







BOSTON SHOW NUMBER
This Magazine is represented at Space 516, Department F, Boston Automobile Show, March 2-9, 1918

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. 71-73 Murray Street—New York

Vol. 24, No. 6 NEW YORK, FEBRUARY, 1918 Monthly, $1.00 per year Single Copy 10 Cents



Stop that Leak

THE easiest and quickest way of repairing leaks in radiators, pumps, water jackets, motor head gaskets, hose connections, etc., is to use Johnson's Radiator Cement. This will stop the leaks in just a few minutes, without laying up the car. No mechanical experience is required—all you have to do is to remove the cap and pour the cement into the radiator. It will ordinarily seal a leak in from two to ten minutes.

JOHNSON'S RADIATOR CEMENT

Quick—Efficient—Harmless

Johnson's Radiator Cement contains no powders, cement or anything which can coat or clog the cooling system. It blends perfectly with the water until it reaches the leak—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water, making a permanent seal.

If your dealer cannot supply you, send us $1.00 and we will forward you by prepaid express a pint can of Johnson's Radiator Cement.

Quarts, $1.75 Pints, $1.00 Half-pints, $0.65

Write for Our Folder on "Keeping Your Car Young"—It's Free

S. C. JOHNSON & CO. Dept. AD-2 RACINE, WIS.



Buyer's Guide and Index to Advertisements, Pages 80, 81 and 82 Table of Contents will be found on Page 108

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Avoid Disputes With Customers

You cannot afford disputes. They are costly in cash and customers.

It will pay to prevent them rather than have to adjust them.

The N. C. R. system in your garage *will* prevent disputes and protect you and your customers.

But disputes are only one of the troubles in the garage business.

The N. C. R. system will prevent troubles by enforcing correct records.

It protects your profits.

It enables you to tell right where you stand in volume of sales and profits.

Install the N. C. R. system in your garage.
For details send this coupon today.



Up-to-date National Cash Register for 4 clerks

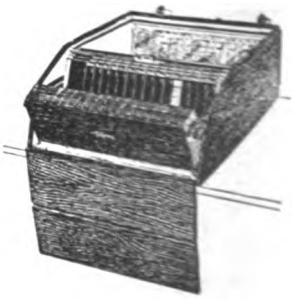
To Dept. 701

National Cash Register Co., Dayton, Ohio

Please send me full particulars of your cash register for a garage, and the N. C. R. Credit File.

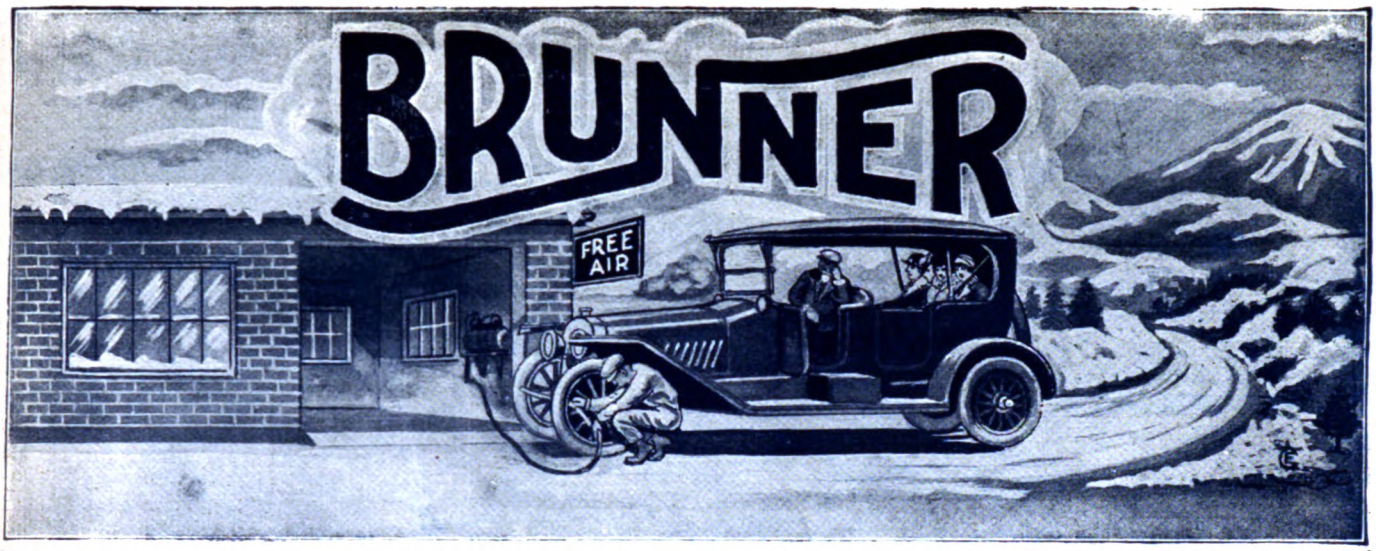
Name_____

Address_____



N. C. R. Credit File for 180 Accounts

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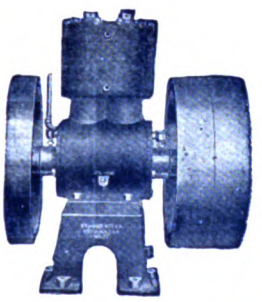


With pleasing smile and twinkling eyes
The garagemen who are Brunnerwise
Will tell you where the secret lies
Of an air supply which satisfies—



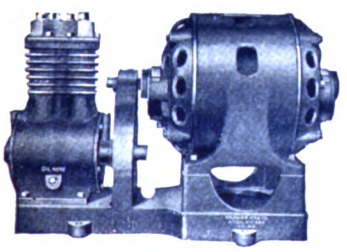
Yes; the Garagemen using Brunner Air Compressors will tell you that Brunner Service satisfies and they will tell you that all of their bothersome compressed air troubles have been eliminated since they have installed the Brunner Air Compressor in their garage. Drop into the first garage you see displaying the Brunner sign and see if this is not so.

A Brunner Air Compressor in your garage would eliminate all of your compressed air troubles—and it would enable you to render your patrons a highly efficient, absolutely reliable compressed air service such as they would appreciate.

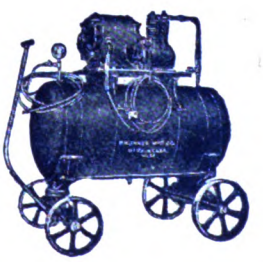


A Brunner Service Sign on your garage would advertise the fact that your garage is strictly up-to-date—it would bring to your door the trade of the Brunnerwise Motorist who recognizes the Brunner Sign as a sure sign of prompt and efficient service.

INVESTIGATE THE BRUNNER AIR COMPRESSOR



The Brunner is the pioneer of all Garage Air Compressors—it has been making good in the garage ever since the garage business has been a business—the Brunner Air Compressor is properly designed and built to suit the garageman's special requirements. No freakish attachments and no restriction of the lubrication to invite disaster but simply the same good substantial business proposition it has always been for the garageman who progresses with the times.



Our new No. 15 Catalogue is the most complete and comprehensive book of its kind ever published. We will be glad to send you the catalogue and the name of the Brunner Jobber who covers your territory.

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"The Motorist Who is Brunnerwise—Knows Brunner Service Satisfies"

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REGULAR use of Johnson's Carbon Remover —once every 500 or 1000 miles—will cure 80% of your engine troubles, and keep the engine right up to the top notch of efficiency all the time. It will increase your power, save 12% to 25% of the gasoline and reduce maintenance expense.

Johnson's Carbon Remover puts new life in your engine. It cleans out carbon, stops knocking and pounding, gives more power on hills, improves the "pick-up" and restores the original "pep" and smoothness.

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Simply pour an ounce of Johnson's Carbon Remover into each cylinder in the evening. Over night it soaks into the accumulated carbon and leaves it a soft inflammable mass. When you start your engine the next morning this mass burns, pulverizes and is blown out with the exhaust in powder form.

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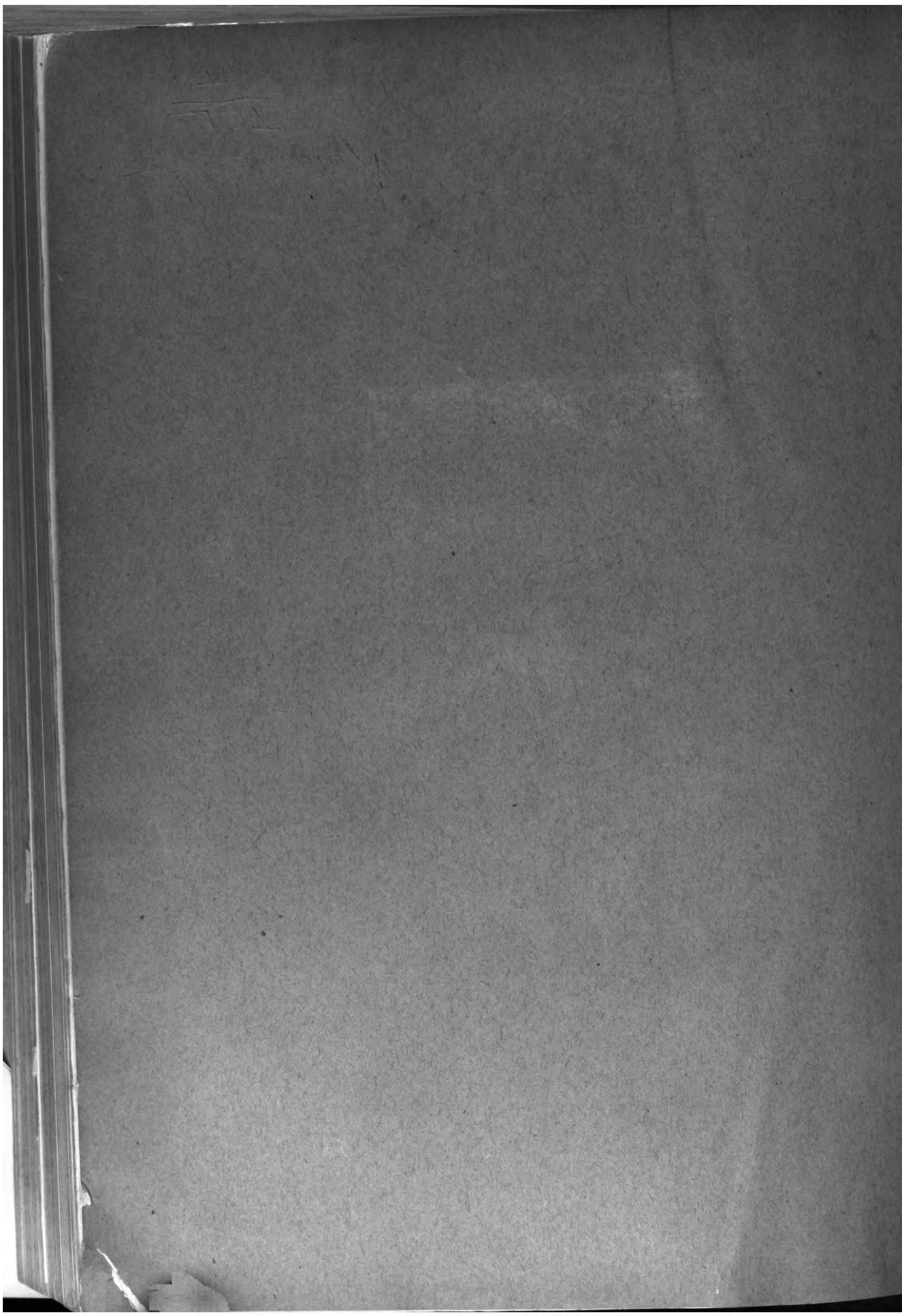
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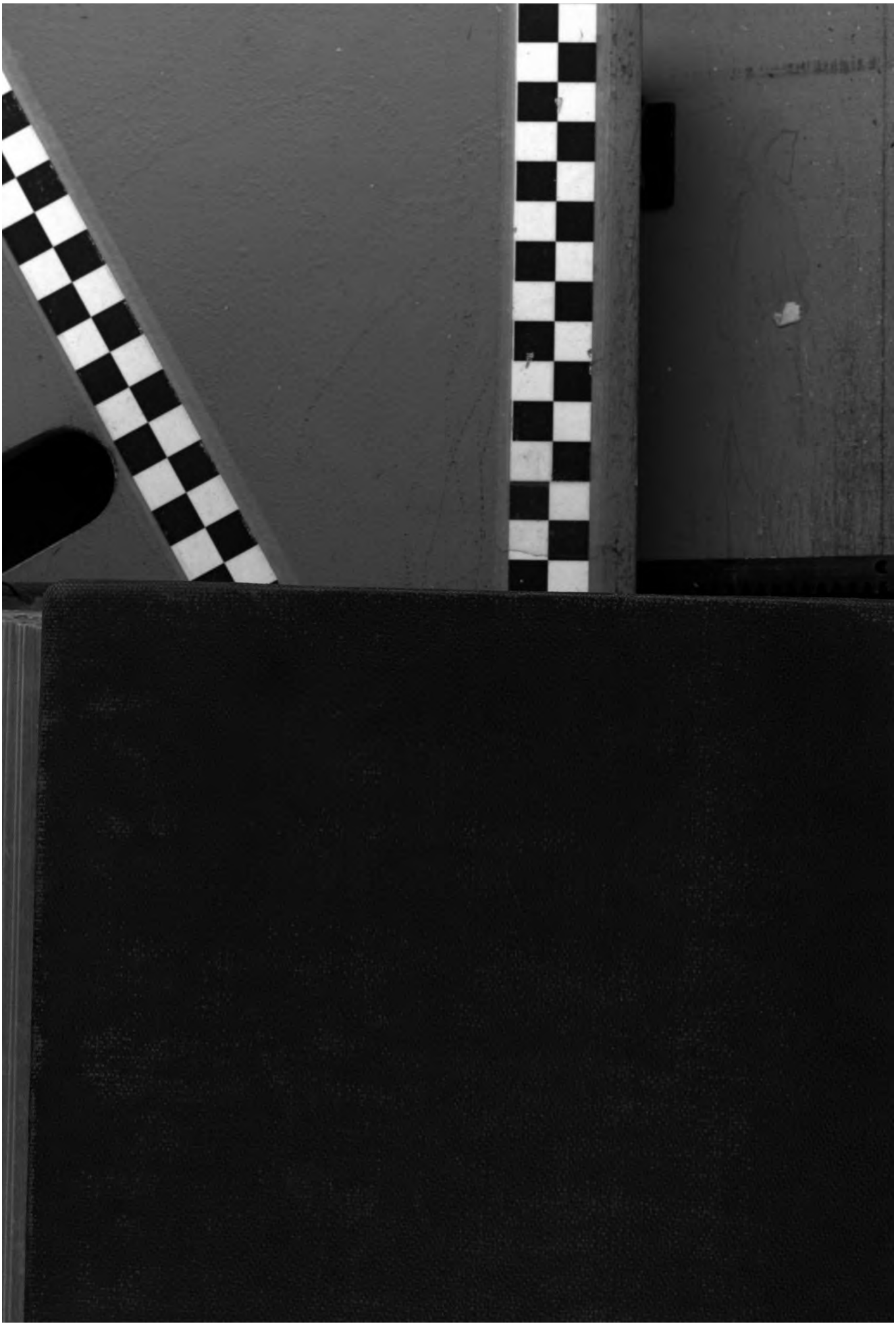
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